Appendix C.4 October 2024 Risk Dossiers

2-PROPENOIC ACID, HOMOPOLYMER2-PROPENOIC ACID, TELOMER WITH MERCAPTOACETIC ACID

This dossier on 2-propenoic acid, homopolymer and 2-propenoic acid, telomer with mercaptoacetic acid presents the most critical studies pertinent to the risk assessment of these substances in their use in coal seam gas extraction activities. These anionic polymers have been assessed as a group. Limited information was available for 2-propenoic acid, telomer with mercaptoacetic acid. However, it is expected to have similar environmental concerns as 2-propenoic acid, homopolymer. Therefore, information provided in this dossier is based on 2-propenoic acid, homopolymer.

This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): 2-carboxyethyl acrylate

CAS RN: [redacted]

Molecular formula: $(C_3H_4O_2)_x$

Molecular weight: variable (UVCB)

Synonyms: 2-Propenoic acid, homopolymer; poly(acrylic acid), poly(1-carboxyethylene); poly(acrylic acid); acrylic acid hompolymer

SMILES: C(C=C)(O)=O

Chemical Name (IUPAC): 2-Propenoic acid, telomer with mercaptoacetic acid

CAS RN: [redacted]

Molecular formula: $(C_3H_4O_2)_x.C_2H_4O_2S$

Molecular weight: 164.18 g/mol (variable, UVCB)

Synonyms: Acetic acid, mercapto-, telomer with 2-propenoic acid; Prop-2-enoic acid-sulfanylacetic acid

SMILES: C(CS)(O)=O.C(C=C)(O)=O

II. PHYSICO-CHEMICAL PROPERTIES

NICNAS has assessed 2-propenoic acid, homopolymer ([redacted][1] and 2-propenoic acid, telomer with mercaptoacetic acid ([redacted] in an IMAP Tier 1 assessment and considers them both as polymers of low concern.[2]

Key physical and chemical properties for 2-propenoic acid, homopolymer (CAS RN [redacted] are listed in Table 1. Physico-chemical property data are not available for 2-propenoic acid, telomer with 2-mercaptoacetic acid (CAS RN [redacted]

Table 1: Overview of the physico-chemical properties of 2-propenoic acid, homopolymer

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Liquid	1	ECHA
Melting Point	-60°C @ 101.3 kPa	1	ECHA
Boiling Point	193.9°C @ 101.3 kPa	1	ECHA
Density	1.206 kg/m^3@ 20°C	1	ECHA
Vapour Pressure	357 Pa @ 25°C	1	ECHA
Partition Coefficient (log K_{ow})	0.27 @ 20°C	1	ECHA
Water Solubility	546 g/L @ 20°C	1	ECHA
Flash Point	93.5 °C	1	ECHA
Auto flammability	459°C	1	ECHA
Viscosity	No data available	-	-
Henry's Law Constant	No data available	-	-

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

2-propenoic acid, homopolymer is not expected to be readily biodegradable, not expected to bioaccumulate, and has a low potential to adsorb to soil or sediment.

B. Partitioning

2-Propenoic acid, homopolymer is composed of polymerized units of acrylic acid (identified as "2-carboxyethyl acrylate oligomers") and residual monomers of acrylic acid, and is expected to exhibit a partition behaviour similar to the one of acrylic acid: both are indeed hydrophylic substances (log P_{ow} < 1) with a high solubility in water, a low volatility (vapour pressure < 5 hPa) (ECHA).

[1] https://services.industrialchemicals.gov.au/assessment-detail/?id=05b2433e-f36b-1410-8de4-00e8f2afc108
[2] https://services.industrialchemicals.gov.au/assessment-detail/?id=70b2433e-f36b-1410-8de4-00e8f2afc108

C. Biodegradation

No experimental data is available for 2-propenoic acid, hompolymer. Polymers in this group are not expected to undergo rapid degradation and are persistent (DoEE, 2017). In water they are expected to dissociate where the monomer (acrylic acid) is susceptible to biodegradation.

The aerobic biodegradability of read-across substance acrylic acid (CAS RN [redacted] was investigated in a GLP-compliant ready biodegradability study performed in accordance with OECD Guideline No. 301 F. The biodegradation of the test item within 28 days was 87.4% ThOD and reached the criteria for ready biodegradability (60% ThOD within a 10-d window). The degradation of the toxicity control after 14 days was >25%; the test item had no inhibitory effect on the inoculum according to the criterion of the guideline (ECHA) [Kl.score=1].

D. Environmental Distribution

According to the data available on acrylic acid, 2-propenoic acid, homopolymer is expected, by analogy, to exhibit an adsorption coefficient K_{oc} in the range 6-137 L/kg (average of 45.3 L/kg) (ECHA) [Kl.score=2].

Based on its average K_{OC} value, the substance is expected to have a low potential for adsorption and have a high to moderate mobility in soil. If released to water, based on its high water solubility value, it is likely to remain in water and not significantly adsorb to suspended solids or sediment.

E. Bioaccumulation

There are no bioaccumulation data for 2-propenoic acid, homopolymer. The log P_{ow} of 2-propenoic acid, homopolymer is 0.27 (20°C), which indicates a low potential for bioaccumulation. Further, due to their large size and negative charge, anionic polymers cannot cross biological membranes. The polymers therefore cannot cause intracellular toxic effects or bioaccumulate (Boethling and Nabholz 1997).

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

There are no toxicological studies for 2-propenoic acid, homopolymer. The monomer, acrylic acid, was used as a surrogate to assess human health hazards. Studies with acrylic acid indicate low acute oral, inhalation and dermal toxicity potential. It is not a skin irritant; however, it is classified as a “corrosive” to the eyes. It is not a skin sensitiser. No systemic toxic effects were observed in repeated dose chronic oral toxicity studies. Read-across substance acrylic acid is not genotoxic and is not a reproductive or developmental toxicant.

B. Metabolism

There are no absorption, distribution, or metabolism data for 2-propenoic acid, homopolymer.

<u>Oral</u>

The disposition and metabolism of acrylic acid was measured in C3H mice after single oral administration (40 or 150 mg/kg bw). Absorption and elimination of acrylic acid were rapid and nearly complete within 24 h after administration of single oral doses of either 150 or 40 mg/kg bw to C3H mice. Metabolism to $^{14}CO_2$ was the major route of elimination, accounting for about 80% of the

administered dose (92% of recovered radioactivity). Approximately 1% or less of the dose remained in the tissues and carcass at the end of the experiment. Elimination of radioactivity from stomach tissue, plasma, liver and kidney was rapid, but it was somewhat slower from fat. Urinary excretion accounted for about 3% of the dose, with most occurring during the first 24 h. Excretion in faeces accounted for about 1% of the dose. Only trace amounts of exhaled volatiles other than $^{14}CO_2$ were detected. Livers collected from orally dosed mice were analysed by high performance liquid chromatography (HPLC) for acrylic acid and metabolites. Unchanged acrylic acid was not detected 1 h after oral administration; however, several metabolites that were more polar than acrylic acid were detected, including 3-hydroxypropionate and peak 1, the metabolite that was also the major urinary metabolite in rats. Neither acrylic acid nor its metabolites were detected at later times after oral administration (ECHA) [Kl.score=2].

Dermal

The absorption of acrylic acid was measure *in vitro* with excised human and mouse skin. C3H mice and Fischer 344 rats, respectively, were treated dermally (10 or 40 mg/kg bw in acetone) with [1-^{14}C]-acrylic acid. After cutaneous application to mice, about 12% of the dose was absorbed, while the remainder was apparently evaporated. Approximately 80% of the absorbed fraction of the dose was metabolised to $^{14}CO_2$ within 24 h. Excretion in urine and faeces each accounted for less than 0.5% of the dose. Elimination of radioactivity from plasma, liver, and kidney was rapid; however, levels in fat were higher at 72 h (0.5% of the higher dose) than at 8 h (0.1% of the higher dose). After cutaneous administration to rats, 19-26% of the dose was absorbed. Disposition of the absorbed fraction of the dose was similar to results found in mice. Results from an in vitro experiment with rat skin (Frantz cell) showed that at least 60 % of the applied dose evaporated and about 25% was absorbed, confirming the in vivo results. HPLC analysis of rat urine and rat and mouse tissues indicated that absorbed acetic acid was rapidly metabolized by the ß-oxidation pathway of propionate catabolism (ECHA) [Kl.score=2].

C. Acute Toxicity

Oral

There are no acute oral toxicity studies for 2-propenoic acid, homopolymer.

An acute inhalation toxicity study (OECD Guideline 403) was conducted with acrylic acid in male and female Sprague-Dawley rats (strain and sex not specified). The animals (1-5 per dose) were exposed to 20, 79, 316, 1260, 2040, 3160, and 5010 mg/kg bw via oral gavage. It was determined that the LD_{50} was approximately 1500 mg/kg bw for acrylic acid when administered orally to rats. (ECHA). [Kl.score=2].

Inhalation

There are no acute inhalation toxicity studies for 2-propenoic acid, homopolymer.

An acute inhalation toxicity study (OECD Guideline 403) was conducted with acrylic acid in male and female Sprague-Dawley rats (10 animals per sex per dose). The animals were exposed to 4,250 or 5,120 mg/m^3 of acrylic acid vapor for 4 hours in a whole-body inhalation system. Afterwards, the animals were observed for 14 mortality and clinical signs. days. Body weight gain and histopathology was measured at the end of the study. No rats died during exposure or during the 14-day postexposure period. Clinical signs observed included reddish periocular and perinasal lacrimation, salivation, eyelid closure, scrubby clotted skin and dyspnoea. A lower body weight gain was observed (both sexes) on both postexposure Days 7 and 14 relative to the control group. No

macroscopic lesions were observed in animals sacrificed at the end of the 2-week post exposure period. The LC_{50} was >5,100 mg/m^3, which was the highest dose tested. (ECHA) [Kl.score=1].

Dermal

There are no acute dermal toxicity studies for 2-propenoic acid, homopolymer.

An acute dermal toxicity test (OECD Guideline 402) was conducted with rabbits to provide information on the potential health hazards from short term exposure to acrylic acid at non-corrosive concentrations via the dermal route. This study was conducted to confirm the results from earlier research which was conducted under non GLP conditions. Acid was tested as a preparation of 20% Acrylic Acid in Water to produce toxicity from a single topical application. Under the conditions of this study, the single dose acute dermal LD50 of the acrylic acid is greater than 2,000 mg/kg of body weight in male and female rabbits. All animals survived exposure to 2,000 mg/kg acrylic acid and gained body weight during the study. Dermal irritation, discoloration, fissuring, and/or mechanical damage was noted at the dose site of all animals throughout the 14 -day observation period. There were no other findings recorded for any animal over the course of the observation period, also necropsy did not show gross abnormalities. The LD_{50} was >2000 mg/kg, which was the highest dose tested (ECHA) [Kl.score=1].

D. Irritation

Skin

There are no acute oral toxicity studies for 2-propenoic acid, homopolymer.

An acute dermal irritation / corrosion study (OECD 404) was conducted with read-across beta-carboxyethyl acrylate using New Zealand White rabbits exposed (3 animals). Each of the 3 rabbits received three 0.5 ml doses of the test article (a liquid) on a dry compress in a single dermal dose to 2.5 cm^2clipped area of the skin. The doses were held in contact with the skin under a semi-occlusive patch for an exposure period of 3 minutes, 1 hour, and 4-hours, respectively. Cutaneous examinations were performed at removal of the dressing, after wiping of the remaining test article, then daily for up to 14 days. Exposure for 3 minutes produced very slight erythema (score 1) in 2/3 animals at removal of the dressing. The effects resolved completely by the 24-hour observation time. No oedema was observed. Exposure for 1 hour produced very slight erythema (score 1) in all 3 animals at removal of the dressing. On one site, erythema increased to well-defined (grade 2) at 72 hours. The effects resolved completely by day 7 (2/3 animals) or day 10 (1 animal). No oedema was observed. Exposure for 4 hours produced very slight erythema (score 1), and very slight (2/3 animals) to well-defined oedema (1 animal). Oedema resolved completely by the 72-hour observation time. On 3 test sites, the erythema increased to well-defined by the 72-hour scoring and persisted at day 7 on one site. Additional findings included superficial lightening and desquamation on 3 sites and 1 site, respectively. These effects resolved completely by day 14. The individual mean scores for each animal were 1.33 – 1.33 – 1.33 for erythema, and 0.33 – 0.67 – 0.33 for oedema. Based on these results, beta-carboxyethyl acrylate was not classified as a skin irritant (ECHA) [Kl.score=2].

Eye

There are no acute oral toxicity studies for 2-propenoic acid, homopolymer.

An acute eye irritation / corrosion study (OECD 405) was conducted using rabbits (species not specified) exposed (3 animals) to 0.005 ml of undiluted acrylic acid, applied to the centre of the

cornea while the lids were retracted. The eyes were examined 18 to 24 hours after instillation and the injury scored. After treatment, exposure to acrylic acid was injury scored 9/10, which is defined as “corrosive” (ECHA) [Kl.score=2].

E. Sensitisation

Skin

There are no skin sensitisation studies for 2-propenoic acid, homopolymer.

A skin sensitisation Modified Maquire Method (modified Split Adjuvant Test) was conducted using male Hartley guinea pigs (10 animals per dose). During induction, animals were dosed (epicutaneous, occlusive) with 0.1 ml of acrylic acid with a repeated dose during the challenge. In this test, acrylic acid did not induce skin reactions indicative of sensitization (ECHA) [Kl.score=2].

F. Repeated Dose Toxicity

Oral

There are no Repeated Dose Toxicity studies for 2-propenoic acid, homopolymer.

A Repeated Dose Chronic Toxicity Study (OECD Guideline 452) was conducted in male and female Wistar rats (20 animals per sex per dose). Animals were exposed to 120, 800, 2000, and 5000 ppm of acrylic acid in drinking water for 12 months. The acrylic acid samples were freshly prepared 3 times a week. During the study, cage side observations, clinical observations, body weight, water consumption, hematology, clinical chemistry, and urinalysis were performed on all animals. At the end of the treatment period, gross pathology, and histopathology was performed. The 4 doses of acrylic acid administered through the drinking water resulted in no impairment of general wellbeing of any of the animals. Apart from one male animal in the 120-ppm group that died after 326 days, no other animals died prematurely. The gross-pathological findings of this animal indicated chronic progressive nephropathy. The mean body weights of the male rats in groups 2000 and 5000 ppm were up to about 9 % below those of the control animals from 1 week after the start of administration up to the end of the study. The mean body weights of the other males and of all the females treated were equivalent to controls. The marginal effect on the body weights of the male rats in the 2000 and 5000 ppm groups must be viewed in the context of the reduction in the consumption of food and/or drinking water by these animals and must be attributed to the administration of the test substance. Only the male rats in the highest dose of 5000 ppm showed reduced food consumption throughout the study. In contrast, the food consumptions of the other animals treated with acrylic acid solutions were comparable with those of the relevant control groups. The reduction in food consumption by the male animals in highest dose group (5000 ppm; main and satellite groups), although slight, was seen throughout the study and must be regarded as connected with administration of the test substance. The consumption of drinking water by the male animals in the groups receiving 120 and 800 ppm was the same or somewhat higher than controls. In contrast, the corresponding figures for the animals in the 5000 ppm group were distinctly (up to about 20 %) lower, and for the rats in the 2000 ppm were less markedly lower (not more than about 13 %) than the figures for the controls. The consumption of drinking water by the female rats in the 120 and 800 ppm groups showed nothing abnormal on comparison with the controls. The drinking water consumption by the animals in the highest dose group (5000 ppm) was reduced, although only slightly. At times, the female rats in the 2000 ppm group also showed this tendency. The marked reduction in the drinking water consumed by the male animals in test group (5000 ppm) and the less pronounced reduction in the drinking water consumption of the male rats in test group (2000 ppm) and the female animals in test groups (2000 and 5000 ppm) are attributed to the test substance.

There were no changes in the haematology, clinical chemistry, or urinalysis. Regarding organ weights, at 5000 ppm, the male animals had reduced absolute adrenal weight, and increased relative kidney, brain and testes weight. In the female animals of the highest dose group, a slight reduction in the relative spleen weight was observed. There were no adverse findings in the gross pathological or histopathological assessment. The dose of 800 ppm in males (equivalent to 40 mg/kg bw/day) was identified as a NOAEL based on decreased water intake and body weight at higher dose levels. No target organs were identified (ECHA) [Kl.score=1].

Inhalation

No data available

Dermal

No data available

G. Genotoxicity

In Vitro Studies

There are no *in vitro* genotoxicity studies for 2-propenoic acid, homopolymer.

The *in vitro* genotoxicity studies on read-across substance acrylic acid are presented in Table 2.

Table 2: *In vitro* genotoxicity studies on acrylic acid

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
OECD 476: In Vitro Mammalian Cell Gene Mutation Test; Chinese Hamster Ovary (CHO)-K1-BHA cells	-	-	1	ECHA

*+, positive; -, negative

In Vivo Studies

There are no *in vivo* genotoxicity studies for 2-propenoic acid, homopolymer.

An *in vivo* bone marrow chromosomal aberration assay (OECD 475: Mammalian Bone Morrow Chromosome Aberration Test) was conducted with rats on read-across substance acrylic acid. Chromosome aberrations were analysed (5 animals per sex, 50 metaphases per animal) at 6, 12, and 24 hours after oral gavage doses of 100, 333, or 1000 mg/kg bw acrylic acid. At the time specified following dosing, the ats received an intraperitoneal injection of colchicine (1.0 mg/kg bw) based on terminal weight to arrest mitosis. At 2 – 4 hours later, the animals were sacrificed. Acrylic acid did not induce chromosomal aberrations in bone marrow cells in this in vivo study in rats following a single oral administration (ECHA) [Kl.score=1].

H. Carcinogenicity

Oral

No data available.

Inhalation

No data available.

Dermal

No data available.

I. Reproductive Toxicity

Oral

There are no reproductive toxicity studies for 2-propenoic acid, homopolymer.

A Two-Generation Reproduction Toxicity Study (OECD Guideline 416) was conducted for acrylic acid in male and female Wistar rats (25 animals per sex per dose). Doses of 0, 500, 2500 or 5000 ppm were administered in the drinking water at least 70 days before mating and during the gestation and lactation periods for the F_0 generation. For the F_1 generation, exposure was at least 98 days before mating and during the gestation and lactation periods. In the F_1 generation, there were no impacts on mortality, clinical signs, sexual maturation, or gross pathological and histopathological findings. There were treatment-related effects on body weighs of F_1 male and female pups exposed to 2500 and 5000 ppm acrylic acid. In the F_2 generation, there were increased incidences of cannibalized pups in the 2500 and 5000 ppm groups. The mean body weights of the F_2 male and female pups were reduced in the 2500 and 5000 ppm groups. There were also clinical impacts of F_2 generation pups in the 500 ppm (hydrocephaly), 2500 ppm (delayed auditory canal opening) and 5000 ppm (delayed eye opening) groups. The NOAEL's for both the F_1 and F_2 generations were 500 ppm, which correspond to an exposure level of 53 mg/kg bw/day (ECHA) [Kl.score=1].

Inhalation

No data available

Dermal

No data available

J. Developmental Toxicity

Oral

No data available

Inhalation

There are no developmental toxicity studies for 2-propenoic acid, homopolymer.

A Prenatal Developmental Toxicity Study (OECD Guideline 414) was conducted for acrylic acid in Sprague-Dawley rats (30 animals per sex per dose). Doses of 0, 40.7, 120.3, or 361 ppm (120, 360, 1,080 mg/m^3) of acrylic acid were administered as a vapour in a whole body continuous infusion pump. Pregnant dams were exposed daily for 6 hours / day from day 6 to day 15 of gestation and the study was terminated at day 20 of gestation. No animals died in any dose group; however, there were signs of maternal toxicity. Indications of a toxic effect on the dams emerged at 120 ppm with

decreased food consumption and reduced body / uterine weight ratios after necropsy. There was marked toxicity on the pregnant animals in the 360 ppm group with lower body weight, body weight gain, reduced food consumption, reduced body/ uterine weight ratios and clinical signs. Regarding observations of the offspring, there were no signs of embryotoxicity or teratogenic effects. The NOAEC for the maternal animals was 120 mg/m^3 with a LOAEC of 360 mg/m^3. The NOAEC for developmental toxicity was >1,080 mg/m^3 (ECHA) [Kl.score=1].

Dermal

No data available

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for 2-propenoic acid, homopolymer and 2-propenoic acid, telomer with mercaptoacetic acid follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

There are no repeat dose toxicity studies for 2-propenoic acid, homopolymer or 2-propenoic acid, telomer with mercaptoacetic acid. A 12-month drinking water study was conducted for read-across substance acrylic acid on male and female wistar rats. A NOAEL of 40 mg/kg bw/day was established based on based on decreased water intake and body weight. The NOAEL of 40 mg/kg bw/day will be used to derive an oral RfD and drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 40/(10 × 10 × 1 x 1 × 1) = 40/100 = 0.40 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)

Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (0.40 × 70 × 0.1)/2 = 1.4 mg/L

B. Cancer

There are no carcinogenicity studies on 2-propenoic acid, homopolymer or read-across substance acrylic acid. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

2-propenoic acid, homopolymer does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

There are no aquatic toxicity studies on 2-propenoic acid, homopolymer. Acute and chronic studies for read-across substance acrylic acid indicate that the substance is of relatively low toxicity to aquatic organisms. Data to support this conclusion are discussed below.

B. Aquatic Toxicity

Acute Studies

There are no acute aquatic toxicity studies on 2-propenoic acid, homopolymer.

Table 3 lists the results of acute aquatic toxicity studies conducted on read-across substance acrylic acid.

Table 3: Acute aquatic toxicity studies on acrylic acid

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Oncorhynchus mykiss	96-hr LC50	27 mg/L	1	ECHA
Daphnia magna	48-hr EC50	47 mg/L	2	ECHA
Pseudokirchneriella subcapitata	72-hr EC50	18 mg/L	1-	ECHA

Chronic Studies

There are no chronic aquatic toxicity studies on 2-propenoic acid, homopolymer.

A 72-hour NOEC of 0.35 mg/L for read-across substance acrylic acid was established for Pseudokirchneriella subcapitata based on growth rate (ECHA) [Kl.score=1].

C. Terrestrial Toxicity

No data available.

D. Calculation of PNEC

The PNEC calculations for 2-propenoic acid, homopolymer follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels for read-across substance acrylic acid. Acute E(L)C_{50} values are available for fish (27 mg/L), *Daphnia* (47 mg/L), and algae (18 mg/L). The NOEC values for acrylic acid from long-term studies are available for algae (0.35 mg/L). On the basis that the data consists of short-term results from three trophic levels and long-term results from one trophic level, an assessment factor of 100 has been applied to the NOEC value of 0.35 mg/L for algae. The $PNEC_{water}$ is 0.0035 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 0.0046 mg/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (1.62/1280) \times 1000 \times 0.0006$
$= 0.0008$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 1.71/1000 \times 2400]$
$= 1.62\ m^3/m^3$

Where:
Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 45.3 \times 0.04$
$= 1.71$ L/kg

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for acrylic acid is 45.3 L/kg. (ECHA)
F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 0.0021 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (0.86/1500) \times 1000 \times 0.0006$
$= 0.0003$ mg/kg

Where:
Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]
$Kp_{soil} = K_{oc} \times f_{oc}$
$= 42.8 \times 0.02$
$= 0.86\ m^3/m^3$

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for acrylic acid is 42.8 L/kg. (ECHA)
F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

No experimental data is available for 2-propenoic acid, hompolymer. 2-propenoic acid, homopolymer is not expected to be readily biodegradable. Polymers in this group are not expected to undergo rapid degradation and are persistent (DoEE, 2017). Thus, it does meet the screening criteria for persistence. In water they are expected to dissociate where the monomer (acrylic acid) is susceptible to biodegradation.

The log P_{ow} of 2-propenoic acid, homopolymer is 0.27 (20°C), which indicates a low potential for bioaccumulation. Thus, 2-propenoic acid, homopolymer does not meet the criteria for bioaccumulation.

No experimental data is available for 2-propenoic acid, hompolymer. The NOECs from the chronic aquatic toxicity studies on read-across substance acrylic acid are > 0.1 mg/L for algae. The acute $E(L)C_{50}$ values from the acute aquatic toxicity studies on acrylic acid are > 1 mg/L for algae, invertebrates and fish. Thus, 2-propenoic acid, homopolymer does not meet the criteria for toxicity.

The overall conclusion is that 2-propenoic acid, homopolymer is not a PBT substance based on the assessment of acrylic acid.

IX. CLASSIFICATION AND LABELLING

A. Classification

Acute Oral Toxicity: 4

Eye Damage: 1

Aquatic Acue: 1

Aquatic Chronic: 2

B. Labelling

Danger

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

Eye Contact

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention.

Ingestion

Rinse mouth with water and then drink a glass of water. Get medical attention. Never give anything by mouth to an unconscious person.

B. Firefighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Keep product and empty container away from heat and sources of ignition. May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon dioxide.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Handle in accordance with good industrial hygiene and safety practice.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

For large amounts: dike spillage and pump off product. For residues: pick up with suitable absorbent material. Dispose of contaminated material as prescribed.

D. Storage and Handling

General Handling

Keep product and empty container away from heat and sources of ignition. Ensure adequate ventilation, especially in confined areas.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for 2-propenoic acid, homopolymer

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Respiratory protection is not required.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is recommended. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

2-propenoic acid, homopolymer is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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ACETIC ACID

This dossier on acetic acid presents the most critical studies pertinent to the risk assessment of acetic acid in its use in coal seam or shale gas extraction activities. It does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

NICNAS has assessed acetic acid in an IMAP Tier 1 assessment and concluded that it poses no unreasonable risk to the environment.

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Acetic acid

CAS RN: [redacted]

Molecular formula: $C_2H_4O_2$

Molecular weight: 60.1 g/mol

Synonyms: Acetic acid, ethanoic acid, ethylic acid, methane carboxylic acid, vinegar acid

SMILES: CC(=O)O

II. PHYSICO-CHEMICAL PROPERTIES

Key physical and chemical properties for the substance are shown in Table 1.

Table 1: Overview of the Physico-Chemical Properties of Acetic Acid

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Colourless liquid with a pungent odour.	2	ECHA
Melting Point	16.64°C @ 101.3 kPa	2	ECHA
Boiling Point	117.9°C @ 101.3 kPa	2	ECHA
Density	1040 kg/m^3 @ 25°C	2	ECHA
Vapour Pressure	2079 Pa @ 25°C	2	ECHA
Partition Coefficient (log K_{ow})	-0.17 @ 20°C	2	ECHA
Water Solubility	602.9 g/L @ 25°C	2	ECHA
Viscosity	1.056 mPa s @ 25°C	2	ECHA
Dissociation constant (pKa)	4.756 @ 25°C	2	ECHA

Acetic acid readily dissociates in aqueous media to the acetate ($H_3C2O_2^-$) and hydrogen (H^+) ions.

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

The acetate ion of acetic acid is readily biodegradable, is not expected to bioaccumulate, and has a low potential to adsorb to soil.

B. Partitioning

The pKa of acetic acid is 4.76, indicating that this substance will exist partially in anion form in the environment and anions generally do not adsorb more strongly to soils containing organic carbon and clay than their neutral counterparts (PubChem).

Volatilization of acetic acid from water and moist soil surfaces is not expected to be an important fate process given a Henry's Law constant of 0.21 pascal cubic metre per mole (Pa-m^3/mol) (ECHA). Acetic acid is expected to volatilise from dry soil surfaces based upon its vapour pressure.

Hydrolysis is not expected to be an important environmental fate process since this substance lacks functional groups that hydrolyse under environmental conditions(PubChem).

C. Biodegradation

Acetic acid was readily biodegradable in a non-acclimated freshwater study. Degradation was 96% after 20 days (Price et al., 1974; ECHA) [Kl. score = 2]. Acetic acid is also readily biodegradable under anaerobic conditions (Kameya et al., 1995) [Kl. score = 2].

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017a).

D. Environmental Distribution

No experimental data are available for acetic acid. Using KOCWIN in EPISuite™ (USEPA, 2017), the estimated K_{oc} values from log K_{ow} and the molecular connectivity index (MCI) are 1.153 and 1.0 L/kg, respectively. Based on these values, acetic acid has a low potential for adsorption to soil and sediment and is expected to have very high mobility in soil.

Acetic acid is highly soluble in water and dissociates completely in aqueous solution to acetate and its hydrogen ion. However, the chemistry of the receiving water compartment, such as its pH and the presence of metal ions, may affect the speciation and partitioning of this substance and its buffering capacity (DoEE, 2017b).

E. Bioaccumulation

There are no bioaccumulation studies on acetic acid. Bioaccumulation of acetic acid is not expected to occur because acetic acid dissociates completely in aqueous solution to acetate and its hydrogen ion.

Both ions are ubiquitous in the environment. Acetate is naturally found in eukaryotic and prokaryotic cells and is involved in their biochemical pathways.

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Acetic acid is a corrosive liquid. Depending on the concentration, aqueous solutions of acetic acid are either corrosive, irritating, or non-irritating to the skin, eyes, and gastrointestinal tract. Vapours from aqueous solutions of acetic acid can cause respiratory irritation. There are no adequate repeated dose toxicity studies on acetic acid. Acetic acid is not genotoxic. Positive findings have been reported in some in vitro genotoxicity studies and are considered to be the result of the pH change in the test system. There are no carcinogenicity studies by the oral or inhalation route. It is not carcinogenic by the dermal route. Animal studies have shown no developmental toxicity from ingestion of acetic acid.

B. Acute Toxicity

Oral

The oral LD_{50} of the sodium salt of acetic acid in rats is 3,310 milligrams per kilogram (mg/kg) (Woodard et al., 1941; ECHA) [Kl. score =2]. The oral LD_{50} of the acetic acid in unfasted rats is 3,530 mg/kg (ECHA) [Kl. score =4]. The oral LD_{50} of the sodium salt of acetic acid in mice is 4,960 mg/kg (Smyth et al., 1951; ECHA) [Kl. score =2].

Inhalation

The 4-hour inhalation LC_{50} in rats for acetic acid vapor is 11.4 milligrams per litre (mg/L). There were clinical signs that were indicative of corrosion (ECHA) [Kl. score = 2].

C. Irritation

Application of a 3.3% or a 10% aqueous solution of acetic acid to the skin of rabbits for 4 hours was slightly irritating. The Primary Dermal Irritation Index scores were 0.5 and 1.1, respectively (Nixon et al., 1990; ECHA) [Kl. score = 2]. Application of a 10% solution of acetic acid to the skin of rabbits for 4 hours under semi-occlusive conditions was slightly irritating (ECHA) [Kl. score = 2].

Instillation of 0.1 mL of a 10% solution of acetic acid to the eyes of rabbits was considered irritating. The mean of the 24-, 48-, and 72-hours scores were: 2.67 for erythema; 1.67 for chemosis; 1.72 for corneal opacity; and a mean of 87% corneal swelling (Jacobs and Martens, 1989; ECHA) [Kl. score = 2]

D. Sensitisation

No studies are available.

E. Repeated Dose Toxicity

Oral

No adequate studies for human health risk assessment are available.

Inhalation

No studies are available.

Dermal

No adequate studies are available.

F. Genotoxicity

In Vitro Studies

The *In Vitro* genotoxicity studies on acetic acid are presented below in Table 2.

Table 2: *In Vitro* Genotoxicity Studies on Acetic Acid

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Bacterial reverse mutation (*S. typhimurium* strains)	NC	-	2	Ishidate et al. (1984); ECHA
Bacterial reverse mutation (*S. typhimurium* strains)	-	-	2	Zeiger et al. (1992); ECHA
Chromosomal aberrations (CHO cells)	-**	-**	2	Morita et al. (1990); ECHA
Mammalian cell gene mutation (mouse lymphoma L5178Y cells)	-***	-***	2	Seifried et al. (2006); ECHA

*+, positive; -, negative; NC, not conducted.
**A dose-dependent increase in chromosomal aberrations was observed with 10 mM acetic acid (-S9) and 8 mM acetic acid (+S9). These concentrations were close to the cytotoxic limit at which the cells could no longer be evaluated. These effects were abolished by neutralizing the test medium or increasing the buffer capacity. These results suggest that the positive findings are due to the acidic pH of the incubation medium rather than a consequence of an intrinsic clastogenic potential of acetic acid.
***Acetic anhydride (hydrolyses to acetic acid in aqueous media).

In Vivo Studies

No studies are available on acetic acid.

A bone marrow micronucleus study has been conducted on acetic anhydride, which hydrolyses to acetic acid. Male and female SD rats were exposed by inhalation to 0, 1, 5, or 20 parts per million (ppm) acetic anhydride, 6 hours/day, 5 days/week for 13 weeks. The incidence of micronucleated immature erythrocytes was not increased at any exposure concentration (ECHA). [Kl. score = 1]

G. Carcinogenicity

No oral or inhalation studies are available.

No deaths nor skin tumours were seen when acetic acid was applied dermally once a week to CD-1 mice for 32 weeks (Slaga et al., 1975; ECHA) [Kl. score = 4].

H. Reproductive Toxicity

No studies are available.

I. Developmental Toxicity

Pregnant female Wistar rats were dosed with 0 or various concentrations up to 1,600 mg/kg apple cider vinegar (5% acetic acid) by oral gavage on gestational days 6 to 15. There were no maternal or developmental toxicity effects noted at any dose level. The no observed adverse effect level (NOAEL) for maternal and developmental toxicity is 1,600 mg/kg-day (ECHA). [Kl. score = 2]

Pregnant female CD-1 mice were dosed with 0, 16, 74.3, 345, or 1,600 mg/kg apple cider vinegar (5% acetic acid) by oral gavage on gestational days 6 to 15. There were no treatment-related effects on maternal or foetal survival, or on soft or skeletal tissues. There was no effect on the foetal development in the presence of slight maternal toxicity (reduced body weight gain) at 345 mg/kg. At 1,600 mg/kg, there was an increase in the number of litters containing a dead foetus and some reductions in ossification. The NOAELs for maternal and developmental toxicity are 74.3 and 345 mg/kg-day, respectively (ECHA). [Kl. score = 2]

Pregnant female Dutch-belted rabbits were dosed with 0, 16, 74.3, 345, or 1,600 mg/kg apple cider vinegar (5% acetic acid) by oral gavage on gestational days 6 to 18. There were no treatment-related effects on maternal or foetal survival, or on soft or skeletal tissues. There was a reduction in the pregnancy rate in the high-dose group; and a dose-dependent decrease in maternal body weights at >74.3 mg/kg. Some deaths or abortions occurred in all treated groups and some litter losses were reported at >345 mg/kg. Maternal effects were much more noticeable than the effects on foetal development. These findings have been considered a consequence of the bactericidal properties of orally administered acetic acid within the gastrointestinal tract of female rabbits, and not a direct effect on embryonic implantation and development of acetic acid (EU, 2008). It is likely that this accounts for the apparent increased sensitivity of this species to oral administration of acetic acid. The NOAEL for developmental toxicity is 1,600 mg/kg-day; a NOAEL for maternal toxicity was not identified (ECHA). [Kl. score = 2]

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for acetic acid follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

There are no repeated dose toxicity studies that were considered adequate for human health risk assessment.

The Joint FAO/WHO Expert Committee on Food Additives (JECFA) has maintained a group acceptable daily intake (ADI) of "not limited" for acetic acid and its potassium and sodium salts (JECFA).

While concentration of acetic acid will affect pH, and extreme pH values (<4 and >11) may adversely affect health, there are insufficient data to set a health guideline value (ADWG, 2011)

B. Cancer

There are no carcinogenicity studies by the oral or inhalation route. A dermal carcinogenicity study in mice showed no carcinogenic activity when acetic acid was applied to the skin for 32 weeks. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Acetic acid is a flammable liquid.

Acetic acid does not exhibit the following physico-chemical properties:

- Explosivity
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Acetic acid is of moderate acute toxicity concern to aquatic organisms, in part because of the effect of pH changes from the dissociated hydrogen ion. The acetate ion is of low acute toxicity concern to aquatic organisms.

B. Aquatic Toxicity

Acute Studies

Table 3 presents the results of acute aquatic toxicity studies on acetic acid and potassium acetate.

Table 3: Acute Aquatic Toxicity Studies on Acetic Acid and Potassium Acetate

Test Substance	Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Potassium acetate	*Oncorhynchus mykiss*	96-hour LC_{50}	>300.82*	2	ECHA
Potassium acetate	*Danio rerio*	96-hour LC_{50}	>300.82*	2	ECHA

Test Substance	Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Acetic acid	*Oncorhynchus mykiss*	96-hour LC_{50}	64.8 (measured)	4	ECHA
Acetic acid	*Oncorhynchus mykiss*	96-hour LC_{50}	31.3 – 67.6	4	ECHA
Potassium acetate	*Daphnia magna*	48-hour EC_{50}	>300.82*	2	ECHA
Acetic acid	*Daphnia magna*	48-hour EC_{50}	79.5 (measured)	4	ECHA
Acetic acid	*Daphnia magna*	48-hour EC_{50}	18.9 (measured)	4	ECHA
Acetic acid	*Desmodesmus subspicatus*	72-hour EC_{50}	486.5	4	ECHA

*As the acetate ion.

Chronic Studies

In a 21-day fish (*Oncorhynchus mykiss*) chronic study, the measured no observed effect concentration (NOEC) values for 60% and 100% acetic acid were 57.2 and 34.3 mg/L, respectively (ECHA). [Kl. score = 4]

In a 21-day *Daphnia* reproduction study, the measured NOEC for 60% and 100% acetic acid were 80 and 31.4 mg/L, respectively (ECHA). [Kl. score = 4]

In a 21-day *Daphnia* reproduction study, the measured NOEC for 100% acetic acid was 22.7 mg/L (ECHA). [Kl. score = 4]

C. Terrestrial Toxicity

No data are available.

D. Calculation of PNEC

Despite the low Klimisch scores for aquatic toxicity testing (K=4), the PNEC calculations for acetic acid follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels. For the acute toxicity studies, data are available on both acetic acid and potassium acetate; both substances dissociate completely in aqueous media to the acetate anion and the corresponding cations (H+ and K+). The toxicity of these substances is expected to be driven by the acetate ion, with the cations having a minor role. The toxicity data on potassium acetate are preferred because of the absence of a potential pH change from the dissociated H+ ion of acetic acid. For the chronic toxicity studies, only acetic acid has been tested for two trophic levels: fish and invertebrates. These studies will not be used to derive the PNEC value; however, an assessment factor of 100 will be applied to the lowest acute $E(L)C_{50}$ values for the acetate ion.

From the potassium acetate studies, acute $E(L)C_{50}$ values (adjusted for acetic acid) are available for fish (300.82 mg/L) and Daphnia (300.82 mg/L). By applying an assessment factor of 100 to the $E(L)C_{50}$ value of 300.82 mg/L from either fish or Daphnia, the $PNEC_{water}$ for acetic acid is 3.0 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 1.9 mg/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1{,}000 \times PNEC_{water}$
$= (0.82/1{,}280) \times 1{,}000 \times 3.0$
$= 1.9$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (cubic metre per cubic metre [m^3/m^3])
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1{,}000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 0.04/1{,}000 \times 2{,}400]$
$= 0.82$ kg/m^3

Where:
Kp_{sed} = solid-water partition coefficient (L/kg).
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 1.0 \times 0.04$
$= 0.04$ L/kg

Where:
K_{oc} = organic carbon normalized distribution coefficient (L/kg). The K_{oc} for acetic acid calculated from EPISUITE™ using the MCI is 1.0 L/kg .
F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There is no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 0.04 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (0.02/1500) \times 1000 \times 3.0$
$= 0.04$ mg/kg

Where:
Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]
$Kp_{soil} = K_{oc} \times f_{oc}$
$= 1.0 \times 0.02$

= 0.02 m^3/m^3

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for acetic acid calculated from EPISUITE™ using the MCI is 1.0 L/kg .
F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (DEWHA, 2009; ECHA, 2017).

Acetic acid is readily biodegradable; thus, it does not meet the screening criteria for persistence.

Bioaccumulation of acetic acid is not expected to occur because acetic acid dissociates completely in aqueous media to acetate and its hydrogen ion. Both ions are ubiquitous in the environment. Acetate is naturally found in eukaryotic and prokaryotic cells and is involved in their biochemical pathways. The log K_{ow} for acetic acid is -0.17. Thus, acetic acid does not meet the screening criteria for bioaccumulation.

The NOECs from the chronic aquatic toxicity studies on acetic acid are >0.1 mg/L. The EC_{50} values for potassium acetate are > 1 mg/L. Thus, acetic acid does not meet the criteria for toxicity.

The overall conclusion is that acetic acid is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

Flammable Liquid Category 3

Skin Corrosion Category 1A

EU:

≥90%: Skin Corrosion 1A

≥25% to <90%: Skin Corrosion 1B

≥10% to <25%: Skin irritant Category 2; Eye irritant Category 2

In addition to the hazard statements corresponding the GHS classifications (if Skin Corrosion 1A or 1B is included), the following non-GHS hazard statement is to be added to the SDS: AUH071: Corrosive to the Respiratory Tract.

B. Labelling

Danger

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Eye Contact

Immediately flush open eyes with plenty of water for at least 15 minutes. Remove contacts, if present and easy to do. Get medical attention immediately, preferably a physician for an ophthalmologic examination.

Skin Contact

For minor skin contact, avoid spreading material on unaffected skin. Remove and isolate contaminated clothing. Wash the contaminated area of body with soap and fresh water. Get medical attention immediately.

Inhalation

Move person to fresh air. Administer oxygen if breathing is difficult. Do not use mouth-to-mouth method if victim inhaled the substance; give artificial respiration with the air of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Give artificial respiration if victim is not breathing. Get medical attention immediately.

Ingestion

Rinse mouth and lips with plenty of water if person is conscious. Do not induce vomiting. Do not use mouth-to-mouth method if victim had ingested the substance. Obtain medical attention immediately if ingested.

Notes to Physician

Treat as a corrosive due to pH of the material. All treatments should be based on observed signs and symptoms of distress in the patient.

B. Fire Fighting Information

Extinguishing Media

Use water spray or fog, foam, dry chemical or carbon dioxide. Do not use straight streams of water.

Specific Exposure Hazards

Flammable liquid and vapor. Vapours are flammable and heavier than air. Vapours may travel across the ground and reach remote ignition sources causing a flashback fire danger. Emits toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon dioxide, carbon monoxide.

Special Protective Equipment for Firefighters

Structural firefighter's protective clothing provides limited protection in fire situations only; it is not effective in spill situations where direct contact with the substance is possible. Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection. Wear positive pressure self-contained breathing apparatus (SCBA). Move containers from fire area if you can do it without risk.

C. Accidental Release Measures

Personal Precautions

Isolate area. Keep unnecessary and unprotected personnel from entering the area. Use personal protective clothing. Ensure adequate ventilation. Wear respiratory protection if ventilation is inadequate. Do not breath mist, vapours, or spray. Avoid contact with skin, eye, and clothing. Eliminate all sources of ignition.

Environmental Precautions

Prevent from entering sewers, waterways, or low areas.

Steps to be Taken if Material is Released or Spilled

Eliminate all sources of ignition. All equipment used when handling the material must be grounded. A vapor suppressing foam may be used to reduce vapours. Use clean non-sparking tools to collect absorbed material. Pick up with suitable absorbent material and transfer to a container for chemical waste. For large amounts, dike spillage and pump off product into container for chemical waste. Dispose of contaminated material as prescribed.

D. Storage And Handling

General Handling

Prevent exposure to ignition sources (i.e., use non-sparking tools and explosion-proof equipment). Avoid contact with eyes, skin, and clothing. Avoid breathing vapor. Wash thoroughly after handling. Keep

container closed. Use with adequate ventilation. Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Peroxides may form upon prolonged storage. Exposure to light, heat or air significantly increases peroxide formation. If evaporated to a residue, the mixture of peroxides residue and material vapor may explode when exposed to heat or shock.

Storage

Keep container tightly closed. Store in a cool, well-ventilated area away from heat and light. Storage containers should be grounded and bonded. Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

The workplace exposure standard for acetic acid in Australia is 10 ppm (25 mg/m^3) as a 8-hr time-weighted average (TWA) and 15 ppm (37 mg/m^3) as a 15-min short-term exposure limit (STEL).

Engineering Controls

Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Personal Protection Equipment

Respiratory Protection:

If workers are exposed to concentrations above the exposure limit, they must use appropriate, certified respirators. If there are no applicable exposure limit requirements or guidelines, use an approved respirator. Selection of air-purifying or positive pressure supplied-air will depend on the specific operation and the potential airborne concentration of the product. For emergency conditions, use an approved positive-pressure self-contained breathing apparatus.

Hand Protection:

Use gloves chemically resistant to this material. Consult the safety data sheet (SDS) for appropriate glove barrier materials.

Skin Protection:

Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

Eye protection:

Use chemical goggles.

Other Precautions:

Wash hands, forearms, and face thoroughly after handling chemical products, before eating, smoking, and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

For glacial acetic acid or >80% acetic acid solutions:
UN 2789 (ACETIC ACID, GLACIAL or ACETIC ACID SOLUTION)
Class: 8
Packing Group: II

For ≥50% to 80% acetic acid solutions:
UN 2790 (ACETIC ACID SOLUTION)
Class: 8
Packing Group: II

For >10% to <50% acetic acid solutions:
UN 2790 (ACETIC ACID SOLUTION)
Class: 8
Packing Group: III

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state, and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

ADWG. (2011). National Water Quality Management Strategy. Australian Drinking Water Guidelines, Section 6, Australian Government, National Health and Medical Research Council, Natural Resource Management Ministerial Council. Updated January 2022. Available: https://www.nhmrc.gov.au/about-us/publications/australian-drinking-water-guidelines

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ACETIC ACID, 2-MERCAPTO-, SODIUM SALT (1:1)

This dossier on acetic acid, 2-mercapto-, sodium salt (1:1) presents the most critical studies pertinent to the risk assessment of acetic acid, 2-mercapto-, sodium salt (1:1) in its use in coal seam or shale gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

AICIS has evaluated acetic acid, 2-mercapto-, sodium salt (1:1) and has determined that based on the available information there are no identified risks to the environment that require further regulation to manage the risk to the environment.[1]

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): sodium 2-sulfanylacetate

CAS RN: [redacted]

Molecular formula: $C_2H_4O_2S.Na$

Molecular weight: 114.09 g/mol

Synonyms: Acetic acid, mercapto-, monosodium salt; sodium mercaptoacetate; sodium thioglycolate

SMILES: [NA+].[O-]C(=O)CS

II. PHYSICO-CHEMICAL PROPERTIES

Key physical and chemical properties for acetic acid, 2-mercapto-, sodium salt (1:1) are shown in Table 1.

Table 1: Overview of the physico-chemical properties of acetic acid, 2-mercapto-, sodium salt (1:1)

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Solid, crystalline, white	2	ECHA
Melting Point	260°C @ 101.3 kPa	1	ECHA
Boiling Point	No data available	---	---
Density	0.609 kg/m^3@ 20°C	--	ECHA
Vapour Pressure	0.048 Pa @ 25°	--	ECHA
Partition Coefficient (log K_{ow})	-2.99 @ 20°C	1	ECHA
Water Solubility	609.1 g/L @ 20°C	2	ECHA

[1] https://cdnservices.industrialchemicals.gov.au/statements/EVA00045%20-%20Evaluation%20Statement%20-%2014%20September%202021.pdf

Property	Value	Klimisch Score	Reference
Flash Point	No data available		
Auto flammability	>400°C	--	ECHA
Viscosity	No data available		
Henry's Law Constant	No data available		

Acetic acid, 2-mercapto-, sodium salt (1:1) is a salt of mercaptoacetic acid (CAS RN [redacted] These salts dissociate in solution to form the mercaptoacetate anion and the respective metallic cations (calcium, ammonium, potassium, strontium or sodium, all of which have low toxicity) (NICAS, 2014).

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Acetic acid, 2-mercapto-, sodium salt (1:1) is expected to be readily biodegradable and is not expected to adsorb to suspended sediments or soil. It has a low potential for bioaccumulation.

B. Biodegradation

No experimental data is available for acetic acid, 2-mercapto-, sodium salt (1:1). Several thiochemicals, including read-across substance thioglycolic acid (TGA), were examined for biodegradation potential according to OECD 301D (Ready Biodegradability: Closed Bottle Test) and OECD 301F (Ready Biodegradability: Manometric Respiratory Test). Based on 87% biodegradation and fulfilling the 10-day window criterion in a manometric respirometry test, TGA is readily biodegradable (ECHA) [Kl.score=1].

In a modified prolonged closed bottle test, the biodegradation potential of TGA was analysed up to 200 days. The preconditioned and aerated sludge was diluted to a concentration of 2 mg/dry wr/L and ammonium chloride was omitted from the medium to prevent nitrification. TGA induced endogenous respiration of 0.4 mg/L at day 28 and 2.3 mg/L after approximately 200 days. Oxygen concentrations does not fall below 0.5 mg/L during the test period. Therefore, TGA is demonstrated as readily biodegradable with 67% biodegradation at day 28 (ECHA) [Kl. score not indicated].

Overall, based on the available date, TGA and its salts are readily biodegradable. The cations are not expected to have any remarkable influence on biodegradability (ECHA).

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

No experimental data are available for acetic acid, 2-mercapto-, sodium salt (1:1). Using KOCWIN in EPISUITE™ (USEPA, 2017), the estimated soil organic carbon partition coefficient (K_{oc}) value from the molecular connectivity index (MCI) and K_{ow} method are 1.44 L/kg and 0.01161 L/kg, respectively (ECHA) [Kl.score=2].

D. Bioaccumulation

No experimental data are available for acetic acid, 2-mercapto-, sodium salt (1:1). Acetic acid, 2-mercapto-, sodium salt (1:1) has a low potential for bioaccumulation based on log K_{ow} <=3, and a low potential to cross biological membranes. Therefore, a bioaccumulation study was not conducted (ECHA).

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Based on read-across data for dermal applications of ammonium thioglycolate , acetic acid, 2-mercapto-, sodium salt (1:1) will have a low dermal absorption rate and no potential for bioaccumulation. Studies on acetic acid, 2-mercapto-, sodium salt (1:1) indicate low acute oral and dermal toxicity. Acute inhalation toxicity data was not available. Acetic acid, 2-mercapto-, sodium salt (1:1) is a mild skin irritant and slightly irritating to the eyes. It is a skin sensitiser. In repeated dose oral toxicity studies, treatment-related effects on the liver and/or some associated blood chemistry parameters were observed. repeated dose oral toxicity study. Acetic acid, 2-mercapto-, sodium salt (1:1) is not genotoxic nor is it carcinogenic. It is not a developmental or reproductive toxicant.

B. Metabolism

There are no metabolism data following dermal application available for acetic acid, 2-mercapto-, sodium salt (1:1). Data is available for ammonium thioglycolate (ATG), an inorganic salt of thioglycolic acid (TGA). This material was used for read-across with similar structure and dissociation potential as acetic acid, 2-mercapto-, sodium salt (1:1). ^{14}C-labelled ATG was applied dermally (165 mg/kg bw) (animal model was not specified). After 30 minutes, the application sites were rinsed and absorption and elimination were measured. It was determined that approximately 1% of the material absorbed into the skin. Of the absorbed material, approximately, 76.5-80.3% of the materials was eliminated in the urine while 19.7-23.5% was eliminated in the faeces. It was concluded that ATG showed low dermal absorption and no potential for bioaccumulation (ECHA) [Kl.score=1].

C. Acute Toxicity

<u>Oral</u>

An acute oral toxicity study (OECD Guideline 423) was conducted in male and female Wistar rats (3 animals per sex per dose) exposed to 25, 50, or 200 mg/kg bw of acetic acid, 2-mercapto-, sodium salt (1:1) via oral gavage following fasting for approximately 17 hours. Animals were observed once daily during the acclimatization phase and then 1, 2, 3 and 5 hours after administration on day 1 and twice daily for surviving animals during days 2-15. Surviving animals were weighted on day 1, 8 and 15. All abnormalities and clinical signs were recorded. All animals were necropsied and examined macroscopically. All males and females treated at 25 and 50 mg/kg survived until the scheduled necropsy. Two out of 3 females treated at 200 mg/kg died on day 1. No clinical signs were observed during the observation period in all 50 mg/kg treated males and females and all 25 mg/kg treated females. Slightly ruffed fur was observed in all 200 mg/kg treated females from 1 to 3 hours (2 females) or from 1 or 5 hours. It was determined that the LD_{50} was between 50 and 200 mg/kg after a single oral administration in both sexes (ECHA) [Kl.score=1].

Inhalation

No data available.

Dermal

An acute dermal toxicity study (OECD Guideline 402) was conducted in male and female Sprague-Dawley rats (5 animals per sex per dose) on acetic acid, 2-mercapto-, sodium salt (1:1). The dorsal area clipped, and the skin was exposed semiocclusively (approximately 5X6 cm for females and 5x7 cm for males) to a single dose of 2000 mg/kg of the material for 24 hours. Clinical signs, mortality and body weight gain were analysed for 14 days following application of the test item. All females died on day 2 with no clinical signs observed prior to death. All male rats survived with no clinical signs noted. A follow-up study was conducted with 1000 mg/kg bw of the test material. All animals survived with reduced body weight gain in 4 out of 5 female rats. Under the experimental conditions, the dermal LD_{50} is >2000 mg/kg in male rats and between 1000 and 2000 mg/kg in female rats (ECHA) [Kl.score=1].

D. Irritation

Skin

An acute dermal irritation / corrosion study (OECD 404) was conducted using New Zealand White rabbits exposed (3 animals) to 0.5 grams of test material (moistened gauze pad) on intact skin for 4 hours. The skin was examined at 1, 24, 48 and 72 hours after removal of the dressing. After a 4-hour exposure, there was very slight or well-defined erythema on day 1. These reactions persisted in two animals up to day 5. The mean scores over 24, 48 and 72 hours were 0.0, 1.0, 2.0 for erythema and 0.0, 0.0, 0.0 for oedema, respectively. Under the experimental conditions, the test item is a mild irritant (ECHA) [Kl.score=1].

Eye

An acute eye irritation / corrosion study (OECD 405) was conducted using New Zealand White rabbits exposed (3 animals) to 0.1 grams of test material, applied to the conjunctival sac of the left eye. The eyes were examined at 1, 24, 48 and 72 hours after instillation of the test material. No iritis and no corneal opacity were recorded. Mean scores calculated over 24, 48 and 72 hours were 0.0, 0.3, and 2.3 for chemosis, 0.7, 0.3 and 2.0 for redness of the conjunctiva, 0.0, 0.0, and 0.0 for iris lesions and 0.0, 0.0, and 0.0 for corneal opacity, respectively. Under the experimental conditions, the test item is slightly irritant (ECHA) [Kl.score=1].

E. Sensitisation

Skin

A skin sensitisation Local Lymph Node Assay (OECD Guideline 429) was conducted using female CBA mice. Animals (4 per dose) were exposed to 2.5, 5.0, 10, or 30% of the test material. The test substance was shown to have the capacity to cause skin sensitisation when applied at 10%. Under the test conditions, the test material is a skin sensitiser (ECHA) [Kl.score=1].

F. Repeated Dose Toxicity

Oral

A Repeated Dose 90-day Oral Toxicity Study (OECD Guideline 408) was conducted in male and female Sprague-Dawley rats. Animals were exposed daily by oral gavage to 7, 20, or 60 mg/kg bw of acetic acid, 2-mercapto-, sodium salt (1:1) for 13 weeks. During the study, morbidity and mortality, clinical observations, body weight, and food consumption were assessed at least once per day. Ophthalmological examinations were performed on all animals before the beginning of the treatment period and on control and high-dose animals on one occasion at the end of the treatment period. At the end of the treatment period, hematology, blood chemistry, urinalysis, bone marrow and pathology were performed. At 7 mg/kg/day, there were no changes in any of the parameters and no signs of toxicity. At 20 mg/kg/day, non-adverse minimal periportal microvacuolation corresponding to minimally increase severity of lipidosis was noted in two males. In females, low glucose and beta-hydroxybutyrate levels were noted, which was associated with high urea and fatty acid concentrations. High mean prothrombin time was also noted in females. There were no signs of adverse toxic effect at 20 mg/kg/day. At 60 mg/kg/day, one female was prematurely sacrificed for humane reasons on day 14 and one male died on day 90. Impacts that were noted in the deceased animals included kidneys, liver and thymus. In the surviving animals, hypersalivation, piloerection and / or areas of thinned hair were transiently observed in some animals. Marked panleukopenia, high mean red blood cell count, haemoglobin concentration, packed cell volume and mean prothrombin time were observed in males and females. Hypoglycemia was noted in males and females, associated with high urea (males and females) and creatinine (males only) levels and low chloride levels (male and female). High fatty acid levels were observed in males and females. Consequently, under the experimental conditions of this study, the No Observed Adverse Effect Level (NOAEL) of acetic acid, 2-mercapto-, sodium salt (1:1) was 20 mg a.i./kg/day, and the No Observed Effect Level (NOEL) was 7 mg a.i./kg/day given by daily oral administration (gavage) to rats for 13 weeks (ECHA) [Kl.score=1].

Inhalation

No data available

Dermal

The potential subchronic dermal toxicity of acetic acid, 2-mercapto-, sodium salt (1:1) was evaluated according to a NTP protocol. Acetic acid, 2-mercapto-, sodium salt (1:1) was applied once daily in Sprague-Dawley rats (10 Males and 10 Females) skin, at the dose-levels of 11.25, 22.5, 45.0, 90.0, and 180.0 mg/kg bw/d for 90 days, 5 days a week. A control group was tested with vehicle (ethanol in water). Body weights were recorded on day one on test, weekly and prior necropsy. Animals were observed twice daily for morbidity and mortality. Blood was collected at days 4 and 22 and from the core study rats at the end of the study. These was processed for haematology and clinical chemistry determinations. All animals were examined for gross pathology, and organs were weighted and submitted to histopathology. No death were reported in any treated group. Significant observations noted in both sexes were limited to dermal irritation at the site of application (SOA), thickened skin at the SOA and ulcerations at the SOA. There were only limited statistically significant differences in the body weight, organ weight, chemistry and haematology results. No gross lesions finding were considered to be test article related or biologically significant. The Lowest-Observed-Effect-Level (LOEL) at the application site was 11.25 mg/kg based on histopathologic examination. There was no No-Observed-Effect-Level (NOEL) at the application site. The NOAEL for systemic toxicity can be estimated to be higher than 180 mg/kg bw/d (ECHA) [Kl.score=1].

G. Genotoxicity

In Vitro Studies

The *in vitro* genotoxicity studies on acetic acid, 2-mercapto-, sodium salt (1:1) are presented in Table 2.

Table 2: *In vitro* genotoxicity studies on acetic acid, 2-mercapto-, sodium salt (1:1)

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Ames test in S. typhimurium, other: Strains: TA98, TA100, TA1535 and TA1537	-	-	2	ECHA

*+, positive; -, negative

In Vivo Studies

The clastogenic potential of acetic acid, 2-mercapto-, sodium salt (1:1) was evaluated in a micronucleus assay on mouse bone marrow performed according to the OECD guideline 474. Acetic acid, 2-mercapto-, sodium salt (1:1) was administered by single gavage to three groups of five male and five female NMRI mice at dose-levels of 0, 62.5, 125 and 250 mg/kg bw. The positive control was the cyclophosphamide administered orally. The polychromatic erythrocytes/normochromatic erythrocytesratios (PE/NE) in the treated groups were equivalent to those of the control groups. However, systemic exposure was confirmed by the clinical signs observed in males and females receiving 250 mg/kg bw of acetic acid, 2-mercapto-, sodium salt (1:1). No increase of the frequency of the micronucleated polychromatic erythrocytes was observed in the bone marrow harvested 24 or 48 hours after the treatment. Positive and vehicle controls gave the expected results (ECHA) [Kl.score=1].

H. Carcinogenicity

Oral

No data available

Inhalation

No data available

Dermal

The carcinogenicity of acetic acid, 2-mercapto-, sodium salt (1:1). was evaluated using 94 Swiss female mice (7 weeks old). Applications of 0.02 ml of a 1.0 and 2.0 % solutions of acetic acid, 2-mercapto-, sodium salt (1:1). in acetone (equivalent to dose levels of 6.6 and 13.3 mg/kg bw) were given twice per week to the shaved skin (interscapular region) of each of the 49 or 45 mice, respectively. Ninety-three mice served as negative controls. Positive control groups, 40 mice, were treated with 7,12-dimethylbenz-[a]-anthracene. None of the experimental or control mice survived beyond week 120 of treatment. Infectious diseases, such as pneumonia and hepatitis, occurred in a small number of animals, resulting in an increased number of deaths. Large numbers of neoplasms were observed in treated and negative control mice: lymphomas, pulmonary adenomas, hepatic hemangiomas, ovarian neoplasms, and dermal fibromas. Epidermal neoplasms were not observed. Differences in the incidence of neoplasms between experimental and negative control mice were

not statistically significant. No significant decrease in the life span of mice in experimental groups was observed. The authors concluded that acetic acid, 2-mercapto-, sodium salt (1:1). was not carcinogenic. The NOAEL was 13.3 mg/kg bw/day, which was the highest dose tested(ECHA) [Kl.score=2].

I. Reproductive Toxicity

A Reproduction / Developmental Toxicity Screening Study (OECD Guideline 421) was conducted in male and female Sprague-Dawley rats (12 animals per sex per dose). Animals were daily exposed to 20, 40, or 80 mg/kg bw of acetic acid, 2-mercapto-, sodium salt (1:1) by oral gavage. Males were exposed during the 10 weeks before mating, the 2-week mating period and until sacrifice. Females were exposed during the 10 weeks before mating, the mating / pregnancy / lactation period and until day 4 postpartum. Clinical signs and mortality were checked daily. Body weight and food consumption were recorded weekly until mating and then at designated intervals throughout gestation and lactation. wo males (weeks 11 and 13) and one female (week 4) given 80 mg/kg/day were found dead during the pre-mating or mating periods with no clinical signs observed before death and no relevant post-mortem findings. These deaths are treatment related. Three out of 11 surviving females given 80 mg/kg/day were found dead on day 23 post-coitum, all having delivered pups, although one female had one fetus in the vagina and still had 11 dead fetuses in the uterine horns at necropsy. Another pregnant female with dead and live fetuses in the uterine horns was sacrificed on day 23 post-coitum because of poor clinical condition. At 80 mg/kg/day, one additional female was prematurely sacrificed on day 1 post-partum because all the pups were dead, and another female was found dead on day 2 post-partum. There were no effects of treatment at 20 mg/kg/day. One female given 40 mg/kg/day was found dead on day 22 post-coitum, pregnant with dead fetuses in the uterine horns. Ptyalism was observed at 40 and 80 mg/kg/day with a dose-related incidence and may be related to the taste of the test item. The NOAEL for parental toxicity was 20 mg/kg/day (based on deaths at 40 and 80 mg/kg/day). Male reproductive performance was not affected by treatment with acetic acid, 2-mercapto-, sodium salt (1:1). Dosing at 40 and 80 mg/kg/day resulted in deaths in late gestation associated with delayed delivery and a No Observed Effect Level (NOEL) for female reproductive performance was therefore set at 20 mg/kg/day. The NOEL for toxic effects on progeny was set at 40 mg/kg/day, based on the dead litter at 80 mg/kg/day. A proper evaluation of the reproductive performance of females given 80 mg/kg/day was not possible because of the numerous deaths observed in this group in the peri-natal period (ECHA) [Kl.score=1].

J. Developmental Toxicity

<u>Oral</u>

No data available

<u>Inhalation</u>

No data available

<u>Dermal</u>

The developmental toxicity of acetic acid, 2-mercapto-, sodium salt (1:1) was evaluated (OECD Guideline 414). Pregnant Sprague-Dawley rats were exposed topically, 6 hr/day, to acetic acid, 2-mercapto-, sodium salt (1:1) (99% pure) in vehicle (95% ethanol:distilled water, 1:1) from gestational day (gd) 6 through 19 at dose levels of 0, 50, 100, and 200 mg/kg bw/d. Twenty-five timed-mated female rats were assigned to each group and monitored at regular intervals throughout gestation for

clinical signs (including dosing site condition), feed and water intake, and body weight. Topically applied acetic acid, 2-mercapto-, sodium salt (1:1) resulted in toxicity to the dam at 200 mg/kg/day (expressed as reduced body weights and weight gain, increased relative water consumption, observations at the dosing site and one death). Treatment-related increases in feed consumption (and observations at the application site) were also present at 50 and 100 mg/kg/day, in the absence of increased body weights or body weight change. This is an uncommon finding and has been previously observed in rats exposed to acetic acid, 2-mercapto-, sodium salt (1:1), attributed to a block in fatty acid metabolism. Acetic acid, 2-mercapto-, sodium salt (1:1) at 200 mg/kg/day also resulted in significantly decreased male and female foetal body weights per litter, with no other evidence of embryofoetal toxicity and no evidence of treatment-related teratogenicity. Based on the study findings, a NOAEL could not be identified for maternal toxicity while for developmental toxicity, 100 mg/kg/day was the NOAEL (ECHA) [Kl.score=1].

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for acetic acid, 2-mercapto-, sodium salt (1:1) follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

In a repeated-dosed oral toxicity study with acetic acid, 2-mercapto-, sodium salt (1:1) in male and female rats , a NOAEL of 20 mg/kg bw/day was established following exposure for 13 weeks based on observed treatment-related effects on the liver and/or some associated blood chemistry parameters. The NOAEL of 20 mg/kg bw/day will be used to derive an oral RfD and drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 10
UF_D (database uncertainty) = 1
Oral RfD = 20/(10 × 10 × 1 × 10 × 1) = 20/1000 = 0.02 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (0.02 × 70 × 0.1)/2 = 0.07 mg/L

B. Cancer

The carcinogenicity of acetic acid, 2-mercapto-, sodium salt (1:1) was evaluated and the authors concluded that acetic acid, 2-mercapto-, sodium salt (1:1) was not carcinogenic.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Acetic acid, 2-mercapto-, sodium (1:1) does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential
- However, it may be corrosive to metals (H290)

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Acetic acid, 2-mercapto-, sodium has moderate acute and chronic aquatic toxicity.

B. Aquatic Toxicity

Acute Studies

Table 3 lists the results of acute aquatic toxicity studies conducted on acetic acid, 2-mercapto-, sodium (1:1).

Table 3: Acute aquatic toxicity studies on acetic acid, 2-mercapto-, sodium (1:1)

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Oncorhynchus mykiss	96-hr LC_{50}	>100 mg/L	1	ECHA
Daphnia magna	48-hr EC_{50}	42.36 mg/L	1	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	5.07 mg/L*	1	ECHA

*The endpoint shown is the result of studies conducted with read-across substances thioglycolic acid (TGA) (CAS RN [redacted] monoethanolamine thioglycolate (MeaTG) (CAS RN [redacted] and potassium thioglycolate (KTG) (CAS RN [redacted] which were combined and the geometric mean was calculated. The value shown has been corrected for the molecular weight of acetic acid, 2-mercapto-, sodium (1:1) (ECHA).

Chronic Studies

Table 4 lists the results of chronic aquatic toxicity studies conducted on acetic acid, 2-mercapto-, sodium (1:1).

Table 4: Chronic aquatic toxicity studies on acetic acid, 2-mercapto-, sodium (1:1)

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Daphnia magna	21-day NOEC	3.3 mg/L	1	ECHA
Pseudokirchneriella subcapitata	72-hr NOEC	0.54 mg/L*	1	ECHA

*The endpoint shown is the result of studies conducted with read-across substances thioglycolic acid (TGA) (CAS RN [redacted] monoethanolamine thioglycolate (MeaTG) (CAS RN [redacted] and potassium thioglycolate (KTG) (CAS RN [redacted] which were combined and the geometric mean was calculated. The value shown has been corrected for the molecular weight of acetic acid, 2-mercapto-, sodium (1:1) (ECHA).

C. Terrestrial Toxicity

No data available.

D. Calculation of PNEC

The PNEC calculations for acetic acid, 2-mercapto-, sodium (1:1) follow the methodology discussed in DEWHA (2009).

<u>PNEC Water</u>

Experimental results are available for three trophic levels. Acute $E(L)C_{50}$ values are available for fish (>100 mg/L), *Daphnia* (42.36 mg/L), and algae (5.07 mg/L). NOEC values from long-term studies are available for invertebrates (3.3 mg/L) and algae (0.54 mg/L). On the basis that the data consists of short-term results from three trophic levels and long-term results from two trophic levels, an assessment factor of 50 has been applied to the lowest reported NOEC value of 0.54 mg/L for algae. The $PNEC_{water}$ is 0.011 mg/L.

<u>PNEC Sediment</u>

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is <u>0.0071 mg/kg sediment wet weight</u>.

The calculations are as follows:

$$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$$
$$= (0.0576/1280) \times 1000 \times 0.011$$
$$= 0.00711 \text{ mg/kg}$$

Where:

$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 0.0576/1000 \times 2400]$
$= 0.0828\ m^3/m^3$

Where:

Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$

$= 1.44 \times 0.04$
$= 0.0576$ L/kg

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). Using KOCWIN in EPISUITE™ (USEPA, 2019), the estimated soil organic carbon partition coefficient (K_{oc}) value from the molecular connectivity index (MCI) method is 1.44 L/kg (US EPA,2017).

F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 0.00021 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (0.0288/1500) \times 1000 \times 0.011$
$= 0.00021$ mg/kg

Where:

Kp_{soil} = soil-water partition coefficient (m^3/m^3)

BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]

$Kp_{soil} = K_{oc} \times f_{oc}$
$= 1.44 \times 0.02$
$= 0.0288\ m^3/m^3$

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). Using KOCWIN in EPISUITE™ (USEPA, 2019), the estimated soil organic carbon partition coefficient (K_{oc}) value from the molecular connectivity index (MCI) method is 1.44 L/kg (US EPA,2017).

F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2021; ECHA, 2023).

Acetic acid, 2-mercapto-, sodium (1:1) is readily biodegradable and thus does not meet the screening criteria for persistence.

Based on log K_{ow} <=3, acetic acid, 2-mercapto-, sodium (1:1) has a low potential for bioaccumulation. Thus, acetic acid, 2-mercapto-, sodium (1:1) does not meet the criteria for bioaccumulation.

The NOECs from the chronic aquatic toxicity studies on acetic acid, 2-mercapto-, sodium (1:1) are > 0.1 mg/L. The acute $E(L)C_{50}$ values from the acute aquatic toxicity studies on acetic acid, 2-mercapto-, sodium (1:1) are > 1 mg/L. Thus, acetic acid, 2-mercapto-, sodium (1:1) does not meet the criteria for toxicity.

The overall conclusion is that acetic acid, 2-mercapto-, sodium (1:1) is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

H301:Acute Oral Tox. 3

H312:Acute Dermal Tox. 4

H317:Skin Sens. 1B

H361f:Repr.2

H373 STOT R3 2: May cause damage to the heart

H412: Aquatic Chronic 3

B. Labelling

Danger

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

Eye Contact

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention.

Ingestion

Rinse mouth with water and then drink a glass of water. Get medical attention. Never give anything by mouth to an unconscious person.

B. Firefighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Keep product and empty container away from heat and sources of ignition. May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon dioxide.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Handle in accordance with good industrial hygiene and safety practice.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

For large amounts: dike spillage and pump off product. For residues: pick up with suitable absorbent material. Dispose of contaminated material as prescribed.

D. Storage and Handling

General Handling

Keep product and empty container away from heat and sources of ignition. Ensure adequate ventilation, especially in confined areas.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for acetic acid, 2-mercapto-, sodium.

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Respiratory protection is not required.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is recommended. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

Acetic acid, 2-mercapto-, sodium (1:1) is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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ALCOHOLS, C10-16, ETHOXYLATED PROPOXYLATED

This dossier on alcohols, C_{10-16}, ethoxylated propoxylated presents the most critical studies pertinent to the risk assessment of alcohols, C_{10-16}, ethoxylated propoxylated in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the Human & Environmental Risk Assessment on Ingredients of European Household Cleaning Products: Alcohol Ethoxylates (HERA, 2009), the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Alcohols, C_{10-16}, ethoxylated propoxylated

CAS RN: [redacted]

Molecular formula: Not available (UVCB substance)

Molecular weight: Not available (UVCB substance)

Synonyms: Ethoxylated propoxylated C_{10-16} alcohols

SMILES: Not available (UVCB substance)

Alcohol ethoxylates (AE) are a class of non-ionic surfactants that have the basic structure $C_{x-y}AE_n$. The subscript (x-y) following the 'C' indicates the range of carbon chain units. The hydrocarbon chain can be either linear or branched. AEs also contain an ethylene oxide (EO) chain attached to the alcohol. The degree of ethylene oxide polymerization is indicated by the subscript (n) which indicates the average number of ethylene oxide units. In household products, the average EO chain length ranges between 3 and 12 units (HERA, 2009).

II. PHYSICO-CHEMICAL PROPERTIES

No information is available for alcohols, C_{10-16}, ethoxylated propoxylated. Key physical and chemical properties for read-across AEs are shown in Table 1.

Table 1: Overview of the physico-chemical properties of alcohols, C_{12-15}, ethoxylated (1 to 2.5 moles ethoxylated) [CAS RN [redacted]

Property	Value	Klimisch Score	Reference
Physical state at 20oC and 101.3 kPa	Clear liquid with a rancid odor*	2	ECHA
Melting Point	7.22°C @ 101.3 kPa	2	ECHA
Boiling Point	287°C @ 101.3 kPa	1	ECHA
Density	926 kg/m^3@ 15.56°C	1	ECHA
Vapour Pressure	Negligible	-	ECHA
Partition Coefficient (log K_{ow})	5.06 @ 25°C	2	ECHA

Property	Value	Klimisch Score	Reference
Water Solubility	0.007-0.063 g/L @ 25°C	2	ECHA
Flash Point	165.56°C	2	ECHA
Auto flammability	235°C	2	ECHA
Viscosity	28.1 mPa s @ 20°C	2	ECHA
Henry's Law Constant	Not available	-	ECHA

*Based on alcohols, C_{12-14}, ethoxylated (1 to 2.5 EO) [CAS RN [redacted]

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Alcohols, C_{10-16}, ethoxylated propoxylated is expected to be readily biodegradable. It has a low potential for bioaccumulation and a moderate potential for adsorption to soil and sediment.

B. Biodegradation

An alcohol ethoxylate, C_{9-11}, branched (2.5 EO) [CAS RN [redacted] was readily biodegradable, as indicated by degradation of 72% in 28 days in an ultimate aerobic biodegradability (CO_2 headspace) ISO 14593 water quality test (ECHA) [Kl.score=2].

An alcohol ethoxylate, C_{9-11}, branched (3 EO) [CAS RN [redacted] was readily biodegradable, as indicated by degradation of 101% in 28 days in an ultimate aerobic biodegradability (CO_2 headspace) ISO 14593 water quality test (ECHA) [Kl.score=2].

Alcohols, C_{12-15}, ethoxylated is readily biodegradable. In an OECD 301B test, degradation was 72% in 28 days but failed the 10-day window (ECHA) [Kl.score=1].

An alcohol, C_{12-15}, ethoxylated (7 EO) was readily biodegradable, as indicated by degradation of 80 to 88% in 28 days when tested using a shake-flask CO_2-evolution test method (ECHA) [Kl.score=2].

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

No experimental data are available for alcohols, C_{10-16}, ethoxylated propoxylated. Using KOCWIN in EPISUITE™ (EPA, 2019), the estimated K_{oc} value for alcohols, C_{10-16}, ethoxylated propoxylated is 1,180 L/kg (MCI) and 3,882 L/kg (K_{ow}).

D. Bioaccumulation

The BCF values for alcohol ethoxylates in fathead minnows have been reported to range from <5 to 387.5 (Toll et al., 2000). The uptake rates varied from 330 to 1660 (L × kg/d) and elimination rates varied from 3.3 to 59 per day (Toll et al., 2000). The high concentration in fish is thought to be prevented by an efficient biotransformation of the alcohol ethoxylates, leading to a high elimination rate.

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

The substance displays a relatively low order of acute toxicity. It is expected to be absorbed via the gastrointestinal tract following oral absorption and minor amounts are expected to be absorbed via the skin. Most of the absorbed dose is rapidly excreted via urine and faeces with a minor amount being expired via CO_2. Tests with similar substances indicate irritation in animal evaluations while human patch tests suggest relatively minimal irritation post exposure. Additionally, the weight of evidence suggests ethoxylates are likely to be irritating to the eyes. Ethoxylates are not expected to be sensitizers.

While no inhalation studies were found, oral and dermal repeat dose studies with similar substances do not indicate significant toxicity.

Similar substances do not demonstrate genotoxicity according to *in vitro* and *in vivo* studies and there was no evidence for any in vivo carcinogenic activity after long term oral dosing.

Relatively high NOAELs obtained from 2-generation oral dosing do not support a conclusion that the ethoxylates are reproductively and developmentally toxic.

B. Metabolism

100% of the ^{14}C-labelled alcohol ethoxylates (AE) are assumed to be absorbed via the gastrointestinal tract after oral ingestion and distributed widely in the body. Only minor amounts of the AE are directly absorbed via the skin (2%). The majority of the absorbed dose is rapidly excreted via urine and feces and minor parts via expired CO_2 with more of the AE being excreted via the feces and expired in air as the ethoxy (EO) chain length increased. Moreover, the length of the alkyl chain is assumed to have an impact on AE with longer alkyl chains being excreted at a higher proportion into expired air and less into the urine and faeces. A maximum of 1% of the administered dose was found in liver and kidneys, respectively. Metabolism is shown to be rapid and complete. The most likely pathway of AE metabolism is expected to be the hydrolysis of the ether linkage and subsequent oxidation of the alcohols to finally form C_2-fragments and shorter alkyl chains and ultimately carbon dioxide and water. The lower molecular weight polyethylene glycol-like compounds are further broken down via ether hydrolysis or are subjected to renal excretion (ECHA).

C. Acute Toxicity

The oral LD_{50} in rats for $C_{11}AE_9$ is 1,100 mg/kg (HERA, 2009) [Kl.score=2].

The oral LD_{50} in rats for $C_{9\text{-}11}AE_{2.5}$ is between 4,000 and 10,000 mg/kg (HERA, 2009) [Kl.score=2]. The oral LD_{50} in rats for $C_{9\text{-}11}AE_8$ is 1,200 mg/kg (HERA, 2009) [Kl.score=2]. The oral LD_{50} in rats for $C_{12\text{-}13}AE_{6.5}$ is 2,100 mg/kg (HERA, 2009) [Kl.score=2]. The oral LD_{50} in rats for $C_{12\text{-}15}AE_7$ is 1,700 mg/kg (HERA, 2009) [Kl.score=2].

The 4-hour inhalation LC_{50} value for $C_{9\text{-}11}AE_5$ is >0.22 mg/L as a mist. The mass median aerodynamic diameters (MMAD) were 3.4 mm and 3.0 mm in the two exposure studies (HERA, 2009) [Kl.score=2].

The acute dermal LD_{50} of $C_{9\text{-}11}AE_6$ is >2,000 mg/kg (HERA, 2009) [Kl.score=2]. An acute dermal LD_{50} values of >2,000 mg/kg were determined for $C_{12\text{-}14}AE_3$ and $C_{12\text{-}14}AE_6$ in two separate studies (HERA, 2009) [Kl.score=2]. The acute dermal LD_{50} of $C_{12\text{-}15}AE_7$ is >2,000 mg/kg (HERA, 2009) [Kl.score=2].

D. Irritation

Skin

Application of $C_{9-11}AE_9$ to the skin of rabbits for 4 hours under semi-occlusive conditions was found to be slightly irritating (HERA, 2009) [Kl.score=2]. Application of $C_{11}AE_9$ to the skin of rabbits for 4 hours under occluded conditions was found to be slightly irritating (HERA, 2009) [Kl.score=2]. Application of $C_{9-11}AE_6$ to the skin of rabbits for 24 hours under occluded conditions was found to be severely irritating (HERA, 2009) [Kl.score=2].

Application of 0.5 mL isotridecanol, ethoxylated (3 EO) to the skin of rabbits for 4 hours under occlusive conditions was considered irritating (ECHA) [Kl. score = 2]. Application of 0.5 mL isotridecanol, branched, ethoxylated (3-4 EO) to the skin of rabbits for 24 hours under occlusive conditions was considered irritating (ECHA) [Kl. score = 2]. Application of 0.5 mL isotridecanol, ethoxylated (3 EO) to the skin of rabbits for 4 hours under semi-occlusive conditions was not considered irritating (ECHA) [Kl. score = 2]. Application of 0.5 mL $C_{12-13}AE<2.5$ (CAS RN [redacted] to the skin of rabbits for 24 hours under occlusive conditions was considered irritating (ECHA) [Kl.score=2].

Application of 0.5 mL alcohols C_{12-13}, branched and linear, <2.5 EO to the skin of rabbits for 4 hours under occlusive conditions was not considered irritating (ECHA) [Kl.score=2].

In a 24-hour human patch test, there was some short-lived redness in some individuals from the application of $C_{12-14}AE_3$, but there was no scaling or edema in any subjects (HERA, 2009) [Kl.score=2].

In a standard 4-hour human patch test, the irritation potential of $C_{12-15}AE_5$ and $C_{12-15}AE_5$ were compared to 20% sodium dodecyl sulfate (which is classified a skin irritant under GHS). The results showed that neither alcohol ethoxylate should be classified as a skin irritant (Basketter et al., 2004) [Kl.score=2]. Nonetheless, current classification according to ECHA recommends classification as an irritant.

Eye

Instillation of $C_{9-11}AE_6$ into the eyes of rabbits was moderately to severely irritating (HERA, 2009).

Instillation of 0.1 mL isotridecanol, ethoxylated (3 EO) (CAS RN [redacted] into the eyes of rabbits was severely irritating. The means of the 24, 48, and 72 hour scores were 1.6 for corneal opacity, 0.6 for iridial lesions, 2.2 for conjunctival redness, and 0.7 for chemosis. The effects were not fully reversible within 21 days (ECHA) [Kl.score=2].

Instillation of 0.1 mL isotridecanol, branched, ethoxylated (3-4 EO) (CAS RN [redacted] into the eyes of rabbits was severely irritating. The means of the 24, 48, and 72 hour scores were 1.0 for corneal opacity, 0.1 for iridial lesions, 1.7 for conjunctival redness, and 0.6 for chemosis. The effects were not fully reversible within 8 days (ECHA) [Kl.score=2].

Instillation of 0.1 mL alcohols C_{12-13}, branched and linear, <2.5 EO (CAS RN [redacted] into the eyes of rabbits was not irritating. The means of the 24, 48, and 72 hour scores were 0.00 for corneal opacity, 0.00 for iridial lesions, 0.83 for conjunctival redness, and 0.50 for chemosis (ECHA) [Kl.score=2].

Instillation of 0.1 mL $C_{12-13}AE<2.5$ (CAS RN [redacted] into the eyes of rabbits was not irritating. The means of the 24, 48, and 72 hour scores were 0.00 for all endpoints (ECHA) [Kl.score=2].

E. Sensitisation

In a guinea pig maximization test, $C_{12-13}AE<2.5$ (CAS RN [redacted] was not considered a skin sensitizer (ECHA) [Kl.score=2].

F. Repeated Dose Toxicity

Oral

Male and female CFE (SPF) rats were given in their feed 0, 125, 250, 500, 1,000, or 3,000 ppm (0, 6.25, 12.5, 25, 50, and 150 mg/kg-day) $C_{9-11}AE_6$ for 13 weeks. There was no mortality and no treatment-related clinical signs. Body weights were significantly lower in the $\geq$250 ppm males throughout the study; body weights of the 125 ppm males were lower for only the first half of the study. Feed consumption was lower in treated males with the change being statistically significant in the $\geq$1,000 ppm males. This reduction in feed consumption was thought to be related to palatability; the feed conversion efficiency values were similar for treated and control males, and so it is not possible to attribute the reduced body weights to the toxicity of the test material alone. The female rats showed no differences in body weights and feed consumption. There were no treatment-related changes in hematology parameters, and the clinical chemistry parameters and organ weights showed no changes that were considered to be of toxicological significance. Gross pathology showed no treatment-related changes. The NOAEL for this study was considered to be 3,000 ppm, which corresponds to150 mg/kg-day (ECHA) [Kl.score=2].

Rats were given in their feed 0, 0.04, 0.2, or 1% $C_{9-11}AE_8$ for 90 days. There were no deaths or treatment-related clinical signs during the study. There was reduced body weight gain and decreased feed consumption in the 1% animals and in the 0.2% females throughout the study. Additional statistical analysis indicated a significant decrease in mean body weight gain in the 1% females and decreased feed consumption in the 1% males and females. The reduced body weight gain of the 0.2% females was not statistically significant. The study authors considered these changes to be due to the poor palatability of the test material in the feed. Organ weights, gross and microscopic pathology were similar across groups. The NOAEL for this study is 1% in the diet, which corresponded to 400 mg/kg-day (HERA, 2009) [Kl.score=2].

Rats were given in their feed 0, 125, 250, or 500 mg/kg $C_{10}AE_5$ for 90 days. There were no deaths or treatment-related clinical signs during the study. The only treatment-related effect noted was a slight increase in absolute liver weights with the 500 mg/kg animals showing statistical significance. However, there were no corresponding histopathologic changes in the liver. The NOAEL is 500 mg/kg-day, the highest dose tested (HERA, 2009) [Kl.score=2].

Rats were given in their diet 0%, 0.0313%, 0.0625%, 0.125, 0.25, 0.5 or 1.0% $C_{12-15}AE_7$ for 90 days. The animals in the $\geq$0.25% groups showed significantly reduced body weight gain, which was associated with marked decreases in food and water consumption. Relative liver weights were significantly increased in the $\geq$0.5% male rats and $\geq$0.25% females. Histopathologic examination showed hepatocytic enlargement in the $\geq$0.125% groups, suggesting increased liver metabolism on the basis of increased alkaline phosphatase activity at the higher dose levels. The NOAEL was established at 0.0625% in the diet or 102 mg/kg-day (HERA, 2009) [Kl.score=2].

Rats were fed $C_{12-14}AE_7$ in the diet at concentrations of 0%, 0.0313%, 0.0625%, 0.125%, 0.25%, 0.5% and 1.0% for 90 days. The animals in the $\geq$0.25% groups showed significantly reduced body weight

gain, which was associated with marked decreases in food and water consumption. Relative liver weights were significantly increased in the ≥0.5% male rats and ≥0.25% females. Histopathologic examination showed hepatocytic enlargement in the ≥0.125% groups, suggesting increased liver metabolism on the basis of increased alkaline phosphatase activity at the higher dose levels. The NOAEL was established at 0.0625% in the diet or 110 mg/kg-day (HERA, 2009) [Kl.score=2].

Rats were given 0, 0.1, 0.5 or 1% $C_{12-13}AE_{6.5}$ in their diet for two years. Body weight gain was reduced in the 1% males and ≥0.5% females, which was likely due to the reduced food consumption in these animals. At study termination, organ to body weight ratios were increased in the ≥0.5% females (liver, kidney and brain), 1% females (heart), and 1% males (liver). A dose-related focal myocarditis was observed in males. While focal myocarditis is commonly observed in non-treated aging rats, the incidence in the treated animals was higher than in the controls. The NOAEL was established at 0.1% or 50 mg/kg-day (HERA, 2009) [Kl.score=2]

Inhalation

There are no studies available.

Dermal

Male and female F344 rats were given dermal applications of 0, 1, 10, or 25% $C_{9-11}AE_6$ solutions 3 days/week for 13 weeks. There were no deaths during the study and no clinical signs of toxicity. Body weights, clinical chemistry and hematology parameters, and urinalysis showed no differences between treated and control animal. The 25% animals showed a slight increase in kidney weights, although no histopathologic findings were noted in the kidney. There were no histopathologic changes that were considered to be treatment related. The NOAEL for this study is 25% (Gingell and Lu, 1991; ECHA) [Kl.score=2].

G. Genotoxicity

In Vitro Studies

The genotoxicity studies conducted on alcohol ethoxylates are reviewed in HERA (2009). The results of few of the *in vitro* genotoxicity studies on similar alcohol ethoxylates to alcohols C_{10-16}, ethoxylated propoxylated are presented in Table 2.

Table 2: *In vitro* genotoxicity studies on selected alcohol ethoxylates

``Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Bacterial reverse mutation (S. typhimurium strains)	-	-	2	HERA, 2009
Bacterial reverse mutation (S. typhimurium strains)	-	-	2	HERA, 2009
Chromosomal aberrations (CHO cells)	-	-	2	HERA, 2009

*+, positive; -, negative

In Vivo Studies

In two separate studies, CD-1 mice were given an intraperitoneal dose of 0, 50, or 100 mg/kg $C_{12-15}AE_3$ or $C_{12-14}AE_9$. There were no increases in the frequency of micronuclei in the bone marrow cells (Talmage, 1994) [Kl.score=2].

Male and female Tunstall rats were given a single oral gavage dose of 0, 250, 500, or 1,000 mg/kg $C_{14-15}AE_7$. There were no increases in chromosomal aberrations in the bone marrow cells (HERA, 2009 [Kl.score=2].

H. Carcinogenicity

Oral

Male and female Sprague-Dawley rats were given in their diet $C_{12-13}AE_{6.5}$ in the diet at doses up to 1% (500 mg/kg-day). Reduced food consumption was noted at the higher dose levels (*i.e.*, 0.5 and 1% for females and 1% for males), resulting in a lower body weight gain compared to the control group. No treatment-related histopathology was found and no increase in tumor incidence was observed (HERA, 2009) [Kl.score=2].

Male and female Charles River rats were given 0, 0.1, 0.5 or 1% $C_{14-15}AE_7$ in their diet for two years. There were no treatment-related changes in general behavior and appearance. The survival rate of the test animals was comparable if not better than the controls. Body weights of the 0.5% females and the 1% males and females had significantly lower weight gains than the control. There were no treatment-related effects on organ weights and tumor incidence (HERA, 2009) [Kl.score=2]

Male and female Sprague-Dawley rats were given in their diet $C_{14-15}AE_7$ at 0.1, 0.5 and 1% for two years. A treatment-related body weight depression was observed in females at the two highest treatment levels and in males at the 1% dose level, probably due to the poor palatability of the diet. There was no evidence for any carcinogenic activity (HERA, 2009) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

There are no studies available.

I. Reproductive Toxicity

A two-generation reproductive toxicity study was conducted on $C_{9-11}AE_6$. Male and female F344 rats were given dermal applications of 0, 1, 10, or 25% solutions of $C_{9-11}AE_6$ (0, 10, 100, or 250 mg/kg-day) 3 days/week; the F_0 and F_1 generations were treated for 119 and 133 days, respectively, before mating. There were no deaths in the F_0 generation, but there were 5 deaths in the F_1 generation (controls and treatment groups) that were not considered to be treatment related. Animals in either generation showed no skin reactions. Body weights of the 25% F_0 and F_1 parental animals were lower during certain periods of the study; however, maternal body weights in both generations were similar across groups during the gestational and lactational periods. The organ weights in the F_0 animals were similar between treated and control animals; the F_1 parental animals showed sporadic organ weight changes but were not no toxicological significance. There were no histopathologic changes that correlated with the organ weight changes in the F_1 parental animals. Mating and

fertility indices were similar across groups in both generations. There were no treatment-related effects on testicular weights, testicular pathology, serum counts and LDH-X activity toxicity in either generation. Macroscopic and microscopic evaluations of the reproductive organ showed no treatment-related effects. The NOAEL for reproductive toxicity for toxicity is 25% test concentration, which corresponded to 250 mg/kg-day, the highest dose tested (Gingell and Lu, 1991; ECHA) [Kl.score=2].

CD rats were given 0, 0.05, 0.1 or 0.5% (approximately 0, 25, 50 or 250 mg/kg-day) $C_{12}AE_6$ in their diet in a two-generation reproductive toxicity study. There were no treatment related effects in the parents or pups on general behaviour, appearance or survival. At 0.5%, there was reduced weight gain in both the parental animals and the pups compared to the controls. Fertility was unaffected by treatment. The NOAEL for reproductive toxicity is 0.5% in the diet, which corresponds to 250 mg/kg-day (HERA, 2009) [Kl.score=2].

In a two-generation developmental and teratogenicity study, CD rats were given in their diet 0, 0.05, 0.1 or 0.5% $C_{14\text{-}15}AE_7$ (approximately 0, 25, 50 or 250 mg/kg-day). Three of the treated groups were given the test substance continuously throughout the study; in the other three groups the females received the test substance on GD 6-15 and the males were untreated. None of the deaths of parental rats during the study was considered to be compound related. There were no treatment-related changes in behaviour or appearance in the parental rats or pups. Slightly lower body weight gain was noted in the 0.5% continuously treated females. Food consumption was similar for control and treated rats. Fertility, gestation and viability indices were similar across groups. The average 21-day body weights for the 0.5% continuous treated pups were significantly lower than that of the control. Relative liver weights of the 0.5% continuously treated F1 parental animals were increased at the 91-day sacrifice; relative liver weights of the 0.5% continuously treated males were also increased at the 60-day and caesarean section sacrifices. There were no treatment-related histopathological lesions in any of the tissues from the F0 and F1 generations. The NOAEL for reproductive toxicity is 0.5% in the diet or 250 mg/kg-day (HERA, 2009) [Kl.score=2].

J. Developmental Toxicity

<u>Oral</u>

In a two-generation reproductive toxicity study, Charles River rats were given in their diet 0, 0.05, 0.1 or 0.5% (about 0, 25, 50 or 250 mg/kg-day) C12AE6. General behaviour, appearance and survival were unaffected by treatment. At the 0.5% dose level, adults and pups gained less weight than the control rats. In the 0.5% dose group, there was a statistical increase in embryo lethality and soft tissue anomalies and at the 0.1% there was a statistical decrease in mean foetal liver weight. Neither of these effects was considered to be treatment-related by the authors as they showed no dose response characteristics. The NOAEL for maternal toxicity is 50 mg/kg-day. The NOAEL for developmental and teratogenicity is 0.1% in the diet or 50 mg/kg-day (HERA, 2009) [Kl.score=2].

Pregnant rabbits were given by oral gavage 0, 50, 100 or 200 mg/kg $C_{12}AE_6$ from gestational days 2 to 16. Nine control rabbits and 31 treated rabbits died during the study. Surviving rabbits at the 200 mg/kg dose group generally showed slight losses of body weight. At 100 and 200 mg/kg, ataxia and a slight decrease in body weight was observed in the pregnant animals. In seven treated and two control rabbits, early deliveries were recorded. There were no treatment-related effects on corpora lutea, implantations, number of live foetuses and spontaneous abortions. The NOAEL for maternal toxicity is 50 mg/kg-day; the NOAEL for developmental toxicity is 200 mg/kg-day (HERA, 2009) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

A two-generation reproductive toxicity study was conducted on $C_{9-11}AE_6$. Male and female F344 rats were given dermal applications of 0, 1, 10, or 25% solutions 3 days/week; the F_0 and F_1 generations were treated for 119 and 133 days, respectively, before mating. There were no deaths in the F_0 generation, but there were 5 deaths in the F_1 generation (controls and treatment groups) that were not considered to be treatment related. Animals in either generation showed no skin reactions. Body weights of the 25% F_0 and F_1 parental animals were lower during certain periods of the study; however, maternal body weights in both generations were similar across groups during the gestational and lactational periods. The organ weights in the F_0 animals were similar between treated and control animals; the F_1 parental animals showed sporadic organ weight changes but were not no toxicological significance. There were no histopathologic changes that correlated with the organ weight changes in the F_1 parental animals. There was no effect on litter size, survival index, sex ratio, or body weights of the pups in either the F_1 or F_2 generation. The NOAEL for developmental toxicity is 25% test concentration, which corresponded to 250 mg/kg-day, the highest dose tested (Gingell and Lu, 1991; ECHA) [Kl.score=2].

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for alcohols, C_{10-16}, ethoxylated propoxylated follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

A two-year dietary study in rats has been conducted on $C_{12-13}AE_{6.5}$ (HERA, 2009). The NOAEL from this study is 50 mg/kg-day based on increased organ weights. The NOAEL of 50 mg/kg-day will be used to derive an oral reference dose and drinking water guidance value for C_{10-16}, ethoxylated propoxylated.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 50/(10 × 10 × 1 × 1 × 1) = 50/100 = 0.5 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (0.5 × 70 × 0.1)/2 = 1.8 mg/L

B. Cancer

The alcohol ethoxylates $C_{12-13}AE_{6.5}$ and $C_{14-15}AE_7$ were not carcinogenic to rats in a two-year dietary study. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Alcohols, C_{10-16}, ethoxylated propoxylated does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

There are no aquatic toxicity studies for alcohols, C_{10-16}, ethoxylated propoxylated. The aquatic toxicity of other AEs has been extensively evaluated in numerous studies on fish, daphnids and algae as well as microorganisms. A review of the acute studies indicates that invertebrates are somewhat more sensitive to AEs than fish and algae. AEs have moderate chronic toxicity to aquatic life.

B. Aquatic Toxicity

Acute Studies

There are no acute aquatic toxicity studies for alcohols, C_{10-16}, ethoxylated propoxylated. The aquatic toxicity of other AEs has been extensively evaluated in numerous studies on fish, daphnids and algae as well as microorganisms. Table 3 lists the results of acute aquatic toxicity studies on read across substance alcohols, C12-C15, ethoxylated (1 to 2.5 EO) [CAS RN [redacted] alcohols, C12-C14, ethoxylated (2 EO) [CAS RN [redacted] and alcohols, C12-C15, branched and linear, ethoxylated [CAS RN [redacted]

Table 3: Acute Aquatic Toxicity Studies on Ethoxylated C12-C16 Alcohol[a,b,c]

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Oncorhynchus mykiss (Rainbow Trout)	96-hr LC_{50}	1.3 – 1.7[a]	2	ECHA
Danio Rio	96-hr LC_{50}	1.2[b]	2	ECHA

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Danio Rio	96-hr LC_{50}	2[b]	2	ECHA
Zebrafish	96-hr LC_{50}	>2[c]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.14[a]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.23[a]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.53[b]	2	ECHA
Daphnia magna	48-hr EC_{50}	2.84[b,d]	2	ECHA
Daphnia magna	48-hr EC_{50}	1.2[e]	1	ECHA
Daphnia magna	48-hr EC_{50}	>2[b]	2	ECHA
Daphnia magna	48-hr EC_{50}	>2[c]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.23	2	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	0.75[a]	2	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	>2[c]	2	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	0.41[b]	2	ECHA
Desmodesmus subspicatus (green algae)	72-hr EC_{50}	0.778[b]	2	ECHA
Desmodesmus subspicatus (green algae)	72-hr EC_{50}	0.87[e]	1	ECHA
Desmodesmus subspicatus (green algae)	72-hr EC_{50}	1.3[e]	1	ECHA

a: Read across to alcohols, C12-C15, ethoxylated (1 to 2.5 EO) CAS RN [redacted]
b: Read across to alcohols, C12-C14, ethoxylated (EO 2) CAS RN [redacted]
c: Read across to alcohols, C12-C15, branched and linear, ethoxylated (CAS RN [redacted]
d: Alcohols, C12-C14, ethoxylated (EO 1) CAS RN [redacted] as WAF (water accommodated fraction)
e: Alcohols, C12-C14, ethoxylated (EO 4 or EO 6) CAS RN [redacted]

A review of the acute studies indicates that invertebrates are somewhat more sensitive to AEs than fish and algae. As concluded in HERA (2009), the Danish EPA (2001) found that the acute toxicity of AEs to invertebrates varies, with EC_{50} values from 0.1 mg/l to more than 100 mg/l for linear AE and from 0.5 mg/l to 50 mg/l for branched AEs. The toxicity is species specific and may vary between 0.29 mg/l and 270 mg/l for the same linear AEs (Lewis and Suprenant 1983, quoted in Danish EPA 2001). The most commonly used invertebrates for testing are Daphnia magna and Daphnia pulex, and they are also among the most sensitive invertebrates to AEs. The Danish EPA (2001) found that some AEs are very toxic to invertebrates, i.e., linear AEs of C12-15 EO1-8 and branched AEs with a low degree of branching, i.e. < 10-25%. They concluded that branching of the alkyl chain reduces the toxicity of AEs to invertebrates, as also observed for algae (Danish EPA 2001). However, the data used for this conclusion was from specially synthesized AE, which have a significantly higher toxicity than AEs used commercially (Kaluza and Taeger, 1996).

Chronic Studies

In developing a water quality guideline for AEs (ANZG, 2018), the toxicity data was normalised for a specific alkyl chain length or a specific number of EO groups. The NOECs listed below were normalised to an alkyl chain length of C13.3 and EO of 8.2. There were chronic data for 13 species that belonged to 7 taxonomic groups (fish, crustacea, blue alga, diatoms, green alga, protozoa, and worms).

Freshwater fish: 2 species, 720 to 1,500 µg/L.

Freshwater crustaceans: 2 species, 590 to 860 µg/L.

Freshwater rotifers: 1 species, *Brachionus calyciflorus*, 1,300 µg/L.

Freshwater algae, diatoms and blue-green algae: 6 species, 200 to 8,700 µg/L.

Freshwater mesocosms: 4 NOEC data for multiple species tests were 80, 80, 320 and 330 µg/L, although replication was insufficient to meet OECD (1992) requirements. Normalised data were 380, 380, 320 and 1,520 µg/L.

C. Terrestrial Toxicity

No studies are available. The substance is readily biodegradable. Therefore, soil is not expected to be a compartment of concern. Thus, the risk to terrestrial macroorganisms is regarded to be negligible (ECHA).

D. Calculation of PNEC

The PNEC calculations for alcohol, $C_{10\text{-}16}$, ethoxylated propoxylated follow the methodology discussed in DEWHA (2009).

PNEC Water

The ANZG water quality guideline (2018) in freshwater is: "A high reliability trigger value of 140 µg/L was derived for AE (normalized data) using the statistical distribution method with 95% protection."

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 2.57 mg/kg sediment wet weight.

The calculations are as follows:

$$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$$
$$= (23.5/1280) \times 1000 \times 0.14$$
$$= 2.57 \text{ mg/kg}$$

Where:

$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 47.2/1000 \times 2400]$
$= 23.5\ m^3/m^3$

Where:

Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 1180 \times 0.04$
$= 47.2$ L/kg

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for alcohols, $C_{10\text{-}16}$, ethoxylated propoxylated calculated from EPISUITE™ using the MCI value is 1,180 L/kg.
F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

<u>PNEC Soil</u>

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ value is <u>2.20 mg/kg soil dry weight</u>.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (23.6/1500) \times 1000 \times 0.14$
$= 2.20$ mg/kg

Where:

Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]
$Kp_{soil} = K_{oc} \times f_{oc}$
$= 1180 \times 0.02$
$= 23.6\ m^3/m^3$

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for alcohols, $C_{10\text{-}16}$, ethoxylated propoxylated calculated from EPISUITE™ using the MCI value is 1,180 L/kg
f_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Alcohols, $C_{10\text{-}16}$, ethoxylated propoxylated is readily biodegradable and thus does not meet the screening criteria for persistence.

The bioconcentration factors (BCF) in fish for ethoxylated alcohols (which includes alcohols, C_{10-16}, ethoxylated propoxylated) have been reported to range from <5 to 387.5. Thus, alcohols, C_{10-16}, ethoxylated propoxylated does not meet the screening criteria for bioaccumulation.

The NOECs from the chronic aquatic toxicity studies on alcohols, C_{10-16}, ethoxylated propoxylated are > 0.1 mg/L. Thus, alcohols, C_{10-16}, ethoxylated propoxylated does not meet the criteria for toxicity.

The overall conclusion is that alcohols, C_{10-16}, ethoxylated propoxylated is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

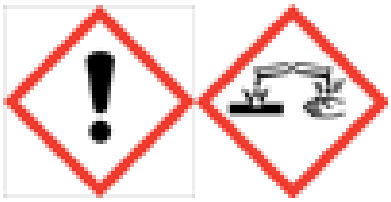
A. Classification

Eye Irritant Category 2

B. Labelling

Warning

C. Pictogram



X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

Eye Contact

Rinse immediately with plenty of running water. If easy to do, remove contact lenses. Get medical attention.

Skin Contact

Wash with soap and water. Get medical attention if symptoms occur.

Inhalation

Treat symptomatically. Move to fresh air. Get medical attention.

Ingestion

Rinse mouth with water and then drink plenty of water. Never give anything by mouth to an unconscious person. Seek medical attention.

B. Firefighting Information

Extinguishing Media

Water spray, dry chemical, foam. Do not use water jet.

Specific Exposure Hazards

May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon oxides.

Special Protective Equipment for Firefighters

Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

C. Accidental Release Measures

Personal Precautions

Wear appropriate personal protective equipment. Do not breath mist or aerosol.

Environmental Precautions

Prevent from entering sewers, waterways, or low area.

Steps to be Taken if Material is Released or Spilled

Absorb spill with inert absorbent material, then place in a container for chemical waste.

D. Storage and Handling

General Handling

Protect against moisture. Shut containers immediately after taking product because product takes up the humidity of air. No special precautions are necessary beyond normal good hygiene practices.

Other Handling Precautions

Wash hands thoroughly after handling. Avoid breathing mists or aerosols.

Storage

Keep container closed.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

The workplace exposure standards for alcohols, C_{10-16}, ethoxylated propoxylated in Australia has not been established.

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Wear respiratory protection if ventilation is inadequate.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Chemical safety goggles.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Eyewash fountains and safety showers must be easily accessible.

F. Transport Information

Alcohols, C_{10-16} ethoxylated propoxylated is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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ALCOHOLS, C11-14-ISO-, C13-RICH, ETHOXYLATED

This dossier on alcohols, C11-14-iso-, C13-rich, ethoxylated presents the most critical studies pertinent to the risk assessment of the substance in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The information presented in this dossier was obtained primarily from the Human & Environmental Risk Assessment on Ingredients of European Household Cleaning Products: Alcohol Ethoxylates (HERA, 2009). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Alcohols, C11-14-iso-, C13-rich, ethoxylated

CAS RN: [redacted]

Molecular formula: Not available (UVCB substance)

Molecular weight: 233.46 g/mol

Synonyms: Ethoxylated branched C11-14, C13-rich alcohols; alpha-Alkyl-omega-hydroxypoly(oxypropylene) and/or poly(oxyethylene) polymers where the alkyl chain contains a minimum of six carbons, minimum number average molecular weight (in amu) 1,100

SMILES: C.C.[*]C.CCCCCCCCCCOCC

II. PHYSICO-CHEMICAL PROPERTIES

Alcohol ethoxylates (AEs) are a class of non-ionic surfactants that have the basic structure $C_{x-y}AE_n$. The subscript (x-y) following the 'C' indicates the range of carbon chain units. The hydrocarbon chain can be either linear or branched. AEs also contain an ethylene oxide (E) chain attached to the alcohol. The degree of ethylene oxide polymerization is indicated by the subscript (n) which indicates the average number of ethylene oxide units. Alcohols, C11-14-iso-, C13-rich, ethoxylated has an average number of 7 moles of ethylene oxide units.

No information is available on alcohols, C11-14-iso-, C13-rich, ethoxylated. Thus, data were read across from a similar substance, alcohols, C12-15, ethoxylated, as shown below.

Table 1: Overview of the Physico-Chemical Properties of Alcohols, C11-14-iso-, C13-rich, ethoxylated[1]

Property	Value	Klimisch score	Reference
Physical state at 20°C and 101.3 kPa	Clear liquid with a rancid odour*	2	ECHA
Melting Point	7.22°C @ 101.3 kPa	2	ECHA
Boiling Point	287°C @ 101.3 kPa	1	ECHA
Density	926 kg/m^3 @ 15.56°C	1	ECHA
Vapour Pressure	Negligible	-	ECHA

Property	Value	Klimisch score	Reference
Partition coefficient (log K_{ow})	5.06* @25 °C	2	ECHA
Water Solubility	0.007 – 0.063 g/L @ 25 °C	1	ECHA
Flash Point	165.56 °C	2	ECHA
Auto Flammability	235 °C	2	ECHA
Viscosity	28.1 mPa s (dynamic) @ 20°C	1	ECHA

1 – Based on alcohols, C12-C15, ethoxylated (1 to 2.5 EO) [CAS RN [redacted]
*Based on alcohols, C12-14, ethoxylated (1 to 2.5 EO) [CAS RN [redacted]

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Alcohols, C11-14-iso-, C13-rich, ethoxylated is readily biodegradable. They are slightly soluble and have high adsorption potential to soil and sediment. However, they have a low potential to bioaccumulate.

B. Biodegradation

No studies are available on alcohols, C11-14-iso-, C13-rich, ethoxylated.

AEs with a typical alkyl chain (e.g., C12 to C15) will normally reach more than 60% ultimate degradation in standardized tests for ready biodegradability (HERA, 2009). For example, alcohols, C12-15, ethoxylated is readily biodegradable. In an OECD 301B test, degradation was 72% in 28 days, but failed the 10-day window (ECHA) [Kl. score = 1].

An alcohol, C12-15, ethoxylated (7 EO) degraded 80 to 88% in 28 days when tested using a shake-flask CO_2-evolution test method (ECHA) [Kl. score = 2].

If a chemical is found to be inherently biodegradable or readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

No experimental data are available for alcohols, C11-14-iso-, C13-rich, ethoxylated.

Using KOCWIN in EPISUITE™ (USEPA, 2019), the estimated K_{oc} values for alcohols, C1.1-14-iso-, C13-rich, ethoxylated were 5649 L/kg (MCI) and 20,085 L/kg (K_{ow}). However, as described in ECHA, one should keep in mind that surfactancy (the fact that surfactants tend to stay in the boundary layer between the phases) and dissociation is not considered in the EPISUITE™ estimations. Therefore, calculated K_{oc} values should be used with caution.

If released to soil, these K_{oc} values indicate a high potential for both adsorption and low potential for mobility. If released to water, based on these K_{oc} values and slight solubility, this substance is expected to strongly adsorb to suspended solids or sediment.

D. Bioaccumulation

There are no bioaccumulation studies on this substance. The BCF values for AEs in fathead minnows have been reported to range from <5 to 387.5 (Toll et al., 2000). The uptake rates varied from 330 to 1,660 (L x kg/d) and elimination rates varied from 3.3 to 59 per day (Toll et al., 2000). The high concentrations in fish are thought to be prevented by an efficient biotransformation of the alcohol ethoxylates, leading to a high elimination rate. Thus, it can be stated that bioaccumulation of AEs is regarded to be negligible as the surfactants will be rapidly metabolised (ECHA).

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Overall, AEs are not expected to be systemically toxic. The available datasets for AEs ranging from C6–C18 and EO3–EO12 are considered representative of the AE category and were used to assess alcohols, C11-14-iso-, C13-rich, ethoxylated.

The acute toxicity of similar AEs is low by the oral and dermal routes. The skin irritation rabbit studies show that the degree of irritation depends on the testing conditions and length of the exposure period. Human patch studies on AEs do not support a skin irritant classification and alcohol ethoxylates in this group are not considered skin sensitisers. Alcohols, C11-14-iso-, C13-rich, ethoxylated is expected to be irritating to the eyes of rabbits. Repeated dose toxicity studies on AEs similar to alcohols, C11-14-iso-, C13-rich, ethoxylated in rats do not indicate any target organ effects. These AEs are not genotoxic, carcinogenic, and have a low potential for reproductive and developmental toxicity.

B. Metabolism

In rats, AEs are readily absorbed in the gastrointestinal tract (i.e., oral absorption has been estimated to be >75%) and rapidly excreted via the urine and faeces after oral application. The alkyl chain length appears to have an impact on the metabolism. AEs with longer alkyl chains are excreted at a higher proportion into expired air and less in urine. Also, ethoxy chain length impacts the proportions excreted via the urine, the faeces, and the expired air with more being excreted via the faeces and expired in the air with longer ethoxy chain length (HERA, 2009).

The same trends were observed when AEs were administered dermally, with the only difference being that adsorption was slower and less of the total administered compound was absorbed (HERA, 2009).

C. Acute Toxicity

No acute toxicity studies are available on alcohols, C11-14-iso-, C13-rich, ethoxylated.

The oral LD_{50} in rats for $C_{12\text{-}15}AE_3$ is >5,000 milligrams per kilogram (mg/kg) (ECHA) [Kl. score = 2]. The oral LD_{50} in rats for $C_{12\text{-}15}AE_7$ is 1,700 mg/kg (HERA, 2009) [Kl. score = 2]. The oral LD_{50} value in rats for $C_{12\text{-}13}AE_{6.5}$ is 2,100 mg/kg (HERA, 2009) [Kl. score = 2]. The oral LD_{50} value in rats for $C_{12\text{-}15}AE_{11}$ is >2,000 mg/kg in males and between 1,000 and 2,000 mg/kg in females (HERA, 2009) [Kl. score = 2]. The oral LD_{50} values in rats for $C_{14\text{-}15}AE_{13}$ in two separate studies are 1,100 and 1,000 mg/kg (HERA, 2009) [Kl. score = 2]. The relative number of ethoxylate (EO) units, but not the carbon chain length, appears to influence acute oral toxicity (HERA, 2009).

An acute dermal LD_{50} values of >2,000 mg/kg were determined for $C_{12-14}AE_3$ and $C_{12-14}AE_6$ in two separate studies (HERA, 2009) [Kl. score = 2]. The acute dermal LD_{50} of $C_{12-15}AE_7$ is >2,000 mg/kg (HERA, 2009) [Kl. score = 2].

D. Irritation

Skin

Application of 0.5 millilitres (mL) $C_{12-13}AE_{<2.5}$ (CAS RN [redacted] to the skin of rabbits for 24 hours under occlusive conditions was considered irritating (ECHA) [Kl. score = 2].

Application of 0.5 mL alcohols C_{12-13}, branched and linear, <2.5 EO to the skin of rabbits for 4 hours under occlusive conditions was not considered irritating (ECHA) [Kl. score = 2].

In a 24-hour human patch test, there was some short-lived redness in some individuals from the application of $C_{12-14}AE_3$, but there was no scaling or oedema in any subjects (HERA, 2009) [Kl. score = 2].

In a standard 4-hour human patch test, the irritation potential of $C_{12-15}AE_5$ and $C_{12-15}AE_5$ were compared to 20% sodium dodecyl sulfate, which is classified a skin irritant under GHS. The results showed that neither AE should be classified as a skin irritant (Basketter et al., 2004) [Kl. score = 2].

Eye

Most AEs tested as the undiluted neat test material are moderately to severely irritating to the eyes of rabbits, with an eye irritation index (EII) ranging from >25 to 50 (HERA, 2009). The AEs $C_{12-14}AE_3$, $C_{12-14}AE_6$, $C_{13}AE_6$, and $C_{12-14}AE_{10}$ were found to be moderately to severely irritating to the eyes of rabbits (HERA, 2009). In another study, $C_{12-15}AE_{11}$ was considered moderately to severely irritating to the eyes of rabbits (HERA, 2009).

Some AEs were reported to be practically or minimally irritating to the eyes of rabbits with EII scores of 0.5 to 15. These AEs include: $C_{12-15}AE_3$, $C_{14-15}AE_7$, $C_{12-14}AE_{15}$, $C_{14-15}AE_{18}$, and $C_{13}AE_{20}$ (HERA, 2009).

E. Sensitisation

No sensitisation studies are available on alcohols, C11-14-iso-, C13-rich, ethoxylated.

In a guinea pig maximisation test, $C_{12-13}AE_{<2.5}$ (CAS RN [redacted] was not considered a skin sensitiser (ECHA) [Kl. score = 2].

F. Repeated Dose Toxicity

Oral

No repeated dose toxicity studies are available on alcohols, C11-14-iso-, C13-rich, ethoxylated.

Rats were given 0%, 0.0313%, 0.0625%, 0.125%, 0.25%, 0.5% or 1.0% $C_{12-15}AE_7$ in their diet for 90 days. The animals in the ≥0.25% groups showed significantly reduced body weight gain, which was associated with marked decreases in food and water consumption. Relative liver weights were significantly increased in the ≥0.5% male rats and ≥0.25% females. Histopathologic examination showed hepatocytic enlargement in the ≥0.125% groups, suggesting increased liver metabolism on the basis of increased alkaline phosphatase activity at the higher dose levels. The no observed

adverse effect level (NOAEL) was established at 0.0625% in the diet or 102 mg/kg/day (HERA, 2009) [Kl. score = 2].

Rats were fed $C_{12-14}AE_7$ in the diet at concentrations of 0%, 0.0313%, 0.0625%, 0.125%, 0.25%, 0.5% and 1.0% for 90 days. The animals in the ≥0.25% groups showed significantly reduced body weight gain, which was associated with marked decreases in food and water consumption. Relative liver weights were significantly increased in the ≥0.5% male rats and ≥0.25% females. Histopathologic examination showed hepatocytic enlargement in the ≥0.125% groups, suggesting increased liver metabolism on the basis of increased alkaline phosphatase activity at the higher dose levels. The NOAEL was established at 0.0625% in the diet or 110 mg/kg/day (HERA, 2009) [Kl. score = 2].

Rats were given 0%, 0.1%, 0.5% or 1% $C_{12-13}AE_{6.5}$ in their diet for two years. Body weight gain was reduced in the 1% males and ≥0.5% females, which was likely due to the reduced food consumption in these animals. At study termination, organ to body weight ratios were increased in the ≥0.5% females (liver, kidney and brain), 1% females (heart), and 1% males (liver). A dose-related focal myocarditis was observed in males. While focal myocarditis is commonly observed in non-treated aging rats, the incidence in the treated animals were higher than in the controls. The NOAEL was established at 0.1% or 50 mg/kg/day (HERA, 2009) [Kl. score = 2].

Inhalation

No studies are available.

Dermal

No adequate studies are available.

G. Genotoxicity

In Vitro Studies

The genotoxicity studies conducted on alcohol ethoxylates are reviewed in HERA (2009). The results of few of the *in vitro* studies on similar alcohol ethoxylates to alcohols, C11-14-iso-, C13-rich, ethoxylated are presented in Table 2.

Table 2: *In Vitro* Genotoxicity Studies on Selected Alcohol Ethoxylates

Test Substance	Test System	Results*		Klimisch Score	Reference
		-S9	+S9		
$C_{14-15}AE_7$	Bacterial reverse mutation (*S. typhimurium* strains)	-	-	2	HERA, 2009
$C_{14-15}AE_7$	Bacterial reverse mutation (*S. typhimurium* strains)	-	-	2	HERA, 2009
$C_{14}AE_{12}$	Chromosomal aberrations (CHO cells)	-	-	2	HERA, 2009

*+, positive; -, negative

In Vivo Studies

In two separate studies, CD-1 mice were given an intraperitoneal dose of 0, 50, or 100 mg/kg $C_{12-15}AE_3$ or $C_{12-14}AE_9$. There were no increases in the frequency of micronuclei in the bone marrow cells (Talmage, 1994) [Kl. score = 2].

Male and female Tunstall rats were given a single oral gavage dose of 0, 250, 500, or 1,000 mg/kg $C_{14-15}AE_7$. There were no increases in chromosomal aberrations in the bone marrow cells (HERA, 2009) [Kl. score = 2].

H. Carcinogenicity

No studies are available on alcohols, C11-14-iso-, C13-rich, ethoxylated. Based on the available data, chemicals in this group are not considered carcinogenic.

Male and female Sprague-Dawley rats were given $C_{12-13}AE_{6.5}$ in their diet at doses up to 1% (500 mg/kg/day). Reduced food consumption was noted at the higher dose levels (i.e., 0.5% and 1% for females and 1% for males), resulting in a lower body weight gain compared to the control group. No treatment-related histopathology was found and no increase in tumour incidence was observed (HERA, 2009) [Kl. score = 2].

Male and female Charles River rats were given 0, 0.1, 0.5 or 1% $C_{14-15}AE_7$ in their diet for two years. There were no treatment-related changes in general behaviour and appearance. The survival rate of the test animals was comparable if not better than the controls. Body weights of the 0.5% females and the 1% males and females had significantly lower weight gains than the control. There were no treatment-related effects on organ weights and tumour incidence (HERA, 2009) [Kl. score = 2]

Male and female Sprague-Dawley rats were given $C_{14-15}AE_7$ in their diet at 0.1%, 0.5% and 1% for two years. A treatment-related body weight depression was observed in females at the two highest treatment levels and in males at the 1% dose level, probably due to the poor palatability of the diet. There was no evidence for any carcinogenic activity (HERA, 2009) [Kl. score = 2].

I. Reproductive Toxicity

No studies are available on alcohols, C11-14-iso-, C13-rich, ethoxylated. Based on the data available, the chemicals of this group are not considered to cause reproductive toxicity.

CD rats were given 0%, 0.05%, 0.1% or 0.5% (approximately 0, 25, 50, or 250 mg/kg/day) $C_{12}AE_6$ in their diet in a two-generation reproductive toxicity study. There were no treatment related effects in the parents or pups on general behaviour, appearance or survival. At 0.5%, there was reduced weight gain in both the parental animals and the pups compared to the controls. Fertility was unaffected by treatment. The NOAEL for reproductive toxicity is 0.5% in the diet, which corresponds to 250 mg/kg/day (HERA, 2009) [Kl. score = 2].

In a two-generation developmental and teratogenicity study, CD rats were given 0%, 0.05%, 0.1% or 0.5% $C_{14-15}AE_7$ in their diet (approximately 0, 25, 50 or 250 mg/kg/day). Three of the treated groups were given the test substance continuously throughout the study; in the other three groups the females received the test substance on GD 6-15 and the males were untreated. None of the deaths of parental rats during the study was considered to be compound-related. There were no treatment-related changes in behaviour or appearance in the parental rats or pups. Slightly lower body weight gain was noted in the 0.5% continuously treated females. Food consumption was similar for control

and treated rats. Fertility, gestation and viability indices were similar across groups. The average 21-day body weights for the 0.5% continuous treated pups were significantly lower than that of the control. Relative liver weights of the 0.5% continuously treated F_1 parental animals were increased at the 91-day sacrifice; relative liver weights of the 0.5% continuously treated males were also increased at the 60-day and caesarean section sacrifices. There were no treatment-related histopathological lesions in any of the tissues from the F_0 and F_1 generations. The NOAEL for reproductive toxicity is 0.5% in the diet or 250 mg/kg/day (HERA, 2009) [Kl. score = 2].

J. Developmental Toxicity

No studies are available on alcohols, C11-14-iso-, C13-rich, ethoxylated. Based on the data available, the chemicals of this group are not considered to cause developmental toxicity.

In a two-generation reproductive toxicity study, Charles River rats were given 0, 0.05, 0.1 or 0.5% (about 0, 25, 50 or 250 mg/kg/day) $C_{12}AE_6$ in their diet. General behaviour, appearance and survival were unaffected by treatment. At the 0.5% dose level, adults and pups gained less weight than the control rats. In the 0.5% dose group, there was a statistical increase in embryo lethality and soft tissue anomalies, and at the 0.1% there was a statistical decrease in mean foetal liver weight. Neither of these effects was considered to be treatment-related by the authors as they showed no dose response characteristics. The NOAEL for maternal toxicity is 50 mg/kg/day. The NOAEL for developmental and teratogenicity is 0.1% in the diet or 50 mg/kg/day (HERA, 2009) [Kl. score = 2].

Pregnant rabbits were given 0, 50, 100 or 200 mg/kg $C_{12}AE_6$ by oral gavage from gestational days 2 to 16. Nine control rabbits and 31 treated rabbits died during the study. Surviving rabbits at the 200 mg/kg dose group generally showed slight losses of body weight. At 100 and 200 mg/kg, ataxia and a slight decrease in body weight was observed in the pregnant animals. In seven treated and two control rabbits, early deliveries were recorded. There were no treatment-related effects on corpora lutea, implantations, number of live foetuses and spontaneous abortions. The NOAEL for maternal toxicity is 50 mg/kg/day; the NOAEL for developmental toxicity is 200 mg/kg/day (HERA, 2009) [Kl. score = 2].

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for alcohols, C11-14-iso-, C13-rich, ethoxylated follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

<u>Oral</u>

A two-year dietary study in rats has been conducted on $C_{12\text{-}13}AE_{6.5}$ (HERA, 2009). The NOAEL from this study is 50 mg/kg/day based on increased organ weights. The NOAEL of 50 mg/kg/day will be used for determining the oral reference dose (RfD) and the drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / (UF_A x UF_H x UF_L x UF_{Sub} x UF_D)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10

UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 50/(10 x 10 x 1 x 1 x 1) = 50/100 = 0.5 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) x (human weight) x (proportion of intake from water) / (volume of water consumed) x (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) x (human weight) x (proportion of water consumed) / (volume of water consumed)

Where:
Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (0.5 x 70 x 0.1)/2 = 1.8 mg/L

B. Cancer

The AEs $C_{12-13}AE_{6.5}$ and $C_{14-15}AE_7$ were not carcinogenic to rats in a two-year dietary study. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Alcohols, C11-14-iso-, C13-rich, ethoxylated does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Alcohols, C11-14-iso-, C13-rich, ethoxylated has moderate chronic toxicity concern to aquatic life.

B. Aquatic Toxicity

Acute Studies

There are no acute aquatic toxicity studies for ethoxylated C12-C16 alcohol. The aquatic toxicity of other AEs has been extensively evaluated in numerous studies on fish, daphnids and algae as well as microorganisms. Table 3 lists the results of acute aquatic toxicity studies on read across substance alcohols, C12-C15, ethoxylated (1 to 2.5 EO) [CAS RN [redacted] alcohols, C12-C14, ethoxylated (2 EO) [CAS RN [redacted] and alcohols, C12-C15, branched and linear, ethoxylated [CAS RN [redacted]

Table 3: Acute Aquatic Toxicity Studies on Ethoxylated C12-C16 Alcohol[a,b,c]

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Oncorhynchus mykiss (Rainbow Trout)	96-hr LC_{50}	1.3 – 1.7[a]	2	ECHA
Danio Rio	96-hr LC_{50}	1.2[b]	2	ECHA
Danio Rio	96-hr LC_{50}	2[b]	2	ECHA
Zebrafish	96-hr LC_{50}	>2[c]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.14[a]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.23[a]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.53[b]	2	ECHA
Daphnia magna	48-hr EC_{50}	2.84[b,d]	2	ECHA
Daphnia magna	48-hr EC_{50}	1.2[e]	1	ECHA
Daphnia magna	48-hr EC_{50}	>2[b]	2	ECHA
Daphnia magna	48-hr EC_{50}	>2[c]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.23	2	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	0.75[a]	2	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	>2[c]	2	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	0.41[b]	2	ECHA
Desmodesmus subspicatus (green algae)	72-hr EC_{50}	0.778[b]	2	ECHA
Desmodesmus subspicatus (green algae)	72-hr EC_{50}	0.87[e]	1	ECHA
Desmodesmus subspicatus (green algae)	72-hr EC_{50}	1.3[e]	1	ECHA

a: Read across to alcohols, C12-C15, ethoxylated (1 to 2.5 EO) CAS No. [redacted]
b: Read across to alcohols, C12-C14, ethoxylated (EO 2) CAS No. [redacted]
c: Read across to alcohols, C12-C15, branched and linear, ethoxylated (CAS No. [redacted]
d: alcohols, C12-C14, ethoxylated (EO 1) CAS No. [redacted] as WAF (water accommodated fraction)
e: alcohols, C12-C14, ethoxylated (EO 4 or EO 6) CAS No. [redacted]

A review of the acute studies indicates that invertebrates are somewhat more sensitive to AEs than fish and algae. As concluded in HERA (2009), the Danish EPA (2001) found that the acute toxicity of AE to invertebrates varies, with EC50 values from 0.1 mg/L to more than 100 mg/L for linear AE and from 0.5 mg/L to 50 mg/L for branched AE. The toxicity is species specific and may vary between 0.29 mg/L and 270 mg/L for the same linear AE (Lewis and Suprenant 1983, quoted in Danish EPA 2001). The most commonly used invertebrates for testing are Daphnia magna and Daphnia pulex, and they are also among the most sensitive invertebrates to AE. The Danish EPA (2001) found that some AEs are very toxic to invertebrates (i.e., linear AE of C12-15 EO1-8 and branched AE with a low degree of branching, < 10-25%). They concluded that branching of the alkyl chain reduces the toxicity of AE to invertebrates, as also observed for algae (Danish EPA, 2001). However, the data used to reach this conclusion is from specially synthesised AEs, which have been shown to have a significantly higher toxicity than the AE made from a technical alcohol which are used commercially (Kaluza and Taeger, 1996).

Chronic Studies

In developing a water quality guideline for AEs (ANZG, 2018), the toxicity data was normalised for a specific alkyl chain length or a specific number of EO groups. The no observed effect concentrations (NOECs) listed below were normalised to an alkyl chain length of C13.3 and EO of 8.2.

Freshwater fish: 2 species, 720 to 1,500 micrograms per litre (μg/L).

Freshwater crustaceans: 2 species, 590 to 860 μg/L.

Freshwater rotifers: 1 species, *Brachionus calyciflorus*, 1,300 μg/L

Freshwater algae, diatoms and blue-green algae: 6 species, 200 to 8,700 μg/L.

Freshwater mesocosms: 4 NOEC data for multiple species tests were 80, 80, 320, and 330 μg/L, although replication was insufficient to meet OECD (1992) requirements. Normalised data were 380, 380, 320, and 1,520 μg/L.

C. Terrestrial Toxicity

No studies are available.

D. Calculation of PNEC

The PNEC calculations for alcohols, C11-14-iso-, C13-rich, ethoxylated follow the methodology discussed by DEWHA (2009).

PNEC Water

The ANZG water quality guideline (2018) for freshwater is: "*A high reliability trigger value of 140 μg/L was derived for AE (normalised data) using the statistical distribution method with 95% protection.*"

For the purposes of calculating the PNEC values for sediment and soil, the $PNEC_{water}$ will be 0.14 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 11.95 mg/kg sediment wet weight.

The calculations are as follows:

$$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$$
$$= (109/1280) \times 1000 \times 0.14$$
$$= 11.95 \text{ mg/kg}$$

Where:

$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (cubic metre per cubic metre [m^3/m^3])
BD_{sed} = bulk density of sediment (kilograms per cubic metre [kg/m^3]) = 1,280 [default]

$K_{sed\text{-}water}$ = 0.8 + [(0.2 x Kp_{sed})/1,000 x BD_{solid}]
= 0.8 + [(0.2 x 226/1,000 x 2,400]
= 109 m^3/m^3

Where:
Kp_{sed} = solid-water partition coefficient (litres per kilogram [L/kg])
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]

Kp_{sed} = K_{oc} x f_{oc}
= 5,649 x 0.04
= 226 L/kg

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for alcohols, C11-14-iso-, C13-rich, ethoxylated calculated from EPISUITE™ using the MCI is 5,649 L/kg. The MCI method is preferred to the K_{ow} method due to the surfactant properties of the substance.
F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 10.54 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil}$ = (Kp_{soil}/BD_{soil}) x 1,000 x $PNEC_{water}$
= (113/1,500) x 1,000 x 0.14
= 10.54 mg/kg

Where:
Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]

Kp_{soil} = K_{oc} x f_{oc}
= 5,649 x 0.02
= 113 m^3/m^3

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for alcohols, C11-14-iso-, C13-rich, ethoxylated calculated from EPISUITE™ using the MCI is 5,649 L/kg.
F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (DEWHA, 2009; ECHA, 2017).

Alcohols, C11-14-iso-, C13-rich, ethoxylated is readily biodegradable and thus does not meet the screening criteria for persistence.

The measured BCF in fish for AEs, which includes alcohols, C11-14-iso-, C13-rich, ethoxylated, have been reported to range from <5 to 387.5. Thus, alcohols, C11-14-iso-, C13-rich, ethoxylated does not meet the screening criteria for bioaccumulation.

The chronic NOEC values for AEs are >0.1 mg/L. Thus, alcohols, C11-14-iso-, C13-rich, ethoxylated does not meet the criteria for toxicity.

The overall conclusion is that alcohols, C11-14-iso-, C13-rich, ethoxylated is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

Eye Irritant Category 2

Aquatic Chronic Toxicity Category 3

B. Labelling

Danger! According to the classification provided by companies to ECHA in Classification, Labelling and Packaging (CLP) notifications, this substance is very toxic to aquatic life, causes serious eye damage, is harmful if swallowed, is harmful to aquatic life with long lasting effects and causes skin irritation.

A. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

<u>Eye Contact</u>

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.

<u>Skin Contact</u>

Wash thoroughly with soap and water.

<u>Inhalation</u>

If inhaled, remove from area to fresh air. Get medical attention.

Ingestion

Rinse mouth with water and then drink a glass of water. Get medical attention. Never give anything by mouth to an unconscious person.

B. Fire Fighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon dioxide.

Special Protective Equipment for Firefighters

Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Handle in accordance with good industrial hygiene and safety practice.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

For large amounts: dike spillage and pump off product. For residues: pick up with suitable absorbent material. Dispose of contaminated material as prescribed.

D. Storage And Handling

General Handling

Protect against moisture. Shut containers immediately after taking product because product takes up the humidity of air. No special precautions are necessary beyond normal good hygiene practices.

Wash hands thoroughly after handling. Avoid breathing mists or aerosols.

Storage

Keep container tightly closed.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for alcohols, C11-14-iso-, C13-rich, ethoxylated.

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Respiratory protection is not required if ventilation is adequate.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is recommended. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

Alcohols, C11-14-iso-, C13-rich, ethoxylated is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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ALCOHOLS, C12-16, ETHOXYLATED
POLY(OXY-1,2-ETHANEDIYL), α-HYDRO-ω-HYDROXY-, MONO-C10-14 ALKYL ETHERS, PHOSPHATES

This dossier on alcohols, C12-16, ethoxylated and similar alcohol ethoxylate poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates, a similar alcohol ethoxylate, present the most critical studies pertinent to the risk assessment of these substances in their use in coal seam gas extraction activities.

This dossier does not represent an exhaustive or critical review of all available data. The information presented in this dossier was obtained primarily from the Human & Environmental Risk Assessment on Ingredients of European Household Cleaning Products: Alcohol Ethoxylates (HERA, 2009), and from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch *et al.*, 1997).

For the purpose of this dossier, alcohols, C12-15, ethoxylated (CAS RN [redacted] has been reviewed as a surrogate chemical for ethoxylated C12-C16 alcohol (CAS RN [redacted] and poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates (CAS RN [redacted] where appropriate.

I. SUBSTANCE IDENTIFICATION

Chemical Name: Alcohols, C12-16, ethoxylated

CAS RN: [redacted]

Molecular formula: $H–(CH_2)_{12–16}–(OCH_2CH_2)_n–OH$ (where n is the average number of EO units)

Molecular weight: Not available (UVCB substance)

Synonyms: Alcohols, C12-16, ethoxylated, Ethoxylated C12-16 alcohols; polyethylene glycol, dodecyl, tetradecyl, hexadecyl ether

SMILES: Not available (UVCB substance)

Chemical Name (IUPAC): Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates

CAS RN: [redacted]

Molecular formula: No data

Molecular weight: No data

Synonyms: Poly(oxy-1,2-ethanediyl), .alpha.-hydro-.omega.-hydroxy-, mono-C10-14 (even numbered)-alkyl ethers, phosphates

SMILES: No data

Alcohol ethoxylates (AE) are a class of non-ionic surfactant polymers that have the basic structure $C_{x-y}AE_n$. The subscript (x-y) following the 'C' indicates the range of carbon chain units. The hydrocarbon

chain can be either linear or branched. AEs also contain an ethylene oxide (EO) chain attached to the alcohol. The degree of EO polymerization is indicated by the subscript (n) which indicates the average number of EO units. Ethoxylated C12-C16 alcohol (CAS RN [redacted] has an average number of 1 to 6 moles of EO units.

II. PHYSICO-CHEMICAL PROPERTIES

No information is available on alcohols, C12-16, ethoxylated or poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates. Therefore, data were read across from a similar substance, alcohols, C12-15, ethoxylated (CAS RN [redacted] as shown below.

Table 1: Overview of the physico-chemical properties of alcohols, C12-15, ethoxylated (1 to 2.5 moles ethoxylated)

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Clear liquid with a rancid odour*	2	ECHA
Melting Point	7.22° (pressure not provided)	2	ECHA
Boiling Point	271.11–516.11°C (pressure not provided)	2	ECHA
Density	ca. 930 kg/m^3 @ 20°C	2	ECHA
Vapor Pressure	<1 Pa@ 25°C	2	ECHA
Partition coefficient (log K_{ow})	5.06** @ 25°C	2	ECHA
Water Solubility	0.021 g/L @ 25°C	2	ECHA
Flash Point	165.56°C	2	ECHA
Auto flammability	235°C	2	ECHA
Viscosity	28.1 mPa s (dynamic) @ 20°	2	ECHA

*Based on alcohols, C12-15, ethoxylated (1 to 2.5 EO) [CAS RN [redacted]
**Weight-averaged log K_{oc} of whole substance based on normalized composition

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Based on a review of read-across substances, alcohols, C12-16, ethoxylated and poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates are readily biodegradable. They have a low potential for bioaccumulation and a moderate potential for adsorption to soil and sediment.

B. Biodegradation

There are no studies available for alcohol, C12-16, ethoxylated or poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates.

AE homologues with linear hydrocarbon chain lengths from C8 to C15 and mean values ranging from 3-20 EO units are readily biodegradable (HERA, 2009).

Alcohols, C12-C14, ethoxylated (7-8) degraded to 100% in 28 days in a die away screening test (HERA, 2009) [Kl.score=2].

Alcohols, C12-15, ethoxylated is readily biodegradable. In an OECD 301B test, degradation of 10 mg/L of alcohols, C12-15. ethoxylated was 72% after 28 days but it failed the 10-day window (ECHA) [Kl.score=1].

In an OECD 301B test, degradation of 20 mg/L of alcohols, C12-15. ethoxylated was 61% after 28 days but it failed the 10-day window (ECHA) [Kl.score=1].

A 240 mg/L concentration of alcohol, C12-15, ethoxylated (7 EO) degraded 80- 88% in 28 days when tested using a shake-flask CO_2-evolution test method (ECHA) [Kl.score=2].

If a chemical is found to be readily biodegradable, it is categorized as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

There are no experimental data are available for alcohols, C12-16, ethoxylated or poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates. Using KOCWIN in EPISuite™ (EPA, 2018), the estimated K_{oc} values for surrogates of alcohols, C12-16, ethoxylated are: K_{oc} for C12-C16 linear alcohol, ethoxylated (2 EO): 3,920 L/kg (molecular connectivity index, MCI) and 13,530 L/kg (K_{ow}).

Based on these K_{oc} values, if released to soil, the alcohols, C12-C16 ethoxylated and similar AE poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates are expected to adsorb strongly to soil and it is expected to have a low potential for mobility.

D. Bioaccumulation

The potential for bioaccumulation of AEs is considered low due to the biotransformation and excretion of the substance. The various studies present considerable evidence that AEs are rapidly eliminated and metabolised (ECHA).

The BCF values for alcohol ethoxylates in fathead minnows have been reported to range from <5 to 387.5 L/kg (Toll et al., 2000; as cited in ECHA) [KI.score=2]. The uptake rates varied from 330 to 1660 (L × kg/d) and elimination rates varied from 3.3 to 59 per day (Toll et al., 2000; as cited in ECHA) [KI. score=2]. The high concentration in fish is thought to be prevented by an efficient biotransformation of the alcohol ethoxylates, leading to a high elimination rate.

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

The acute toxicity of alcohols, C12-16, ethoxylated and poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates is low by the oral and dermal routes. Skin irritation studies in rabbits on alcohols, C12-16, ethoxylated have shown mixed results, but human patch studies on these alcohol ethoxylates do not support a skin irritant classification. Alcohols, C12-16, ethoxylated and poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates is expected to be irritating to the eyes of rabbits. Alcohols, C12-16, ethoxylated is not a skin sensitiser. Repeated dose toxicity studies on alcohol ethoxylates similar to alcohols, C12-16, ethoxylated in rats

do not indicate any target organ effects. These alcohol ethoxylates are not genotoxic, carcinogenic, and they have a low potential for reproductive and developmental toxicity.

B. Acute Toxicity

There are no acute toxicity studies are available on alcohols, C12-16, ethoxylated or poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates.

Oral

The oral LD_{50} in rats for $C_{12-15}AE_3$ is >5,000 mg/kg (ECHA) [Kl.score=2]. The oral LD_{50} in rats for $C_{12-15}AE_7$ is 1,700 mg/kg (HERA, 2009) [Kl.score=2]. The oral LD_{50} value in rats for $C_{12-13}AE_{6.5}$ is 2,100 mg/kg (HERA, 2009) [Kl.score=2]. The oral LD_{50} value in rats for $C_{12-15}AE_{11}$ is >2,000 mg/kg in males and between 1,000 and 2,000 mg/kg in females (HERA, 2009) [Kl.score=2]. The oral LD_{50} values in rats for $C_{14-15}AE_{13}$ in two separate studies are 1,100 and 1,000 mg/kg (HERA, 2009) [Kl.score=2]. The relative number of EO units, but not the carbon chain length, appears to influence acute oral toxicity (HERA, 2009).

The acute oral LD_{50} for alcohols, C12-C15, ethoxylated in male and female Wistar rats is >5000-<10,000 mg/kg bw (ECHA) [KI. score = 2].

Inhalation

The 4-hour LC_{50} for alcohols, C12-C15, ethoxylated in male and female Sprague-Dawley rats is > 1,600 mg/m^3 (>1.6 mg/L) (ECHA) [KI. score =2].

Dermal

Acute dermal LD_{50} values of >2,000 mg/kg were determined for $C_{12-14}AE_3$ and $C_{12-14}AE_6$ in two separate studies (HERA, 2009) [Kl.score=2]. The acute dermal LD_{50} of $C_{12-15}AE_7$ is >2,000 mg/kg (HERA, 2009) [Kl. score = 2].

The acute dermal LD_{50} for alcohols, C12-C15, ethoxylated in male and female Wistar rats >2000 mg/kg bw (ECHA) [Kl.score=2].

C. Irritation

Skin

Application of 0.5 mL isotridecanol, ethoxylated (3 EO) to the skin of rabbits for 4 hours under occlusive conditions was considered irritating (ECHA) [Kl.score=2].

Application of 0.5 mL isotridecanol, ethoxylated (3 EO) to the skin of rabbits for 4 hours under semi-occlusive conditions was not considered irritating (ECHA) [Kl.score=2].

In a 24-hour human patch test, there was some short-lived redness in some individuals from the application of $C_{12-14}AE_3$, but there was no scaling or edema in any subjects (HERA, 2009) [Kl.score=2].

In a standard 4-hour human patch test, the irritation potential of $C_{12-15}AE_5$ and $C_{12-15}AE_5$ were compared to 20% sodium dodecyl sulfate (which is classified a skin irritant under GHS). The results showed that neither alcohol ethoxylate should be classified as a skin irritant (Basketter et al., 2004) [Kl.score=2]. Nonetheless, the substance is classified by ECHA as an irritant (see Section IX).

Eye

Most alcohol ethoxylates tested as the undiluted neat test material are moderately to severely irritating to the eyes of rabbits, with an eye irritation index (EII) ranging from >25 to 50 (HERA, 2009). The alcohol ethoxylates $C_{12-14}AE_3$, $C_{12-14}AE_6$, $C_{13}AE_6$, and $C_{12-14}AE_{10}$ were found to be moderately to severely irritating to the eyes of rabbits (HERA, 2009). In another study, $C_{12-15}AE_{11}$ was considered moderately to severely irritating to the eyes of rabbits (HERA, 2009).

Some alcohol ethoxylates were reported to be practically or minimally irritating to the eyes of rabbits with EII scores of 0.5 to 15. These alcohol ethoxylates include: $C_{12-15}AE_3$, $C_{14-15}AE_7$, $C_{12-14}AE_{15}$, $C_{14-15}AE_{18}$, and $C_{13}AE_{20}$ (HERA, 2009).

D. Sensitisation

There are no sensitisation studies are available on alcohols, C12-16, ethoxylated or poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates.

In a guinea pig maximization test, $C_{12-13}AE_{<2.5}$ (CAS RN [redacted] was not considered a skin sensitiser (ECHA) [Kl.score=2].

In guinea pig maximization tests, $C_{12-15}AE_3$, $C_{12-15}AE_7$, and $C_{14-15}AE_7$ were not considered skin sensitisers (HERA, 2009) [Kl.score=2].

E. Repeated Dose Toxicity

Oral

There are no repeated dose toxicity studies are available on alcohols, C12-16, ethoxylated or poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates. Data for similar ethoxylates are presented below.

Rats were given 0%, 0.0313%, 0.0625%, 0.125, 0.25, 0.5 or 1.0% $C_{12-15}AE_7$ in their diet for 90 days. The animals in the ≥0.25% groups showed significantly reduced body weight gain, which was associated with marked decreases in food and water consumption. Relative liver weights were significantly increased in the ≥0.5% male rats and ≥0.25% females. Histopathologic examination showed hepatocytic enlargement in the ≥0.125% groups, suggesting increased liver metabolism based on increased alkaline phosphatase activity at the higher dose levels. The NOAEL was established at 0.0625% in the diet or 102 mg/kg-day (HERA, 2009) [Kl.score=2].

Rats were fed $C_{12-14}AE_7$ in the diet at concentrations of 0%, 0.0313%, 0.0625%, 0.125%, 0.25%, 0.5% and 1.0% for 90 days. The animals in the ≥0.25% groups showed significantly reduced body weight gain, which was associated with marked decreases in food and water consumption. Relative liver weights were significantly increased in the ≥0.5% male rats and ≥0.25% females. Histopathologic examination showed hepatocytic enlargement in the ≥0.125% groups, suggesting increased liver metabolism based on increased alkaline phosphatase activity at the higher dose levels. The NOAEL was established at 0.0625% in the diet or 110 mg/kg-day (HERA, 2009) [Kl.score=2].

Male and female Wistar rats given in their diet 0, 300, 1,000, 3,000, and 10,000 ppm $C_{14-15}AE_7$ for 90 days. There were no deaths during the study. Mean body weights and feed were lower in 10,000 ppm males and the 3,000 ppm females. Feed consumption was lower in the 10,000 ppm animals and the 3,000 ppm females. Relative liver weights were increased in the ≥3,000 ppm animals, and

relative spleen weights were increased in the 10,000 ppm males. Clinical chemistry changes were noted in the 10,000-ppm group and consisted of significantly higher urea, chloride and potassium levels in males, significantly higher urea, chloride and cholesterol in females. Increased total leucocytes and lymphocytes were seen in the 10,000 ppm animals and in the 3,000 ppm males. The 10,000 ppm females showed lower numbers of neutrophils; mean cell volume and mean cell hemoglobin were identified in one or both sexes fed in the ≥3,000 ppm dose groups. In the 1,000 ppm females, there were minor, but statistically significant changes in the liver and kidney weights and plasma urea concentration; these effects were considered to be of no toxicological significance. Histopathologic examination showed no treatment-related effects at any dose level. The NOAEL for this study is 1,000 ppm in the diet, which corresponded to 50 mg/kg-day (HERA, 2009) [Kl.score=2].

Rats were given 0, 0.1, 0.5, or 1% $C_{14-15}AE_7$ in their diet for 90 days. Body weights, food intake, organ weights, and hematology and clinical chemistry parameters were similar across groups. The NOAEL for this study is 1% in the diet, which corresponded to 700 and 785 mg/kg-day for males and females, respectively (HERA, 2009) [Kl.score=2].

Rats were given 0, 0.1, 0.5 or 1% $C_{12-13}AE_{6.5}$ or $C_{14-15}AE_7$ in their diet for two years. Body weight gain was reduced in the 1% males and ≥0.5% females, which was likely due to the reduced food consumption in these animals. At study termination, organ to body weight ratios were increased in the ≥0.5% females (liver, kidney, and brain), 1% females (heart), and 1% males (liver). A dose-related focal myocarditis was observed in males. While focal myocarditis is commonly observed in non-treated aging rats, the incidence in the treated animals were higher than in the controls. The NOAEL was established at 0.1% or 50 mg/kg-day (HERA, 2009) [Kl.score=2].

Male and female CR rats were given $C_{14-15}AE_7$ at 0.1, 0.5 and 1% in their diet for two years. A treatment-related body weight depression was observed in females at the two highest treatment levels and in males at the 1% dose level, probably due to the poor palatability of the diet. Relative liver, kidney, heart, and thyroid/parathyroid gland weights were increased in the 1% dietary group at study termination. Histopathological examination showed a dose-related increase in the incidence of focal myocarditis at the 12-month time point, but not at the end of the study at two years. The NOAEL for this study was 0.5% in the diet, which corresponded to 162 and 190 mg/kg-day for males and females, respectively (HERA, 2009) [Kl.score=2].

An OECD guideline 422 (Combined repeated dose toxicity study with the reproduction/developmental toxicity screening test) was conducted in male and female Wistar rats exposed to a daily (7 days a week) dose of 100, 300, and 1,000 mg/kg bw/day of alcohols, C12-C15, ethoxylated by oral gavage for 29 (males) -64 days (females). Slightly increased plasma albumin concentrations were observed in males at the 300 and 1000 mg/kg bw/day dose levels, increased plasma urea concentrations were observed in males at the 1000 mg/kg bw/day dose level, decreased plasma cholesterol concentrations in males at the 300 and 1000 mg/kg bw/day levels and increased bile acid concentrations in females at the 1000 mg/kg bw/day dose level were considered as non-adverse since these changes were not associated with any adverse pathological alterations. Non-adverse test item-related morphologic alterations were present in males and females at the 1000 mg/kg bw/day dose level in the liver (macroscopically enlarged liver, centrilobular hypertrophy, increased weights starting at 100 mg/kg bw/day in males and 300 mg/kg bw/day in females), forestomach (squamous cell hyperplasia) and jejunum (vacuolation in the lamina propria), in males starting at 100 mg/kg bw/day in the thyroid gland (follicular cell hypertrophy and increased weights at 1000 mg/kg bw/day) and in females at 1000 mg/kg/day in the adrenal gland (macroscopically enlarged adrenal gland, diffuse cortical hypertrophy, and increased weights at 1000 mg/kg bw/day). There were no toxicologically significant changes were noted in any of the remaining parameters investigated in this study, i.e., mortality, clinical appearance, functional

observations (motor activity, grip strength, hearing ability, pupillary reflex and static righting reflex), body weight, food consumption, hematology and clotting parameters, male T4 thyroid hormone. A systemic NOAEL of ≥1000 mg/kg bw/day and a reproductive toxicity NOAEL of ≥1000 mg/kg bw/day was established for this study (ECHA) [KI. score = 1].

Inhalation

There are no studies are available.

Dermal

There are no adequate studies are available.

F. Genotoxicity

In vitro Studies

The genotoxicity studies conducted on alcohol ethoxylates are reviewed in HERA (2009). The results of few of the *in vitro* studies on similar alcohol ethoxylates to alcohols, C12-16, ethoxylated and poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates are presented below in Table 2.

Table 2: *In vitro* genotoxicity studies on selected alcohol ethoxylates

Test Substance	Test System	Results*		Klimisch Score	References
		-S9	+S9		
$C_{14-15}AE_7$	Bacterial reverse mutation (*S. typhimurium* strains)	-	-	2	HERA, 2009
$C_{14-15}AE_7$	Bacterial reverse mutation (*S. typhimurium* strains)	-	-	2	HERA, 2009
$C_{14}AE_{12}$	Chromosomal aberrations (CHO cells)	-	-	2	HERA, 2009

*+, positive; -, negative

In vivo Studies

In two separate studies, CD-1 mice were given an intraperitoneal dose of 0, 50, or 100 mg/kg $C_{12-15}AE_3$ or $C_{12-14}AE_9$. There were no increases in the frequency of micronuclei in the bone marrow cells (Talmage, 1994) [Kl.score=2].

Male and female Tunstall rats were given a single oral gavage dose of 0, 250, 500, or 1,000 mg/kg $C_{14-15}AE_7$. There were no increases in chromosomal aberrations in the bone marrow cells (HERA, 2009) [Kl.score=2].

G. Carcinogenicity

There are no studies are available on alcohols, C12-16, ethoxylated or poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates. Therefore, data from similar substances are presented below.

Male and female Sprague-Dawley rats were given in their diet $C_{12-13}AE_{6.5}$ in the diet at doses up to 1% (500 mg/kg-day). Reduced food consumption was noted at the higher dose levels (*i.e.*, 0.5 and 1% for females and 1% for males), resulting in a lower body weight gain compared to the control group. No treatment-related histopathology was found and no increase in tumour incidence was observed (HERA, 2009) [Kl.score=2].

Male and female Charles River rats were given in their diet 0, 0.1, 0.5 or 1% $C_{14-15}AE_7$ for two years. There were no treatment-related changes in general behaviour and appearance. The survival rate of the test animals was comparable if not better than the controls. Body weights of the 0.5% females and the 1% males and females had significantly lower weight gains than the control. There were no treatment-related effects on organ weights and tumour incidence (HERA, 2009) [Kl.score=2].

Male and female Sprague-Dawley rats were given in their diet $C_{14-15}AE_7$ at 0.1, 0.5 and 1% for two years. A treatment-related body weight depression was observed in females at the two highest treatment levels and in males at the 1% dose level, probably due to the poor palatability of the diet. There was no evidence for any carcinogenic activity (HERA, 2009) [Kl.score=2].

H. Reproductive Toxicity

There are studies are available on alcohols, C12-16, ethoxylated or poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates.

CD rats were given 0, 0.05, 0.1 or 0.5% (approximately 0, 25, 50 or 250 mg/kg-day) $C_{12}AE_6$ in their diet in a two-generation reproductive toxicity study. There were no treatment related effects in the parents or pups on general behaviour, appearance, or survival. At 0.5%, there was reduced weight gain in both the parental animals and the pups compared to the controls. Fertility was unaffected by treatment. The NOAEL for reproductive toxicity is 0.5% in the diet, which corresponds to 250 mg/kg-day (HERA, 2009) [Kl.score=2].

In a two-generation developmental and teratogenicity study, CD rats were given 0, 0.05, 0.1 or 0.5% $C_{14-15}AE_7$ (approximately 0, 25, 50 or 250 mg/kg-day) in their diet. Three of the treated groups were given the test substance continuously throughout the study; in the other three groups the females received the test substance on GD 6-15 and the males were untreated. None of the deaths of parental rats during the study was considered to be compound related. There were no treatment-related changes in behaviour or appearance in the parental rats or pups. Slightly lower body weight gain was noted in the 0.5% continuously treated females. Food consumption was similar for control and treated rats. Fertility, gestation, and viability indices were similar across groups. The average 21-day body weights for the 0.5% continuous treated pups were significantly lower than that of the control. Relative liver weights of the 0.5% continuously treated F_1 parental animals were increased at the 91-day sacrifice; relative liver weights of the 0.5% continuously treated males were also increased at the 60-day and caesarean section sacrifices. There were no treatment-related histopathological lesions in any of the tissues from the F_0 and F_1 generations. The NOAEL for reproductive toxicity is 0.5% in the diet or 250 mg/kg-day (HERA, 2009) [Kl.score=2].

A sub-acute reproductive and developmental toxicity screening study was completed using male and female Wistar rats exposed to 100, 300, and 1,000 mg/kg bw/day of alcohols, C12-15, ethoxylated via oral gavage for 29 (males)-64 (females) days. All the females had regular cycles of 4 to 5 days. Extended di-oestrous occurred during the mating period in three females of the control group and two females of the mid-dose group (300 mg/kg bw/day) with a regular cycle during premating. One female at 300 mg/kg bw/day had an inconclusive cycle determination during the premating phase. Given their absence of a dose-related incidence, this finding did not indicate a relation with

treatment. Length and regularity of the oestrous cycle were considered not to have been affected by treatment with the test item up to 1000 mg/kg bw/day. Mating index was not affected by treatment. The mating indices were 90, 100, 100 and 100% for the control, 100, 300 and 1000 mg/kg bw/day groups, respectively. One female of the control group did not mate. All paired females showed evidence of mating within 4 days, except one female at 300 mg/kg bw/day for which mating took 13 days. Hence, precoital time was not affected by treatment with the test item. Number of implantation sites was considered not to be affected by treatment. The mean number of implantation sites were 11.0, 8.9, 12.9 and 12.1 for the control, 100, 300 and 1000 mg/kg bw/day, respectively. The relatively low mean number of implantation sites at 100 mg/kg bw/day was attributed to the low number of implantation sites in three females (4, 1 and 2 implantation sites, respectively). In the absence of a dose-related incidence, the relatively low mean number of implantation sites at 100 mg/kg bw/day was considered not to be related to treatment with the test item. One female at 100 mg/kg bw/day and one female at 1000 mg/kg bw/day were not pregnant. In the absence of a dose-related incidence of non-pregnancy, this was considered not to be related to treatment with the test item. The fertility indices were 100, 90, 100 and 90% for the control, 100, 300 and 1000 mg/kg bw/day groups, respectively. It was considered not to be affected by treatment of the animals. Gestation index and duration of gestation were not affected by treatment with the test item up to 1000 mg/kg bw/day. The gestation indices were 100% for all groups. All pregnant females had 21-22 days gestation, except for one female at 100 mg/kg bw/day which only had 19 days of gestation (her litter consisted of 1 pup only). Given the incidental occurrence and lack of a dose-related trend, no toxicological relevance was attributed to this early delivery. No signs of difficult or prolonged parturition and no deficiencies in maternal care were noted among the pregnant females. A NOAEL for systemic toxicity was reported to be ≥1000 mg/kg bw/day ECHA) [KI. score =1].

A two-generation reproductive toxicity study was completed using male and female Fischer 344 rats exposed to 10, 100, and 250 mg/kg bw/day alcohols, C12-15, ethoxylated via dermal exposure. No mortalities were observed in the parental generation, and the five deaths in the F_1 adult males and females in the control and treatment groups were not considered to be compound related. In the highest dose group, body weights of both males and females in both treated generations were sporadically decreased compared to controls. There was no effect on maternal body weight during gestational and lactational periods in both generations. At necropsy organ weight differences in liver, lung, kidney, and heart were observed in the F_1 generation. However, there were no pathological findings that were associated with these affected organs. There were no compound-related effects on mating and fertility indices and mean gestational length in both generations. No effects on testicular weights, sperm counts and LDH-X activities in F_0 and F_1 male adults were observed. Macroscopic and microscopic examination of the reproductive organs did not reveal significant differences in the treated groups compared to the controls. A NOAEL for systemic toxicity was reported to be ≥ 250 mg/kg bw/day based on changes in body and organ weights that were not associated with histopathological findings. A reproductive toxicity NOAEL was reported to be ≥ 250 mg/kg bw/day (ECHA)[KI. score = 2].

I. Developmental Toxicity

There are no studies are available on alcohols, C12-16, ethoxylated or poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates.

In a two-generation reproductive toxicity study, Charles River rats were given 0, 0.05, 0.1 or 0.5% (about 0, 25, 50 or 250 mg/kg-day) $C_{12}AE_6$ in their diet. General behaviour, appearance and survival were unaffected by treatment. At the 0.5% dose level, adults and pups gained less weight than the control rats. In the 0.5% dose group, there was a statistical increase in embryo lethality and soft

tissue anomalies and at the 0.1% there was a statistical decrease in mean foetal liver weight. Neither of these effects was considered to be treatment-related by the authors as they showed no dose response characteristics. The NOAEL for maternal toxicity is 50 mg/kg-day. The NOAEL for developmental and teratogenicity is 0.1% in the diet or 50 mg/kg-day (HERA, 2009) [KI.score=2].

Pregnant rabbits were given by oral gavage 0, 50, 100 or 200 mg/kg $C_{12}AE$ from gestational days 2 to 16. Nine control rabbits and 31 treated rabbits died during the study. Surviving rabbits at the 200 mg/kg dose group generally showed slight losses of body weight. At 100 and 200 mg/kg, ataxia and a slight decrease in body weight was observed in the pregnant animals. In seven treated and two control rabbits, early deliveries were recorded. There were no treatment-related effects on corpora lutea, implantations, number of live foetuses and spontaneous abortions. The NOAEL for maternal toxicity is 50 mg/kg-day; the NOAEL for developmental toxicity is 200 mg/kg-day (HERA, 2009) [KI.score=2].

A developmental toxicity study was conducted using Fischer 344 rats exposed to 10,100,250 mg/kg bw/day alcohols, C12-15 ethoxylated via dermal exposure three days a week from gestation day 0 until weaning. In the highest dose, body weights of both males and females in both treated generations were sporadically and not always statistically significant decreased compared to controls. At necropsy organ weight differences in liver, lung, kidney, and heart were observed in the F1 generation, but no pathological findings were associated with the affected organs. There were no treated related effects reported for the foetuses. The NOAEL for developmental toxicity was reported to be ≥ 250 mg/kg bw/day and the NOAEL for maternal toxicity was reported to be ≥ 250 mg/kg bw/day. The NOAEL for fetotoxicity was reported to be ≥250 mg/kg bw/day (ECHA) [KI.score=2].

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for alcohols, C12-16, ethoxylated and poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

<u>Oral</u>

Two-year dietary studies in rats have been conducted on alcohol ethoxylates $C_{12\text{-}13}AE_{6.5}$ and $C_{14\text{-}15}AE_7$ (HERA, 2009). The lowest NOAEL from these studies is 50 mg/kg-day based on increased organ weights. The NOAEL of 50 mg/kg-day will be used to derive an oral reference dose and drinking water guidance value for alcohols, C12-16, ethoxylated.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:
UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1

Oral RfD = 50/(10 × 10 × 1 × 1 × 1) = 50/100 = 0.5 mg/kg-day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,
Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

where:
Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)

Drinking water guidance value = (0.5 × 70 × 0.1)/2 = 1.8 mg/L

B. Cancer

Several alcohol ethoxylates similar to alcohols, C12-16, ethoxylated were not carcinogenic to rats in a two-year dietary study. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Alcohols, C12-16, ethoxylated does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidizing potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

There are no aquatic toxicity studies for ethoxylated C12-C16 alcohol or poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates. The aquatic toxicity of other AEs has been extensively evaluated in numerous studies on fish, daphnids and algae as well as microorganisms. A review of the acute studies indicates that invertebrates are somewhat more sensitive to AEs than fish and algae. AEs have moderate chronic toxicity to aquatic life.

B. Aquatic Toxicity

There are no acute aquatic toxicity studies for ethoxylated C12-C16 alcohol or poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates. The aquatic toxicity of other AEs has been extensively evaluated in numerous studies on fish, daphnids and algae as well as microorganisms. Table 3 lists the results of acute aquatic toxicity studies on read across substance alcohols, C12-C15, ethoxylated (1 to 2.5 EO) [CAS RN [redacted] alcohols, C12-C14, ethoxylated (2 EO) [CAS RN [redacted] and alcohols, C12-C15, branched and linear, ethoxylated [CAS RN [redacted]

Table 3: Acute aquatic toxicity studies on ethoxylated C12-C16 alcohol[a,b,c]

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Oncorhynchus mykiss (Rainbow Trout)	96-hr LC_{50}	1.3 – 1.7[a]	2	ECHA
Danio Rio	96-hr LC_{50}	1.2[b]	2	ECHA
Danio Rio	96-hr LC_{50}	2[b]	2	ECHA
Zebrafish	96-hr LC_{50}	>2[c]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.14[a]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.23[a]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.53[b]	2	ECHA
Daphnia magna	48-hr EC_{50}	2.84[b,d]	2	ECHA
Daphnia magna	48-hr EC_{50}	1.2[e]	1	ECHA
Daphnia magna	48-hr EC_{50}	>2[b]	2	ECHA
Daphnia magna	48-hr EC_{50}	>2[c]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.23	2	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	0.75[a]	2	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	>2[c]	2	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	0.41[b]	2	ECHA
Desmodesmus subspicatus (green algae)	72-hr EC_{50}	0.778[b]	2	ECHA
Desmodesmus subspicatus (green algae)	72-hr EC_{50}	0.87[e]	1	ECHA
Desmodesmus subspicatus (green algae)	72-hr EC_{50}	1.3[e]	1	ECHA

a: Read across to alcohols, C12-C15, ethoxylated (1 to 2.5 EO) CAS RN [redacted]
b: Read across to alcohols, C12-C14, ethoxylated (EO 2) CAS RN [redacted]
c: Read across to alcohols, C12-C15, branched and linear, ethoxylated (CAS RN [redacted]
d: alcohols, C12-C14, ethoxylated (EO 1) CAS RN [redacted] as WAF (water accommodated fraction)
e: alcohols, C12-C14, ethoxylated (EO 4 or EO 6) CAS RN [redacted]

A review of the acute studies indicates that invertebrates are somewhat more sensitive to AEs than fish and algae. As concluded in HERA (2009), the Danish EPA (2001) found that the acute toxicity of AE to invertebrates varies, with EC50 values from 0.1 mg/l to more than 100 mg/l for linear AE and from 0.5 mg/l to 50 mg/l for branched AE. The toxicity is species specific and may vary between 0.29 mg/l and 270 mg/l for the same linear AE (Lewis and Suprenant 1983, quoted in Danish EPA 2001). The most commonly used invertebrates for testing are Daphnia magna and Daphnia pulex, and they are also among the most sensitive invertebrates to AE. The Danish EPA (2001) found that some AE are very toxic to invertebrates, i.e., linear AE of C12-15 EO1-8 and branched AE with a low degree of branching, i.e. < 10-25%. They concluded that branching of the alkyl chain reduces the toxicity of AE to invertebrates, as also observed for algae (Danish EPA, 2001). However, the data used to reach this conclusion is from specially synthesized AE which have been shown to have a significantly higher toxicity than the AE made from a technical alcohol which are used commercially (Kaluza and Taeger, 1996).

Chronic studies

In developing a water quality guideline for AEs (ANZG, 2018), the toxicity data was normalized for a specific alkyl chain length or a specific number of EO groups. The NOECs listed below were normalized to an alkyl chain length of C13.3 and EO of 8.2. There were chronic data for 13 species that belonged to 7 taxonomic groups (fish, crustacea, blue alga, diatoms, green alga, protozoa, and worms).

Freshwater fish: 2 species, 720 to 1,500 µg/L.

Freshwater crustaceans: 2 species, 590 to 860 µg/L.

Freshwater rotifers: 1 species, Brachionus calyciflorus, 1,300 µg/L.

Freshwater algae, diatoms and blue-green algae: 6 species, 200 to 8,700 µg/L.

Freshwater mesocosms: 4 NOEC data for multiple species tests were 80, 80, 320 and 330 µg/L, although replication was insufficient to meet OECD (1992) requirements. Normalized data were 380, 380, 320 and 1,520 µg/L.

C. Terrestrial Toxicity

There are no studies are available. The substance is readily biodegradable. Therefore, soil is not expected to be a compartment of concern. Thus, the risk to terrestrial macroorganisms is regarded to be negligible (ECHA).

D. Calculation of PNEC

The PNEC calculations for ethoxylated C12-C16 and poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates alcohol follow the methodology discussed in DEWHA (2009).

PNEC water

The ANZG water quality guideline (2018) in freshwater is: "A high reliability trigger value of 140 µg/L was derived for AE (normalized data) using the statistical distribution method with 95% protection."

PNEC sediment

There are no toxicity data for sediment-dwelling organisms. Nonetheless, a $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 0.0875 mg/kg sediment wet weight.

The calculations are as follows:
$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= 0.800/1280 \times 1000 \times 0.140$
$= 0.0875$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 kg/m^3[default]
$PNEC_{water}$ = 0.002 mg/L

$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 156.8)/1000 \times 2400]$
$= 0.800\ m^3/m^3$

And:
Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 kg/m^3[default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 3920 \times 0.04$
$= 156.8$ L/kg

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for alcohols, C12-16, ethoxylated based on the molecular connectivity index (MCI) is 3,920 L/kg (USEPA, 2018).
f_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 7.32 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (78.4/1500) \times 1000 \times 0.14$
$= 7.32$mg/kg

Where:
Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 kg/m^3 [default]

$Kp_{soil} = K_{oc} \times f_{oc}$
$= 3920 \times 0.02$
$= 78.4\ m^3/m^3$

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for alcohols, C12-16, ethoxylated based on the molecular connectivity index (MCI) is 3,920 L/kg (USEPA, 2018).
f_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU Reach Criteria methodology (IChEMS, 2022; ECHA, 2023).

Based on a review of similar read-across substances, alcohols, C12-16, ethoxylated and poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates are considered to be readily biodegradable and thus do not meet the screening criteria for persistence.

The bioconcentration factors (BCF) in fish for ethoxylated alcohols (which includes alcohols, C12-16, ethoxylated and poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers,

phosphates) have been reported to range from <5 to 387.5. Thus, alcohols, C12-16, ethoxylated and poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates does not meet the screening criteria for bioaccumulation.

The chronic NOEC values for alcohols ethoxylates are >0.1 mg/L. Thus, alcohols, C12-16, ethoxylated and poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates do not meet the criteria for toxicity.

The overall conclusion is that alcohols, C12-16, ethoxylated and poly(oxy-1,2-ethanediyl), α-hydro-ω-hydroxy-, mono-C10-14-alkyl ethers, phosphates are not PBT substances.

IX. CLASSIFICATION AND LABELLING

A. Classification

H400: Very toxic to aquatic life
H412: Harmful to aquatic life with long lasting effects

B. Labelling

Warning

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Eye Contact

Rinse immediately with plenty of running water. If easy to do, remove contact lenses. Get medical attention.

Skin Contact

Wash with soap and water. Get medical attention if symptoms occur.

Inhalation

Treat symptomatically. Move to fresh air. Get medical attention.

Ingestion

Rinse mouth with water and then drink plenty of water. Never give anything by mouth to an unconscious person. Seek medical attention.

B. Firefighting Information

Extinguishing Media

Water spray, dry chemical, foam. Do not use water jet.

Specific Exposure Hazards

May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon oxides.

Special Protective Equipment for Firefighters

Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

C. Accidental Release Measures

Personal Precautions

Wear appropriate personal protective equipment. Do not breath mist or aerosol.

Environmental Precautions

Prevent from entering sewers, waterways, or low area

Steps to be Taken if Material is Released or Spilled

Absorb spill with inert absorbent material, then place in a container for chemical waste.

D. Storage and Handling

General Handling

Protect against moisture. Shut containers immediately after taking product because product takes up the humidity of air. No special precautions are necessary beyond normal good hygiene practices.

Other Handling Precautions

Wash hands thoroughly after handling. Avoid breathing mists or aerosols.

Storage

Keep container closed.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for alcohols, C12-16, ethoxylated.

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Wear respiratory protection if ventilation is inadequate.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Chemical safety goggles.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Eyewash fountains and safety showers must be easily accessible.

F. Transport Information

UN: UN 1993

Class:3

Packaging Group: II

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state, and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

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ALCOHOLS, C6-12, ETHOXYLATED PROPOXYLATED

This dossier on alcohols, C_{6-12}, ethoxylated propoxylated presents the most critical studies pertinent to the risk assessment of alcohols, C_{6-12}, ethoxylated propoxylated in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the Human & Environmental Risk Assessment on Ingredients of European Household Cleaning Products: Alcohol Ethoxylates (HERA, 2009) and the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Alcohols, C_{6-12}, ethoxylated propoxylated

CAS RN: [redacted]

Molecular formula: Not available (UVCB substance)

Molecular weight: Not available (UVCB substance)

Synonyms: (C6-C12) Alkyl alcohol ethoxylate propoxylate; Ethoxylated propoxylated alcohols (C6-12)

SMILES: Not available (UVCB substance)

Alcohol ethoxylates (AE) are a class of non-ionic surfactants that have the basic structure $C_{x-y}AE_n$. The subscript (x-y) following the 'C' indicates the range of carbon chain units. The hydrocarbon chain can be either linear or branched. AEs also contain an ethylene oxide (E) chain attached to the alcohol. The degree of ethylene oxide polymerization is indicated by the subscript (n), which indicates the average number of ethylene oxide units. In household products, the average EO chain length ranges between 3 and 12 units (HERA, 2009).

II. PHYSICO-CHEMICAL PROPERTIES

No information is available for alcohols, C_{6-12}, ethoxylated propoxylated. Key physical and chemical properties for read-across AEs are shown in Table 1.

Table 1: Overview of the physico-chemical properties of alcohols, C_6-C_8-(even numbered, linear) ethoxylated (<2.5 EO) [CAS RN [redacted]

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Colourless, viscous liquid	1	ECHA
Melting Point	≤30°C @ 101.3 kPa	1	ECHA
Boiling Point	105°C @ 101.3 kPa	1	ECHA
Density	947 kg/m^3@ 20°C	1	ECHA
Vapour Pressure	1400 Pa @ 20°C	1	ECHA

Property	Value	Klimisch Score	Reference
Partition Coefficient (log K_{ow})	1.5 @ 23°C	1	ECHA
Water Solubility	4 g/L @ 20°C	1	ECHA
Flash Point	111°C	1	ECHA
Auto flammability	230°C	1	ECHA
Viscosity	13.3 mPa s @ 20°C	1	ECHA
Henry's Law Constant	Not available	-	

Table 2: Overview of the Physico-chemical Properties of Alcohols, C_{9-11}, Branched and Linear, Ethoxylated (1 – 2.5 moles ethoxylated) [CAS RN [redacted]

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Colourless to light yellow liquid	2	ECHA
Melting Point	≤20°C @ 101.3 kPa	1	ECHA
Boiling Point	260° @ 101.3 kPa	2	ECHA
Density	940 kg/m³ @ 20°C	1	ECHA
Vapour Pressure	Negligible	-	ECHA
Partition Coefficient (log K_{ow})	3.74 @ 25°C	2	ECHA
Water Solubility	Moderately soluble	2	ECHA
Flash Point	125°C	1	ECHA
Auto flammability	311°C	1	ECHA
Viscosity	0.01112 mPa s @ 40°C	1	ECHA
Henry's Law Constant	Not available		A

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Alcohols, C_{6-12}, ethoxylated propoxylated is expected to be readily biodegradable. It has a low potential for bioaccumulation and a moderate potential for absorption to soil and sediment.

B. Biodegradation

In an OECD 301 B test, degradation of alcohols, C_{6-8} alkyl-(even, linear), ethoxylated (<2.5 EO) [CAS RN [redacted] was 63% in 28 days. The 10-day window was met (ECHA) [Kl.score=1].

An alcohol ethoxylate, C_{9-11}, branched (2.5 EO) [CAS RN [redacted] was readily biodegradable, as indicated by degradation of 72% in 28 days in an ultimate aerobic biodegradability (CO_2 headspace) ISO 14593 water quality test (ECHA) [Kl.score=2].

An alcohol ethoxylate, C_{9-11}, branched (3 EO) [CAS RN [redacted] was readily biodegradable, as indicated by degradation of 101% in 28 days in an ultimate aerobic biodegradability (CO_2 headspace) ISO 14593 water quality test (ECHA) [Kl.score=2].

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

No experimental data are available for alcohols, C_{6-12}, ethoxylated propoxylated. Using KOCWIN in EPISUITE™ (EPA, 2019), the estimated K_{oc} value for alcohols, C_{6-12}, ethoxylated propoxylated is 10.1 L/kg (MCI) and 5.946 L/kg (K_{ow}).

D. Bioaccumulation

The BCF values for alcohol ethoxylates in fathead minnows have been reported to range from <5 to 387.5 (Toll et al., 2000). The uptake rates varied from 330 to 1660 (L × kg/d) and elimination rates varied from 3.3 to 59 per day (Toll et al., 2000). The high concentrations in fish are thought to be prevented by an efficient biotransformation of the alcohol ethoxylates, leading to a high elimination rate.

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

The acute toxicity of alcohols, C_{6-12}, ethoxylated is expected to be low by the oral and dermal routes. The skin irritation with alcohols, C_{12-16}, ethoxylated have shown mixed results in rabbits, but human patch studies on these alcohol ethoxylates do not support a skin irritant classification. Alcohols, ethoxylated are expected to be irritating to the eyes of rabbits. Alcohols, ethoxylated do not appear to be skin sensitisers. Repeated dose toxicity studies on alcohol ethoxylates similar to alcohols, C_{12-16}, ethoxylated in rats do not indicate any target organ effects. These alcohol ethoxylates are not genotoxic or carcinogenic and have a low potential for reproductive and developmental toxicity.

B. Acute Toxicity

The oral LD_{50} in rats for $C_{7-9}AE_6$ is >2,000 mg/kg (HERA, 2009) [Kl.score=2]. The oral LD_{50} in rats for $C_{11}AE_9$ is 1,100 mg/kg (HERA, 2009) [Kl.score=2]. The oral LD_{50} in rats for $C_{9-11}AE_{2.5}$ is between 4,000 and 10,000 mg/kg (HERA, 2009) [Kl.score=2]. The oral LD_{50} in rats for $C_{9-11}AE_8$ is 1,200 mg/kg (HERA, 2009) [Kl.score=2]. The oral LD_{50} in rats for $C_{12-13}AE_{6.5}$ is 2,100 mg/kg (HERA, 2009) [Kl.score=2].

The 4-hour inhalation LC_{50} value for $C_{9-11}AE_5$ is >0.22 mg/L as a mist. The mass median aerodynamic diameter (MMAD) were 3.4 mm and 3.0 mm in the two exposure tests (HERA, 2009) [Kl.score=2].

The acute dermal LD_{50} of $C_{7-9}AE_6$ is >2,000 mg/kg (HERA, 2009) [Kl.score=2]. The acute dermal LD_{50} of $C_{9-11}AE_6$ is >2,000 mg/kg (HERA, 2009) [Kl.score=2]. An acute dermal LD_{50} values of >2,000 mg/kg were determined for $C_{12-14}AE_3$ and $C_{12-14}AE_6$ in two separate studies (HERA, 2009) [Kl.score=2].

C. Irritation

Skin

Application of $C_{9-11}AE_9$ to the skin of rabbits for 4 hours under semi-occlusive conditions was found to be slightly irritating (HERA, 2009) [Kl.score=2]. Application of $C_{11}AE_9$ to the skin of rabbits for 4 hours under occluded conditions was found to be slightly irritating (HERA, 2009) [Kl.score=2]. Application of $C_{9-11}AE_6$ to the skin of rabbits for 24 hours under occluded conditions was found to be severely irritating (HERA, 2009) [Kl.score=2].

Eye

Instillation of $C_{7-9}AE_{12}$ into the eyes of rabbits was minimally irritating (HERA, 2009). Instillation of $C_{9-11}AE_6$ into the eyes of rabbits was moderately to severely irritating (HERA, 2009). Instillation of $C_{7-9}AE_6$ into the eyes of one rabbit was severely irritating (HERA, 2009).

D. Sensitisation

In a guinea pig maximization test, alcohols, C_{6-C8}-(even numbered, linear)-ethoxylated (<2.5 EO) was not found to be a skin sensitizer (ECHA) [Kl.score=1].

In a guinea pig maximization test, $C_{12-13}AE<2.5$ (CAS RN [redacted] was not found to be a skin sensitizer (ECHA) [Kl.score=2].

E. Repeated Dose Toxicity

Oral

Male and female CFE (SPF) rats were given in their feed 0, 125, 250, 500, 1,000 or 3,000 ppm (0, 6.25, 12.5, 25, 50 and 150 mg/kg-day) $C_{9-11}AE_6$ for 13 weeks. There was no mortality and no treatment-related clinical signs. Body weights were significantly lower in the >250 ppm males throughout the study; body weights of the 125 ppm males were lower for only the first half of the study. Feed consumption was lower in treated males with the change being statistically significant in the >1,000 ppm males. This reduction in feed consumption was thought to be a palatability issue; the feed conversion efficiency values were similar for treated and control males, and so it is not possible to attribute the reduced body weights to the toxicity of the test material alone. The female rats showed no differences in body weights and feed consumption. There were no treatment-related changes in hematology parameters, and the clinical chemistry parameters and organ weights showed no changes that were of toxicological significance. Gross pathology showed no treatment-related changes. The NOAEL for this study was 3,000 ppm, which corresponds to 150 mg/kg-day (ECHA) [Kl.score=2].

Rats were given in their feed 0, 0.04, 0.2 or 1% $C_{9-11}AE_8$ for 90 days. There were no deaths or treatment-related clinical signs during the study. There was reduced body weight gain and decreased feed consumption in the 1% animals and in the 0.2% females throughout the study. Additional statistical analysis indicated a significant decrease in mean body weight gain in the 1% females and decreased feed consumption in the 1% males and females. The reduced body weight gain of the 0.2% females was not statistically significant. The study authors considered these changes to be due to the poor palatability of the test material in the feed. Organ weights and gross and microscopic pathology were similar across groups. The NOAEL for this study is 1% in the diet, which corresponded to 400 mg/kg-day (HERA, 2009) [Kl.score=2].

Rats were given in their feed 0, 125, 250 or 500 mg/kg $C_{10}AE_5$ for 90 days. There were no deaths or treatment-related clinical signs during the study. The only treatment-related effect noted was a slight increase in absolute liver weights, with the 500 mg/kg animals showing statistical significance. However, there were no corresponding histopathologic changes in the liver. The NOAEL is 500 mg/kg-day, the highest dose tested (HERA, 2009) [Kl.score=2].

Rats were fed $C_{12-14}AE_7$ in the diet at concentrations of 0%, 0.0313%, 0.0625%, 0.125%, 0.25%, 0.5% and 1.0% for 90 days. The animals in the >0.25% groups showed significantly reduced body weight gain, which was associated with marked decreases in food and water consumption. Relative liver weights were significantly increased in the >0.5% male rats and >0.25% females. Histopathologic examination showed hepatocytic enlargement in the >0.125% groups, suggesting increased liver metabolism based on increased alkaline phosphatase activity at the higher dose levels. The NOAEL was established at 0.0625% in the diet or 110 mg/kg-day (HERA, 2009) [Kl.score=2].

Rats were given in their diet 0, 0.1, 0.5 or 1% $C_{12-13}AE_{6.5}$ for two years. Body weight gain was reduced in the 1% males and >0.5% females, which was likely due to the reduced food consumption in these animals. At study termination, organ to body weight ratios were increased in the >0.5% females (liver, kidney and brain), 1% females (heart) and 1% males (liver). A dose-related focal myocarditis was observed in males. While focal myocarditis is commonly observed in non-treated aging rats, the incidence in the treated animals were higher than in the controls. The NOAEL was established at 0.1% or 50 mg/kg-day (HERA, 2009) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

Male and female F344 rats were given dermal applications of 0, 1, 10 or 25% $C_{9-11}AE_6$ solutions 3 days/week for 13 weeks. There were no deaths during the study and no clinical signs of toxicity. Body weights, clinical chemistry and hematology parameters, and urinalysis showed no differences between treated and control animal. The 25% animals showed a slight increase in kidney weights, although no histopathologic findings were noted in the kidney. There were no histopathologic changes that were considered to be treatment related. The NOAEL for this study is 25% (Gingell & Lu, 1991; ECHA) [Kl.score=2].

F. Genotoxicity

In Vitro Studies

The genotoxicity studies conducted on alcohol ethoxylates are reviewed in HERA (2009). Representative results of the *in vitro* genotoxicity studies on alcohol ethoxylates similar to alcohols, C_{6-12}, ethoxylated propoxylated are presented in Table 3.

Table 3: *In vitro* genotoxicity studies on selected alcohol ethoxylates

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Bacterial reverse mutation (S. typhimurium strains)	-	-	2	HERA, 2009

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Bacterial reverse mutation (S. typhimurium strains)	-	-	2	HERA, 2009
Chromosomal aberrations (CHO cells)	-	-	2	HERA, 2009

*+, positive; -, negative

In Vivo Studies

In two separate studies, CD-1 mice were given an intraperitoneal dose of 0, 50 or 100 mg/kg $C_{12-15}AE_3$ or $C_{12-14}AE_9$. There were no increases in the frequency of micronuclei in the bone marrow cells (Talmage, 1994) [Kl.score=2].

G. Carcinogenicity

Oral

Male and female Sprague-Dawley rats were given in their diet $C_{12-13}AE_{6.5}$ in the diet at doses up to 1% (500 mg/kg-day). Reduced food consumption was noted at the higher dose levels (i.e., 0.5 and 1% for females and 1% for males), resulting in a lower body weight gain compared with the control group. No treatment-related histopathology was found, and no increase in tumour incidence was observed (HERA, 2009) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

There are no studies available.

H. Reproductive Toxicity

A two-generation reproductive toxicity study was conducted on $C_{9-11}AE_6$. Male and female F344 rats were given dermal applications of 0, 1, 10 or 25% solutions of $C_{9-11}AE_6$ (0, 10, 100 or 250 mg/kg-day) 3 days/week; the F_0 and F_1 generations were treated for 119 and 133 days, respectively, before mating. There were no deaths in the F_0 generation, but there were 5 deaths in the F_1 generation (controls and treatment groups) that were not considered to be treatment related. Animals in either generation showed no skin reactions. Body weights of the 25% F_0 and F_1 parental animals were lower during certain periods of the study; however, maternal body weights in both generations were similar across groups during the gestational and lactational periods. The organ weights in the F_0 animals were similar between treated and control animals; the F_1 parental animals showed sporadic organ weight changes but were not no toxicological significance. There were no histopathologic changes that correlated with the organ weight changes in the F_1 parental animals. Mating and fertility indices were similar across groups in both generations. There were no treatment-related effects on testicular weights, testicular pathology, serum counts and LDH-X activity toxicity in either generation. Macroscopic and microscopic evaluations of the reproductive organ showed no treatment-related effects. The NOAEL for reproductive toxicity for toxicity is 25% test concentration, which corresponded to 250 mg/kg-day, the highest dose tested (Gingell & Lu, 1991; ECHA) [Kl.score=2].

CD rats were given in their diet 0, 0.05, 0.1 or 0.5% (approximately 0, 25, 50 or 250 mg/kg-day) $C_{12}AE_6$ in a two-generation reproductive toxicity study. There were no treatment-related effects in the parents or pups on general behaviour, appearance or survival. At 0.5%, there was reduced weight gain in both the parental animals and the pups compared with the controls. Fertility was unaffected by treatment. The NOAEL for reproductive toxicity is 0.5% in the diet, which corresponds to 250 mg/kg-day (HERA, 2009) [Kl.score=2].

I. Developmental Toxicity

Oral

In a two-generation reproductive toxicity study, Charles River rats were given in their diet 0, 0.05, 0.1 or 0.5% (about 0, 25, 50 or 250 mg/kg-day) $C_{12}AE_6$. General behaviour, appearance and survival were unaffected by treatment. At the 0.5% dose level, adults and pups gained less weight than the control rats. In the 0.5% dose group, there was a statistical increase in embryo lethality and soft tissue anomalies, and at the 0.1% there was a statistical decrease in mean fetal liver weight. Neither of these effects was considered to be treatment-related by the authors as they showed no dose response characteristics. The NOAEL for maternal toxicity is 50 mg/kg-day. The NOAEL for developmental and teratogenicity is 0.1% in the diet or 50 mg/kg-day (HERA, 2009) [Kl.score=2].

Pregnant rabbits were given by oral gavage 0, 50, 100 or 200 mg/kg $C_{12}AE_6$ from gestational days 2 to 16. Nine control rabbits and 31 treated rabbits died during the study. Surviving rabbits at the 200 mg/kg dose group generally showed slight losses of body weight. At 100 and 200 mg/kg, ataxia and a slight decrease in body weight was observed in the pregnant animals. In seven treated and two control rabbits, early deliveries were recorded. There were no treatment-related effects on corpora lutea, implantations, number of live fetuses or spontaneous abortions. The NOAEL for maternal toxicity is 50 mg/kg-day; the NOAEL for developmental toxicity is 200 mg/kg-day (HERA, 2009) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

A two-generation reproductive toxicity study was conducted on $C_{9\text{-}11}AE_6$. Male and female F344 rats were given dermal applications of 0, 1, 10 or 25% solutions 3 days/week; the F_0 and F_1 generations were treated for 119 and 133 days, respectively, before mating. There were no deaths in the F_0 generation, but there were 5 deaths in the F_1 generation (controls and treatment groups) that were not considered to be treatment related. Animals in either generation showed no skin reactions. Body weights of the 25% F_0 and F_1 parental animals were lower during certain periods of the study; however, maternal body weights in both generations were similar across groups during the gestational and lactational periods. The organ weights in the F_0 animals were similar between treated and control animals; the F_1 parental animals showed sporadic organ weight changes but were not no toxicological significance. There were no histopathologic changes that correlated with the organ weight changes in the F_1 parental animals. There was no effect on litter size, survival index, sex ratio or body weights of the pups in either the F_1 or F_2 generation. The NOAEL for developmental toxicity is 25% test concentration, which corresponded to 250 mg/kg-day, the highest dose tested (Gingell & Lu, 1991; ECHA) [Kl.score=2].

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for alcohols, C_{6-12}, ethoxylated propoxylated follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

A two-year dietary study in rats has been conducted on $C_{12-13}AE_{6.5}$ (HERA, 2009). The NOAEL from this study is 50 mg/kg-day based on increased organ weights. The NOAEL of 50 mg/kg-day will be used to derive an oral reference dose and drinking water guidance value for alcohols, C_{6-12}, ethoxylated propoxylated.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 50/(10 × 10 × 1 × 1 × 1) = 50/100 = 0.5 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (0.5 × 70 × 0.1)/2 = 1.8 mg/L

B. Cancer

The alcohol ethoxylate $C_{12-13}AE_{6.5}$ was not carcinogenic to rats in a two-year dietary study. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Alcohols, C_{6-12}, ethoxylated propoxylated does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

There are no aquatic toxicity studies for alcohols, C_{6-12}, ethoxylated propoxylated. The aquatic toxicity of other AEs has been extensively evaluated in numerous studies on fish, daphnids and algae as well as microorganisms. A review of the acute studies indicates that invertebrates are somewhat more sensitive to AEs than fish and algae. AEs have moderate chronic toxicity to aquatic life.

B. Aquatic Toxicity

Acute Studies

There are no acute aquatic toxicity studies for alcohols, C_{6-12}, ethoxylated propoxylated. The aquatic toxicity of other AEs has been extensively evaluated in numerous studies on fish, daphnids and algae as well as microorganisms. Table 4 lists the results of acute aquatic toxicity studies on read across substance alcohols, C12-C15, ethoxylated (1 to 2.5 EO) [CAS RN [redacted] alcohols, C12-C14, ethoxylated (2 EO) [CAS RN [redacted] and alcohols, C12-C15, branched and linear, ethoxylated [CAS RN [redacted]

Table 4: Acute aquatic toxicity studies on ethoxylated C12-C16 alcohol[a,b,c]

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Oncorhynchus mykiss (Rainbow Trout)	96-hr LC_{50}	1.3 – 1.7[a]	2	ECHA
Danio Rio	96-hr LC_{50}	1.2[b]	2	ECHA
Danio Rio	96-hr LC_{50}	2[b]	2	ECHA
Zebrafish	96-hr LC_{50}	>2[c]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.14[a]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.23[a]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.53[b]	2	ECHA
Daphnia magna	48-hr EC_{50}	2.84[b,d]	2	ECHA
Daphnia magna	48-hr EC_{50}	1.2[e]	1	ECHA
Daphnia magna	48-hr EC_{50}	>2[b]	2	ECHA
Daphnia magna	48-hr EC_{50}	>2[c]	2	ECHA
Daphnia magna	48-hr EC_{50}	0.23	2	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	0.75[a]	2	ECHA

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Pseudokirchneriella subcapitata	72-hr EC_{50}	>2[c]	2	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	0.41[b]	2	ECHA
Desmodesmus subspicatus (green algae)	72-hr EC_{50}	0.778[b]	2	ECHA
Desmodesmus subspicatus (green algae)	72-hr EC_{50}	0.87[e]	1	ECHA
Desmodesmus subspicatus (green algae)	72-hr EC_{50}	1.3[e]	1	ECHA

a: Read across to alcohols, C12-C15, ethoxylated (1 to 2.5 EO) CAS RN [redacted]
b: Read across to alcohols, C12-C14, ethoxylated (EO 2) CAS RN [redacted]
c: Read across to alcohols, C12-C15, branched and linear, ethoxylated (CAS RN [redacted]
d: Alcohols, C12-C14, ethoxylated (EO 1) CAS RN [redacted] as WAF (water accommodated fraction)
e: Alcohols, C12-C14, ethoxylated (EO 4 or EO 6) CAS RN [redacted]

A review of the acute studies indicates that invertebrates are somewhat more sensitive to AEs than fish and algae. As concluded in HERA (2009), the Danish EPA (2001) found that the acute toxicity of AEs to invertebrates varies, with EC_{50} values from 0.1 mg/L to more than 100 mg/L for linear AE and from 0.5 mg/L to 50 mg/L for branched AEs. The toxicity is species specific and may vary between 0.29 mg/L and 270 mg/L for the same linear AEs (Lewis & Suprenant 1983, quoted in Danish EPA, 2001). The most commonly used invertebrates for testing are *Daphnia magna* and *Daphnia pulex*, and they are also among the most sensitive invertebrates to AEs. The Danish EPA (2001) found that some AEs are very toxic to invertebrates, i.e., linear AEs of C12-15 EO1-8 and branched AEs with a low degree of branching, i.e. < 10–25%. They concluded that branching of the alkyl chain reduces the toxicity of AEs to invertebrates, as also observed for algae (Danish EPA, 2001). However, the data used for this conclusion were from specially synthesized AE, which have a significantly higher toxicity than AEs used commercially (Kaluza & Taeger, 1996).

Chronic Studies

In developing a water quality guideline for AEs (ANZG, 2018), the toxicity data were normalised for a specific alkyl chain length or a specific number of EO groups. The NOECs listed below were normalised to an alkyl chain length of C13.3 and EO of 8.2. There were chronic data for 13 species that belonged to 7 taxonomic groups (fish, crustacea, blue alga, diatoms, green alga, protozoa and worms).

Freshwater fish: 2 species, 720 to 1,500 µg/L.

Freshwater crustaceans: 2 species, 590 to 860 µg/L.

Freshwater rotifers: 1 species, *Brachionus calyciflorus*, 1,300 µg/L.

Freshwater algae, diatoms and blue-green algae: 6 species, 200 to 8,700 µg/L.

Freshwater mesocosms: 4 NOEC data for multiple species tests were 80, 80, 320 and 330 µg/L, although replication was insufficient to meet OECD (1992) requirements. Normalised data were 380, 380, 320 and 1,520 µg/L.

C. Terrestrial Toxicity

No studies are available. The substance is readily biodegradable. Therefore, soil is not expected to be a compartment of concern. Thus, the risk to terrestrial macroorganisms is regarded to be negligible (ECHA).

D. Calculation of PNEC

The PNEC calculations for alcohols, C_{6-12}, ethoxylated propoxylated follow the methodology discussed in DEWHA (2009).

PNEC Water

The ANZG water quality guideline (2018) in freshwater is: "A high reliability trigger value of 140 µg/L was derived for AE (normalized data) using the statistical distribution method with 95% protection."

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 0.11 mg/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (0.994/1280) \times 1000 \times 0.14$
$= 0.11$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 0.404/1000 \times 2400]$
$= 0.994\ m^3/m^3$

Where:
Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 10.1 \times 0.04$
$= 0.404$ L/kg

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for alcohols, C_{6-12}, ethoxylated propoxylated calculated from EPISUITE™ using the MCI is 10.1 L/kg.
f_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 0.019 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (0.202/1500) \times 1000 \times 0.14$
$= 0.019$ mg/kg

Where:
Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]
$Kp_{soil} = K_{oc} \times f_{oc}$
$= 10.1 \times 0.02$
$= 0.202\ m^3/m^3$

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for alcohols, C6-12, ethoxylated propoxylated calculated from EPISUITE™ using the MCI is 10.1 L/kg.
f_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Alcohols, C_{6-12}, ethoxylated propoxylated is readily biodegradable and thus does not meet the screening criteria for persistence.

The bioconcentration factors (BCF) in fish for ethoxylated alcohols (which includes alcohols, C_{6-12}, ethoxylated propoxylated) have been reported to range from <5 to 387.5. Thus, alcohols, C_{6-12}, ethoxylated propoxylated does not meet the criteria for bioaccumulation.

The NOECs from the chronic aquatic toxicity studies on alcohols, C_{6-12}, ethoxylated propoxylated are > 0.1 mg/L. Thus, alcohols, C_{6-12}, ethoxylated propoxylated does not meet the criteria for toxicity.

The overall conclusion is that alcohols, C6-12, ethoxylated propoxylated is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

Not Classified

B. Labelling

None

C. Pictogram

None

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

Eye Contact

Rinse immediately with plenty of running water. If easy to do, remove contact lenses. Get medical attention.

Skin Contact

Wash with soap and water. Get medical attention if symptoms occur.

Inhalation

Treat symptomatically. Move to fresh air. Get medical attention.

Ingestion

Rinse mouth with water, and then drink plenty of water. Never give anything by mouth to an unconscious person. Seek medical attention.

B. Firefighting Information

Extinguishing Media

Water spray, dry chemical, foam. Do not use water jet.

Specific Exposure Hazards

May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon oxides.

Special Protective Equipment for Firefighters

Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

C. Accidental Release Measures

Personal Precautions

Wear appropriate personal protective equipment. Do not breath mist or aerosol.

Environmental Precautions

Prevent from entering sewers, waterways, or low area.

Steps to be Taken if Material is Released or Spilled

Absorb spill with inert absorbent material, and then place in a container for chemical waste.

D. Storage And Handling

General Handling

Protect against moisture. Shut containers immediately after taking product because product takes up the humidity of air. No special precautions are necessary beyond normal good hygiene practices.

Other Handling Precautions

Wash hands thoroughly after handling. Avoid breathing mists or aerosols.

Storage

Keep container closed.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

The workplace exposure standards for alcohols, C6-12, ethoxylated propoxylated in Australia has not been established.

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Wear respiratory protection if ventilation is inadequate.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Chemical safety goggles.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Eyewash fountains and safety showers must be easily accessible.

F. Transport Information

Alcohols, C6-12, ethoxylated propoxylated is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

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AMINE OXIDES, COCOALKYLDIMETHYL

This dossier on amine oxides, cocoalkyldimethyl presents the most critical studies pertinent to the risk assessment of amine oxides, cocoalkyldimethyl in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the OECD-SIDS documents on amine oxides (OECD, 2006). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Coco alkyldimethylamine oxides

CAS RN: [redacted]

Molecular formula: $CH_3.(CH_2)_R.N(CH_3)_2{:}O$ where R is 9-17 (UVCB substance)

Molecular weight: Unspecified (UVCB substance)

Synonyms: Cocamine oxide; coco dimethylamine oxide; coconutdimethylamineoxide; N-(cocoalkyl)-dimethylamine oxide; N,N-dimethylcocamino oxide

SMILES: Not available (UVCB substance)

The typical alkyl chain length distribution of amine oxides, cocoalkyldimethyl is:

<1-3 C_{10}; 64-74 C_{12}; 21-30 C_{14}; 2-13 C_{16}; and <1-9 C_{10}. The average alkyl chain is 13.0 (OECD, 2006).

II. PHYSICO-CHEMICAL PROPERTIES

Specific physico-chemical properties on amine oxides, cocoalkyldimethyl are unavailable. Therefore, key physical and chemical properties for the surrogate substance Amines, C10-16- Alkyldimethyl, N-oxides, Average Chain Length 12.6* (CAS RN [redacted] are shown in Table 1.

Table 1: Overview of the physico-chemical properties of Amines, C10-16- Alkyldimethyl, N-oxides, Average Chain Length 12.6* [CAS No. [redacted] (OECD, 2006)

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Liquid (commercially available in water at 25–35% activity)	-	OECD, 2006
Melting Point	Average: 130.5°C @ 101.3 kPa	2	OECD, 2006
Boiling Point	Decomposes before boiling***	2	OECD, 2006
Density	Not available	-	-
Vapour Pressure	Negligible	2	OECD, 2006
Partition Coefficient (log K_{ow})	<2.7 (temperature not available)	2	OECD, 2006
Water Solubility	409.5 g/L (temperature not available)	2	OECD, 2006
Flash Point	Not available	-	-

Property	Value	Klimisch Score	Reference
Auto flammability	Not available	-	-
Viscosity	Not available	-	-
Henry's Law Constant	Not available	-	-

*Except melting point.
**Aliphatic amine oxides undergo thermal decomposition between 90° and 200°C, so melting point is likely to be accompanied with decomposition; all boiling points are predicted to be far above the decomposition temperature

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

The substance is not expected to persist, adsorb, or bioaccumulate. Specific data are discussed below.

B. Biodegradation

Amine oxides, cocoalkyldimethyl is readily biodegradable. In an OECD 301 D test, degradation was 89% after 14 days and 93% after 28 days (OECD, 2006) [Kl.score=2].

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

No experimental data are available for amine oxides, cocoalkyldimethyl. Based on read-across from amines, C12-14 (even numbered)-alkyldimethyl, N-oxides (CAS RN [redacted] a normalised organic carbon to water partition coefficient (K_{oc}) value of 1,525 L/kg was identified (ECHA). Based on this estimated value, amine oxides, cocoalkyldimethyl is expected to have low mobility in soil. If released to water, based on the K_{oc} value and its water solubility, it is expected to adsorb to suspended solids and sediment.

D. Bioaccumulation

There are no bioaccumulation studies on amine oxides, cocoalkyldimethyl. Amine oxides, cocoalkyldimethyl is not expected to bioaccumulate based on a log K_{ow} of <2.7 (OECD, 2006).

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

In general, amine oxides, cocoalkyldimethyl does not exhibit significant acute oral or dermal toxicity. It appears to be a skin and eye irritant but not a skin sensitiser. It is not a reproductive or developmental toxicant, genotoxic or expected to be a carcinogen.

B. Toxicokinetics/Metabolism

Following an oral dose to male and female rats, approximately 75% of the radioactivity was excreted within 24 hours. Excretion was primarily in the urine (>50%), followed by feces and expired CO_2. The amount of test compound recovered in liver was 1.1 to 1.5%; 1.9 to 4.8% of the dose was retained in

the carcass, with the remaining tissues <0.1% of the dose. Degradation of the alkyl chain to 4-carbon acid metabolites was more efficient in rabbits (OECD, 2006).

In two human volunteers, the uptake and excretion of 1-dodecanamine, N,N-dimethyl-, N-oxide (CAS No. [redacted] was rapid, with 37 to 50% of the administered radioactivity collected in urine and 18 to 22% in the expired air within two hours after dosing. Humans were more efficient than rats in metabolizing the alkyl chain to 4-carbon acid metabolites (Turan & Gibson, 1981).

C. Acute Toxicity

The oral LD_{50} in rats of amine oxides, cocoalkyldimethyl was 1,236 mg/kg in males and 846 in females (OECD, 2006) [Kl. score = 2]. In another study, the oral LD50 in rats of amine oxides, cocoalkyldimethyl was 3,873 mg/kg (OECD, 2006) [Kl.score=2].

No inhalation studies available.

The dermal LD_{50} values of amines, C10-16 alkyldimethyl, N-oxides (CAS No. [redacted] were >520 mg/kg (OECD, 2006) [Kl.score=2]

D. Irritation

Application of amine oxides, cocoalkyldimethyl (30% solution) to the skin of rabbits for 4 hours under semi-occlusive conditions was irritating (OECD, 2006) [Kl.score=1].

Instillation of a 30% solution of 1-dodecanamine, N,N-dimethyl-, N-oxide (CAS No. [redacted] into the eyes of rabbits was slightly irritating (OECD, 2006) [Kl.score=2].

Instillation of 28% solution of C10-16 alkyldimethyl, N-oxides (CAS No. [redacted] into the eyes of rabbits was moderately to severely irritating (OECD, 2006) [Kl.score=2]. In another study, instillation of 27.84% solution of C10-16 alkyldimethyl, N-oxides (CAS No. [redacted] into the eyes of rabbits was moderately irritating (OECD, 2006) [Kl.score=2].

E. Sensitisation

No studies are available on amine oxides, cocoalkyldimethyl.

C10-16 alkyldimethyl, N-oxides (CAS No. [redacted] was not considered to be a skin sensitizer in a guinea pig Buehler test (OECD, 2006) [Kl.score=2].

F. Repeated Dose Toxicity

No studies are available on amine oxides, cocoalkyldimethyl.

<u>Oral</u>

Male and female SD rats were given 0, 0.1, 0.2, or 0.4% C10-16 alkyldimethyl, N-oxides (CAS No. [redacted] in their diet for 13 weeks. The estimated daily intakes were 0, 63, 112 and 236 mg/kg-day for males, and 0, 80, 150 and 301 mg/kg-day for females. Mean body weights were significantly lower in the 0.4% males and ≥0.2% females. The opthalmoscopic examination showed lenticular opacities in the posterior cortex of the ≥0.2% males. There were no treatment-related effects in the clinical chemistry and hematology parameters nor was there any histopathologic changes in the treated animals compared to controls. The NOAEL for this study is 0.1% in the diet, which corresponds to 63 and 80 mg/kg-day for males and females, respectively (OECD, 2006) [Kl.score=2].

Male and female New Zealand rabbits were given 0, 0.1, 0.5 or 1.0% C10-16 alkyldimethyl, N-oxides (CAS No. [redacted] in their diet for 32 weeks. The estimated daily intakes were 0, 40, 196 and 390 mg/kg-day for males and 0, 39, 195 and 380 mg/kg-day for females. There were no opthalmoscopic effects. The 0.5% males had decreased alkaline phosphatase levels and increased relative liver weights. Histopathologic examination showed no treatment-related effects. The NOAEL for this study is 1% in the diet, which corresponds to 390 and 380 mg/kg-day for males and females, respectively (OECD, 2006) [Kl.score=2].

Male and female rats were given 0, 0.1, 0.1 or 0.2% C10-16 alkyldimethyl, N-oxides (CAS No. [redacted] in their diet for 104 weeks. The estimated daily intakes were 0, 4.24, 42.3 or 87.4 mg/kg-day for males, and 0, 5.23, 52.6 or 107 mg/kg-day for females. Survival, clinical chemistry, opthalmoscopic exams, clinical signs, gross pathology, and histopathology were similar across groups. The 0.2% animals had reduced body weights of >10%. The NOAEL for this study is 0.1% in the diet, which corresponds to 42 and 53 mg/kg-day for males and females, respectively (OECD, 2006) [Kl.score=2].

Inhalation

No studies are available.

Dermal

Male and female ICR Swiss mice received dermal applications of an aqueous solution of C10-16 alkyldimethyl, N-oxides (CAS No. [redacted] 3 times/week for 104 weeks. The average daily dose was 0, 1.1, 2.8 or 5.6 mg/kg-day. The high-dose mice showed microscopic signs of skin irritation. There were no other treatment-related effects (OECD, 2006) [Kl.score=2].

G. Genotoxicity

In Vitro Studies

The *in vitro* genotoxicity studies on amine oxides, cocoalkyldimethyl and similar substances are presented in Table 2.

Table 2: *In vitro* Genotoxicity Studies on Amine Oxides, Cocoalkyldimethyl

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Bacterial reverse mutation (S. typhimurium strains)	-	-	2	ECHA
Mammalian cell gene mutation (Chinese hamster fibroblasts)**	-	-	1	ECHA

*+, positive; -, negative
**Read-across from C10-16 alkyldimethyl, N-oxides (CAS No. [redacted]

In Vivo Studies

In a dominant lethal test, male mice were given in their drinking water 0, 10, 100 or 1,000 mg/kg 1-dodecanamine, N,N-dimethyl-, N-oxide (CAS No. [redacted] There was no evidence of a mutagenic effect (OECD, 2006) [Kl.score=2].

H. Carcinogenicity

No carcinogenicity studies are available on amine oxides, cocoalkyldimethyl.

Oral

Male and female rats were given 0, 0.1, 0.1 or 0.2% C10-16 alkyldimethyl, N-oxides (CAS No. [redacted] in their diet for 104 weeks. The estimated daily intakes were 0, 4.24, 42.3 or 87.4 mg/kg-day for males, and 0, 5.23, 52.6 or 107 mg/kg-day for females. The incidence of tumours was similar between treated and control animals (OECD, 2006) [Kl.score=1].

Inhalation

There are no studies available.

Dermal

Male and female ICR Swiss mice received dermal applications of an aqueous solution of C10-16 alkyldimethyl, N-oxides (CAS No. [redacted] 3 times/week for 104 weeks. The average daily dose was 0, 1.1, 2.8 or 5.6 mg/kg-day. The high-dose mice showed microscopic signs of skin irritation. There was no evidence of skin tumors at any dose level (OECD, 2006) [Kl.score=2].

I. Reproductive Toxicity

A two-generation reproductive toxicity study has been conducted in CD rats on 1-dodecanamine, N,N-dimethyl-, N-oxide (CAS No. [redacted] The dietary levels were 0, 750, 1,500 and 3,000 ppm for 6.5 weeks, and 0, 188, 375 and 750 ppm for the remainder of the study. The dietary levels were reduced because of the reduced body weight gain in the mid- and high-dose groups. There were slight reductions in body weight gain of both the parental animals and offspring, but mating performance and fertility were unaffected by treatment in either generation. Macroscopic and microscopic pathologic examinations showed no differences between treated and control groups. The NOAEL for reproductive and developmental toxicity is 750 ppm, which corresponded to 40 mg/kg-day (OECD, 2006) [Kl.score=1].

J. Developmental Toxicity

Oral

Pregnant female CD rats were dosed by oral gavage with 0, 50, 100 or 200 mg/kg 1-dodecanamine, N,N-dimethyl-, N-oxide (CAS No. [redacted] on GD 7 to 17. One-half of the females/group were sacrificed on GD 20, and the other half were allowed to deliver; the pups were weaned at PND 25, and the F_1 animals were paired at 10 weeks of age. Body weights and water consumption were lower (<10%) in the 200 mg/kg group. Mean fetal weights were lower and associated with slight retardation of fetal ossification in the 200 mg/kg group that were sacrificed in GD 20. However, pup survival and pup growth were unaffected in the offspring of the 200 mg/kg group that were allowed to deliver. The subsequent growth, mating performance and fertility of the F_1 animals were similar between treated and control groups; F_1 females from the 200 mg/kg F_0 group had slightly elevated fetal and placental weights. There were no macroscopic changes seen in the F_1 animals at terminal necropsy that were considered to be treatment-related. The NOAEL for maternal and developmental toxicity is 100 mg/kg-day (OECD, 2006) [Kl.score=1] suggesting that observations of developmental toxicity are related to maternal effects.

Pregnant female SD rats were dosed by oral gavage with 0, 25, 100 or 200 mg/kg C10-16 alkyldimethyl, N-oxides (CAS No. [redacted] on GD 6-19. There was one death in the 200 mg/kg group. The ≥100 mg/kg groups had reduced body weight gain and relative feed consumption. In the 200 mg/kg group, early resorptions were increased, and liver litter sizes and fetal body weights were decreased. The reduced fetal body weights were associated with fetal variations consisting of delays in skeletal ossifications. The 100 mg/kg group also showed some delays in ossification. There was no indication of fetal malformations at any dose level. The NOAEL for maternal and developmental toxicity is 25 mg/kg-day (OECD, 2006) [Kl.score=2] suggesting that observations of developmental toxicity are related to maternal effects.

Pregnant female New Zealand rabbits were dosed by oral gavage with 0, 40, 80 or 160 mg/kg 1-dodecanamine, N,N-dimethyl-, N-oxide (CAS RN [redacted] on GD 6-18. Three of the 80 mg/kg and three of the 160 mg/kg dams died or were killed in extremis. These deaths were not considered to be treatment related. Body weight gain was reduced in all treated groups, although 40 mg/kg dams achieved similar body weights to controls at study termination. Feed consumption was reduced compared with the pre-treatment period, during the second half of the treatment period in the 40 and 80 mg/kg animals, and for the entire treatment period in the 160 mg/kg animals. Water consumption was also decreased in all treated groups. There was no indication of developmental toxicity. The NOAEL for maternal toxicity was > 160 mg/kg-day based on decreased body weight. The NOAEL for developmental toxicity is > 160 mg/kg-day, the highest dose tested (OECD, 2006) [Kl.score=1].

Inhalation

There are no studies available.

Dermal

There are no studies available.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for amine oxides, cocoalkyldimethyl follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

In a two-year rat dietary study, the lowest NOAEL was 42 mg/kg-day (OECD, 2006). The NOAEL of 42 mg/kg-day will be used for determining the oral Reference dose (RfD) and the drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1

UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 42/(10 × 10 × 1 × 1 × 1) = 42/100 = 0.4 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:
Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (0.42 × 70 × 0.1)/2 = 1.5 mg/L

B. Cancer

There are no carcinogenicity studies on amine oxides, cocoalkyldimethyl. However, C_{10-16} alkyldimethyl, N-oxides (CAS No. [redacted] was not carcinogenic to rats in a 2-year dietary study; nor was there any evidence of skin tumors in mice in a 104-week dermal study. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Amine oxides, cocoalkyldimethyl does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Overall, amine oxides, cocoalkyldimethyl is moderately toxic to aquatic organisms. Based on hazard data, freshwater green algae are considered the most sensitive species, for acute and chronic endpoints. Acute toxicity is affected by chain length for fish and invertebrates.

B. Aquatic Toxicity

Acute Studies

Table 3 lists the results of acute aquatic toxicity studies conducted on amine oxides, cocoalkyldimethyl.

Table 3: Acute Aquatic Toxicity Studies on Amine Oxides, Cocoalkyldimethyl

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Salmo gairdneri	96-hr LC_{50}	13	1	OECD, 2006
Brachydanio rerio	96-hr LC_{50}	1.0	2	OECD, 2006
Leuciscus idus melanotus	96-hr LC_{50}	4.3	2	OECD, 2006
Daphnia magna	48-hr EC_{50}	2.9	1	OECD, 2006
Selenastrum capricornutum	72-hr EC_{50}	0.29	2	OECD, 2006

Chronic Studies

The 302-d NOEC for C10-16 alkyldimethyl, N-oxides (CAS No. [redacted] to *Pimephales promelas* was 0.42 mg/L; this value is 0.31 mg/L when normalized to a $C_{12.9}$ amine oxide (OECD, 2006) [Kl.score=2].

The 21-day NOEC for 1-dodecanamine, N,N-dimethyl-, N-oxide (CAS No. [redacted] in a *Daphnia* reproduction test is 0.36 mg/L; this value is 0.28 mg/L when normalized to a $C_{12.9}$ amine oxide (OECD, 2006) [Kl.score=1].

As noted with acute toxicity, green algae are the most sensitive for chronic endpoints with a 72-hr EC_{20} value of 0.09 mg/L for *Selenastrum capricornutum*. (The geometric mean of 12 studies for the group was 0.11 mg/L) (OECD, 2006) [Kl.score=2].

C. Terrestrial Toxicity

No studies are available.

D. Calculation of PNEC

The PNEC calculations for amine oxides, cocoalkyldimethyl follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels. Acute $E(L)C_{50}$ values are available for fish (1.0 mg/L), invertebrates (2.9 mg/L) and algae (0.29 mg/L). Results from chronic studies are available for fish (0.31 mg/L), invertebrates (0.28 mg/L) and algae (0.09 mg/L). On the basis that the data consists of short-term and long-term studies for three trophic levels, an assessment factor of 10 has been applied to the lowest reported NOEC value of 0.09 mg/L for algae. The $PNEC_{water}$ is 0.009 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 0.21 mg/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$

= (30.1/1280) × 1000 × 0.009
= 0.21 mg/kg

Where:

$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water}$ = 0.8 + [(0.2 × Kp_{sed})/1000 × BD_{solid}]
= 0.8 + [(0.2 × 61.0/1000 × 2400]
= 30.1 m^3/m^3

Where:

Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
Kp_{sed} = K_{oc} × f_{oc}
= 1525 × 0.04
= 61.0 L/kg

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for amine oxides, cocoalkylmethyl is 1525 L/kg based on read-across from C12-14 (even numbered)-alkyldimethyl, N-oxides (CAS RN [redacted] (ECHA).

f_{oc} = fraction of organic carbon in sediment = 0.04 [default].PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 0.18 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil}$ = (Kp_{soil}/BD_{soil}) × 1000 × $PNEC_{water}$
= (30.5/1500) × 1000 × 0.009
= 0.18 mg/kg

Where:

Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]
Kp_{soil} = K_{oc} × f_{oc}
= 1525 × 0.02
= 30.5 m^3/m^3

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for amine oxides, cocoalkylmethyl is 1525 L/kg based on read-across from C12-14 (even numbered)-alkyldimethyl, N-oxides (CAS No. [redacted] (ECHA)
f_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Amine oxides, cocoalkyldimethyl is readily biodegradable; thus, it does not meet the screening criteria for persistence.

Based on a predicted log K_{ow} of <2.7, amine oxides, cocoalkyldimethyl does not meet the screening criteria for bioaccumulation.

The lowest NOEC from chronic aquatic toxicity studies conducted on amine oxides, cocoalkyldimethyl and similar substances is <0.1 mg/L. Thus, amino oxides, cocoalkyldimethyl meets the screening criteria for toxicity.

The overall conclusion is that amine oxides, cocoalkyldimethyl is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

H315: Skin Irritant Category 2

H318:Eye Damage Category 1

H400: Aquatic Acute Category 1

B. Labelling

Danger!

According to the classification provided by companies to ECHA in CLP notifications, this substance is very toxic to aquatic life, causes serious eye damage, is harmful if swallowed and causes skin irritation

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

<u>Eye Contact</u>

In the case of contact with eyes, rinse immediately with plenty of water. Seek medical advice. Call a physician immediately.

Skin Contact

After contact with skin, wash immediately with plenty of soap and water. Consult a physician.

Inhalation

Remove to fresh air. If breathing is irregular or stopped, administer artificial respiration.

Ingestion

Call a physician immediately. Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person.

Medical Conditions Aggravated by Exposure

Exposure to substance may aggravate individuals with asthma or other respiratory conditions.

Emergency Personnel Protection

CAUTION!

Wear appropriate protective equipment and respiratory protection where dusts or airborne particulates of unknown concentrations may be generated.

LARGE SPILLS: Self-contained breathing apparatus preferred.

B. Firefighting Information

Extinguishing Media

Dry powder, Water spray, Foam.

Specific Exposure Hazards

Heating or fire can release toxic gas.

Special Protective Equipment for Firefighters

In the event of fire, wear self-contained breathing apparatus.

C. Accidental Release Measures

Personal Precautions

CAUTION!

Wear appropriate protective equipment and respiratory protection where dusts or airborne particulates of unknown concentrations may be generated. For large spills, self-contained breathing apparatus preferred.

Environmental Precautions

Do not release to drains or flush into surface water or sanitary sewer system.

Steps to be Taken if Material is Released or Spilled

Carefully shovel spills into appropriate containers for disposal. Avoid generating dust. Wet residue with water and absorb with inert material (sand, earth, etc.). Transfer into appropriate containers for recovery or disposal. Keep spill out of sewers and open bodies of water.

D. Storage and Handling

General Handling

Provide sufficient air exchange and/or exhaust in work rooms. Avoid contact with skin and eyes.

Other Handling Precautions

Take precautionary measures against static discharges.

Storage

Keep container tightly closed. To maintain product quality, do not store in heat or direct sunlight. Keep in a dry, cool and well-ventilated place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for amine oxides, cocoalkyldimethyl.

Engineering Controls

Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protection Equipment

Respiratory Protection: In the case of vapor formation use a respirator with an approved filter.

Hand Protection: Suitable material: Nitrile rubber.

Skin Protection: Choose protection according to amount/concentration of dangerous substance. No special protective equipment required.

Eye protection: Tightly fitting safety goggles.

Other Precautions: Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

F. Transport Information

Australian Transportation Codes

Environmentally Hazardous Substance

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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BENZALDEHYDE

This dossier on benzaldehyde presents the most critical studies pertinent to the risk assessment of benzaldehyde in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Benzaldehyde

CAS RN: [redacted]

Molecular formula: C_7H_6O

Molecular weight: 106.12 g/mol

Synonyms: Artificial Almond Oil; Benzaldehyde FFC; Benzenecarbonal; Benzenecarboxaldehyde; Benzoic aldehyde; Phenylmethanal; Almond artificial essential oil; Phenylmethanal benzenecarboxaldehyde; NCI-C56133; Oil of Bitter Almond; Artificial essential oil of almond; Benzene carbaldehyde; NA 1989; Artificial essential oil of almond; Artificial bitter almond oil; Benzene methylal; Benzoyl hydride; Ethereal oil of bitter almonds; Benzyaldehyde

SMILES: c1(C=O)ccccc1

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the physico-chemical properties of benzaldehyde

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Colourless liquid, becoming yellowish on keeping; almond odour	2	ECHA
Melting Point	-26°C @ 101.3 kPa	2	ECHA
Boiling Point	179°C @ 101.3 kPa	2	ECHA
Density	1.042 (relative density) 25°C	2	ECHA
Vapour Pressure	169 Pa @ 25°C	2	ECHA
Partition Coefficient (log K_{ow})	1.4 @ 25°C	1	ECHA
Water Solubility	6.95 g/L @ 25°C	2	ECHA
Flash Point	62°C	2	ECHA
Auto flammability	192°C	2	ECHA
Viscosity	1.321 mPa s @ 25°C	2	ECHA
Henry's Law Constant	Not available	-	

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Benzaldehyde is readily biodegradable. It is not expected to bioaccumulate. It has a low potential to adsorb to soil or sediment.

B. Biodegradation

Benzaldehyde is readily biodegradable. In an activate sludge test, degradation was approximately 100% after 19 days as measured by DOC removal (ECHA) [Kl.score=2].

In a BOD test, degradation was >60% after 28 days as measured by O_2 consumption (ECHA) [Kl.score=2]. In a CO_2 evolution test, degradation was about 60% in 7 days and 100% in 28 days (ECHA) [Kl.score=2].

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

No experimental data are available for benzaldehyde. Using KOCWIN in EPISUITE™ (EPA, 2019), the estimated K_{oc} value from log K_{ow} is 32.69 L/kg. The estimated K_{oc} value from the molecular connectivity index (MCI) is 11.09 L/kg. If released to soil, based on these K_{oc} values, the substance is expected to have very high mobility. If released to water, based on the K_{oc} values and its water solubility, benzaldehyde is not expected to adsorb to suspended solids and sediment.

D. Bioaccumulation

There are no bioaccumulation studies on benzaldehyde. Benzaldehyde is not expected to bioaccumulate based on a log Kow of 1.4 (ECHA).

IV. HUMAN HEALTH HAZARD ASSESSMENT

The following sections detail the available and relevant literature on the toxicity of benzaldehyde. The information described below was obtained from NICNAS IMAP if available and the ECHA database.

A. Summary

Benzaldehyde is hazardous and considered harmful if swallowed. It has low acute dermal toxicity and moderate acute inhalation toxicity potential. It is not irritating to the skin but may be an eye and respiratory irritant. It is not a skin sensitiser. Based on the data available, the chemical is not considered to cause serious damage to health from repeated oral exposure or through inhalation. No data are available to evaluate exposure via the dermal pathway. The substance is not genotoxic when tested in both *in vitro* and *in vivo* assays. There is no indication that this substance will cause malformations or have an adverse effect on reproduction and development.

B. Acute Toxicity

Oral

The oral LD_{50} of the test substance in rats is between 300 and 2000 mg/kg bw/day. In the key OECD 401 Guideline Study (Acute Oral Toxicity), an acute LD_{50} value for rats appeared to be approximately 1430 mg/kg bw (ECHA) [Kl.score=2].

In a supportive study, a LD_{50} value of 1300 mg/kg bw in rats and 1000 mg/kg bw for guinea pigs was derived. In another limitedly reported supporting study, an LD_{50} value of 800–1600 mg/kg bw was reported for both rats and mice. In an acute oral toxicity study in rats, an oral LD_{50} of > 2170 mg/kg (> 2000 mg/kg) was reported (ECHA) [Kl.score=4].

The chemical is classified as hazardous with the risk phrase 'Harmful if swallowed' (Xn; R22) in HSIS (Safe Work Australia). In humans, a lethal oral dose of 600–900 mg/kg bw was calculated for the chemical in the absence of prompt treatment (NICNAS, 2016).

Dermal

Although limited information is available, the chemical is likely to have low acute dermal toxicity in animal tests following dermal exposure. In the key study, four rabbits were dermally exposed (semi-occlusive) for 24 hours to the test substance (2000 mg/kg). No mortality was observed. The LD_{50} was > 2,000 mg/kg bw (ECHA) [Kl.score=2]. In an acute dermal toxicity study in rabbits with limited available data, an LD50 of >1250 mg/kg bw was reported (ECHA) [Kl.score=4].

Inhalation

Although limited data are available, the available information indicates that the chemical has moderate acute toxicity in animal tests. Based on an acute inhalation toxicity study in rats, the inhalation LC50 is 1000–5000 mg/m^3 (ECHA) [Kl.score=1].

Based on two studies on sensory irritation (Babiuk, 1984; Steinhagen, 1983), it cannot be excluded that benzaldehyde induces sensory irritation in rodents. The data are, however, not sufficient to set an effect level in humans (ECHA) [Kl.score=4].

An increased incidence of respiratory symptoms was noted among workers exposed to vapour of the chemical at atmospheric concentrations of >5 mg/m^3 (NICNAS, 2016).

C. Irritation

Although limited data are available, the available information indicates that the chemical is not likely to be a skin irritant. However, it has been reported to be an eye irritant in animal and human studies and a respiratory irritant in humans.

Skin

The shaved skin of guinea pigs was exposed to undiluted benzaldehyde with a gauze pad for 24 hours. The concentration of the test substance ranged from 5 to 20 mL/kg. The test substance was moderately irritating to the guinea pig skin in this test (ECHA) [Kl.score=4].

A read-across study was conducted using benzoic acid in New Zealand White Rabbits. The test substance caused very slight erythema in two animals at 60 minutes after removal of the dressings.

The erythema resolved by day 2. Twenty-four hours after test substance removal, one animal showed very slight oedema, which resolved within 24 hours. No signs of systemic intoxication were observed in any of the rabbits. The test substance was considered minimally irritating to the skin (ECHA) [Kl.score=2].

Eyes

In an OECD 405 Guideline Study (Acute Eye Irritation/Corrosion), New Zealand White Rabbits were dosed with 100 microliter of benzaldehyde in the eye and observed for 7 days. The test substance was slightly irritating to the rabbit eye in this test. Immediate irritation effects were noted at 1 hour and within 24 hours; the anterior portion of the cornea was damaged. The cornea was cleared within 48 hours and only erythema of the conjunctiva and nictitating membrane was noted at this stage. Although the rabbit died on the sixth day, the death was not related to the application of the chemical (ECHA) [Kl.score=2].

In an inhalation toxicity study, human volunteers were exposed to 4.5 ppm (19.5 mg/m^3) of the chemical for one minute. Irritation of the eyes and upper respiratory tract were observed. In an occupational study, workers exposed to the chemical vapour at atmospheric concentrations of >5 mg/m^3 reported symptoms of slight eye irritation and considerable skin irritation (NICNAS, 2016).

D. Sensitisation

Overall, it is concluded that the test substance is not a skin sensitiser (ECHA).

The test substance was determined not to be a contact sensitiser using the Magnusson-Kligmann method [Kl. Score = 2] and the open epicutaneous test [Kl.score=4]. However, it was reported positive for allergenicity in guinea pigs in the Draize test, the maximisation test and a test with Freund's complete adjuvant (ECHA) [Kl.score=4].

Supportive evidence from Opdyke (1976) showed no evidence of sensitisation in a maximisation test with 25 human volunteers. In this test, a concentration of 4% in petrolatum was used. Furthermore, in a human patch test using 5% of the test substance in Vaseline, positive reactions were noted in 10 of 100 patients. Positive reactions occurred in patients with sensitivity to benzoic acid or vanillin.

Although the chemical has produced skin sensitisation reactions in some tests, based on the weight of evidence, the chemical is not likely to be a skin sensitiser. It is also noted that the chemical is rapidly metabolised to benzoic acid in the skin. Clinical reports of allergy to the chemical are rare, and benzoic acid has also been reported not to produce sensitisation in clinical trials in humans (NICNAS, 2016).

E. Repeated Dose Toxicity

Oral

In a sub-chronic oral toxicity study, male and female Fischer 344 rats and B6C3F1 mice were treated daily with the test substance by gavage for 90 days in several doses. Groups of 10 male and 10 female F344 rats were given gavage doses of benzaldehyde of 50, 100, 200, 400 and 800 mg/kg body weight (dissolved in corn oil). Groups of 10 male and 10 female B6C3F1 mice were given benzaldehyde doses of 75, 150, 300, 600 or 1200 mg/kg body weight per day. Both groups were dosed 5 days/week for a period of 13 weeks (90 days).

The symptoms of intoxication observed in the rats of the 800 mg/kg group were increased activity, trembling or periodic inactivity. Six males and three females of this group and one female animal of

the 400 mg/kg group and the control group died in the second half of the experiment. In the male animals of the 800 mg/kg group, body weight gains and the absolute and relative weights (relative to the brain weight) of the thymus and testes were reduced. The female animals of this group were found to have slightly increased liver, kidney, thymus and heart weights. In most of the animals of the 800 mg/kg group and two males of the 400 mg/kg group, slight hyperplasia and hyperkeratosis of the forestomach epithelium, accompanied by increased mitotic activity in the basement membrane, were detected. This study yielded a NOEL for rats of 400 mg/kg body weight per day as the damage to the forestomach is likely due to the application methodology.

No clinical symptoms of intoxication were observed in mice. All male animals and one female from the 1200 mg/kg group died during the first 4 weeks of the experiment. The body weight gains were reduced in the female animals after doses of 1200 mg/kg and in the male animals after doses as low as 600 mg/kg. At the end of the experiment the body weights of the male animals of the 600 mg/kg group were reduced by 9% relative to those of the controls. The organ weights did not differ from the control values. In the gross pathological and microscopic examinations, weak to moderate degeneration of the renal tubules was detected in all male animals of the 1200 mg/kg group and one male of the 600 mg/kg group. This study, therefore, yielded a NOEL of 300 and 600 mg/kg body weight per day for male and female mice, respectively (Kluwe et al. 1983; NTP, 1990, cited in ECHA) [Kl.score=2].

<u>Inhalation</u>

In a short-term inhalation study, groups of 14 Sprague-Dawley rats per sex and group were exposed in whole animal exposure chambers on 14 consecutive days, for 6 hours a day, to benzaldehyde vapour in concentrations of 0, 500, 750 and 1000 mL/m^3 (about 2200, 3300 and 4400 mg/m^3). During the experiment, 11 animals from the 1000 mL/m^3 group (10 females, 1 male) and 3 female animals from the 750 mL/m^3 group died. In all animals exposed to benzaldehyde, tremor, piloerection, diuresis, decreased respiration rates, hypothermia, reduced motor activity and concentration-dependent symptoms of eye and nose irritation occurred in the first week of the experiment. Since effects were observed at all test levels, this study did not yield a NOEL (ECHA) [Kl.score=2].

Albino rats were exposed to 26 mg/m^3 (about 6.0 mL/m^3) of benzaldehyde for a period of 4 months for 5 hours a day under dynamic conditions. After 3 months of exposure, changes were detected in haematological parameters (hypoglobulinaemia, erythrocytosis, leukocytosis, initial lymphocytosis followed by lymphopenia) and delays in body weight gain. At the end of the experiment, all the parameters were within the normal range (ECHA) [Kl.score=4].

Exposure to benzaldehyde concentrations of 6 mg/m^3 (about 1.4 mL/m^3) under otherwise identical conditions was tolerated by albino rats without symptoms (no further details) (Peresedov, 1974, cited in ECHA) [Kl.score=4].

F. Genotoxicity

Overall, the data indicate that the chemical has no mutagenic or genotoxic potential. Although there is no mutagenic activity in bacterial systems, the chemical does have weak clastogenic effects in some mammalian cell assays.

The genotoxicity of benzaldehyde has been investigated in many *in vitro* test systems (ECHA). In Salmonella typhimurium, in mutagenicity studies with the strains TA98, TA100, TA102, TA104, TA1535, TA1537 and TA2637, and in a DNA repair test with and without metabolic activation,

genotoxic activity was not detected. In a mutagenicity test with Escherichia coli WP2 uvrA and the mutagen 4-nitroquinoline-1-oxide, benzaldehyde from concentrations of 2120 µg/p1ate was found to have an antimutagenic effect (Watanabe et al., 1988). In Bacillus subtilis, DNA-damaging effects were observed at high concentrations only after metabolic activation. An increase in the incidence of mutants in the mouse Lymphoma test occurred only in the high, cytotoxic concentration range, and the finding is therefore questionable. Evidence of a weak clastogenic potential in the chromosomal aberration test and in the sister chromatid exchange test was also found only with high concentrations. Therefore, there is unreliable evidence of benzaldehyde having weak genotoxic activity.

In an *in vivo* test, a sex-linked recessive lethal test with *Drosophila melanogaster*, benzaldehyde administered in a concentration of 1500 ppm with the diet and injection of 2500 ppm was inactive (NTP, 1990; Woodruff et al., 1985, cited in ECHA) [Kl.score=2].

G. Carcinogenicity

H. Reproductive Toxicity and Developmental Toxicity

Benzyl derivatives, including benzaldehyde, have not been reported to produce reproductive and developmental toxicity. Benzyl derivatives generally follow similar metabolic pathways; therefore, studies conducted on benzyl derivatives are sufficient to support benzaldehyde (ECHA).

In one available study, 10 female rats were given oral doses of 2 mg benzaldehyde per animal (about 5 mg/kg body weight and day) every second day for a period of 223 days and were mated with untreated males on days 75 and 108 after the beginning of treatment. The number of offspring, weight of the pups (after 1 and 3 weeks) and pup survival were in the range of the control values. The number of pregnant females in the lest group was decreased relative to that in the control group (Sporn et al., 1967, as cited in ECHA). The study design (small number of treated animals, only one dose group) does not meet present-day standards and cannot, therefore, be regarded as evidence of impairment of female fertility (ECHA) [Kl.score=2].

The key study evaluating effects on fertility were by Kieckebusch and Lang (1960), which evaluated the effects of benzoic acid over four generations in rats via feeding. While this study does have some limitations, supplemental data on reproductive organs/tissues (sperm parameters, including epididymis/cauda epididimys/testis weights, sperm motility/density/abnormal sperm; Estrous cyclicity in females) from a 13-week repeated dose study of benzyl acetate (a substances that is metabolized completely to benzoic acid) (Morrissey et al., 1988), the apparent gaps in data from the current OECD 443 study design are filled. Overall, taking into consideration both the Kieckebusch and Lang (1960), and Morrissey et al. (1988) studies, no effects on reproductive performance and offspring were reported at 1% the test substance in feed (500 mg/kg bw). Therefore, the NOAEL for toxicity to reproduction is set at 500 mg/kg bw. (ECHA) [Kl.score=2].

Sodium benzoate is the sodium salt of benzoic acid and is completely metabolized to benzoic acid prior to excretion via the hippuric acid pathway. In a sub-acute developmental toxicity study conducted in rats and mice using sodium benzoate, dose levels applied showed no evidence of maternal toxicity. No effects on foetal development were reported. A NOAEL of 175 mg/kg bw/day was established. This level is considered to be very conservative, and rats and mice seem to be the most sensitive species (ECHA) [Kl.score=2].

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for benzaldehyde follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

The lowest NOAEL is 175 mg/kg-day, which is based on the absence of reproductive effects in a sub-acute developmental toxicity study in rats and mice. The NOAEL of 175 mg/kg-day will be used for determining the oral Reference dose (RfD) and the drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 10
UF_D (database uncertainty) = 1
Oral RfD = 175/(10 × 10 × 1 × 10 × 1) = 175/1000 = 0.175 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (0.175 × 70 × 0.1)/2 = 0.61 mg/L

B. Cancer

There was no evidence of carcinogenicity in rat and mouse chronic studies conducted on benzaldehyde. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Benzaldehyde does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Benzaldehyde has moderate toxicity to aquatic organisms.

B. Aquatic Toxicity

Acute Studies

Table 3 lists the results of acute aquatic toxicity studies conducted on benzaldehyde.

Table 3: Acute aquatic toxicity studies on benzaldehyde

Test Species	Endpoint	Results (mg/L)	Klimisch score	Reference
Fathead minnow	96-hr LC_{50}	12.4	2	ECHA
Rainbow trout	96-hr LC_{50}	11.2	2	ECHA
Goldfish	96-hr LC_{50}	13.8	2	ECHA
Channel catfish	96-hr LC_{50}	5.39	2	ECHA
Bluegill	96-hr LC_{50}	1.07	2	ECHA
Daphnia magna	48-hr EC_{50}	19.7	1	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	33.1 (growth) 8.05 (yield)	1	ECHA

Chronic Studies

In a juvenile growth test, the 7-day NOEC to 1- day *Pimephales promelas* larvae was 0.12 mg/L (measured) based on growth rate and mortality (ECHA) [Kl.score=2].

The 8-day NOEC to *Scenedesmus quadricauda* is 34 mg/L (ECHA) [Kl.score=4].

The 72-hr EC_{10} for Raphidocelis subcapitata was reported as 0.039 mg/L (ECHA) [Kl.score=1].

C. Terrestrial Toxicity

No studies are available.

D. Calculation of PNEC

The PNEC calculations for benzaldehyde follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels. Acute $E(L)C_{50}$ values are available for fish (1.07 mg/L), invertebrates (19.7 mg/L) and algae (8.05 mg/L). Results from chronic studies are available for fish (0.12 mg/L) and algae (0.039 mg/L). On the basis that the data consists of short-term studies for three trophic levels and long-term results studies for two trophic levels, an assessment factor of 50 has been applied to the lowest reported NOEC of 0.039 mg/L for algae. The $PNEC_{water}$ is 0.0008 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 0.00063 mg/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (1.0129/1280) \times 1000 \times 0.0008$
$= 0.0.00063$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 0.4436/1000 \times 2400]$
$= 1.0129\ m^3/m^3$

Where:
Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 11.09 \times 0.04$
$=0.4436$ L/kg

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for benzaldehyde calculated from EPISUITE™ using the MCI is 11.09 L/kg.
f_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 0.0003 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (0.22/1500) \times 1000 \times 0.002$
$= 0.0003$ mg/kg

Where:

Kp_{soil} = soil-water partition coefficient (m^3/m^3)

BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]

$Kp_{soil} = K_{oc} \times f_{oc}$

$= 11.09 \times 0.02$

$= 0.22\ m^3/m^3$

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for benzaldehyde calculated from EPISUITE™ using the MCI is 11.09 L/kg.

f_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Benzaldehyde is readily biodegradable; thus, it does not meet the screening criteria for persistence.

Based on a measured log K_{ow} of 1.4, benzaldehyde does not meet the screening criteria for bioaccumulation.

The lowest chronic NOEC for benzaldehyde is <0.1 mg/L. Thus, benzaldehyde meets the screening criteria for toxicity.

The overall conclusion is that benzaldehyde is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

H302: Acute toxicity – oral and dermal – Category 4

H332: Respiratory sensitization Category 1

B. Labelling

Warning

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

Eye Contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

Skin Contact

Wash off with soap and plenty of water. Consult a physician.

Inhalation

Move person to fresh air. If not breathing, give artificial respiration. Consult a physician.

Ingestion

Do NOT induce vomiting. Rinse mouth with water. Consult a physician.

Notes to Physician

Symptoms may occur even after several hours. Medical observation for at least 48 hours is recommended.

Benzaldehyde may cause allergy or asthma symptoms or breathing difficulties if inhaled.

Medical Conditions Aggravated by Exposure

No data available.

Emergency Personnel Protection

Avoid breathing dust/fume/gas/mist/vapours/spray.

B. Firefighting Information

Extinguishing Media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Specific Exposure Hazards

No data available.

Special Protective Equipment for Firefighters

No special measures required; wear self-contained breathing apparatus for firefighting if necessary.

C. Accidental Release Measures

Personal Precautions

Use personal protective equipment. Respiratory protection and/or ventilation may be necessary to avoid breathing vapours, mist or gas. Remove all sources of ignition. Evacuate unprotected persons. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental Precautions

Do not allow to enter sewers, drains or waterways. Discharge into the environmental must be avoided.

Steps to be Taken if Material is Released or Spilled

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations. Keep in suitable, closed containers for disposal.

D. Storage and Handling

General Handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist. No smoking.

Other Handling Precautions

Keep away from sources of ignition. Take measures to prevent the build-up of electrostatic charge.

Storage

Keep container tightly closed in a dry and well-ventilated place. Containers that are opened must be carefully resealed and kept upright to prevent leakage. Storage under nitrogen if necessary.

Sensitive to light. Store in light-resistant containers.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Australia: No specific exposure standards are available.

The chemical has an exposure standard of 5 mg/m^3 time weighted average (TWA) in Bulgaria, Hungary, Latvia and Russia; 10 mg/m^3 in Poland; and 2 ppm in the USA.

Short-term exposure limits (STEL) of 4 ppm in the USA and Canada; 10 mg/m^3 in Hungary; and 40 mg/m^3 in Poland have been reported.

Engineering Controls

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapours below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection Equipment

Respiratory Protection: Vapour respirator.

Hand Protection: Impervious gloves. Inspect gloves before use.

Skin Protection: Protective clothing as required by the situation.

Eye protection: Splash goggles or face shield and safety glasses.

Other Precautions: Use other PPE as required by the situation.

F. Transport Information

UN Number: 1990

Class 9

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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BENZOIC ACID, 2-CHLORO-4-FLUORO-, SODIUM SALT (1:1) (CAS RN [redacted]
BENZOIC ACID, 2-CHLORO-5-FLUORO-, SODIUM SALT (1:1) (CAS RN [redacted]

This dossier on two halogenated sodium benzoate salts (benzoic acid, 2-chloro-4-fluoro-, sodium salt [1:1] and benzoic acid, 2-chloro-5-fluoro-, sodium salt [1:1]) presents the most critical studies pertinent to the risk assessment of two halogenated sodium benzoate salts (benzoic acid, 2-chloro-4-fluoro-, sodium salt [1:1] and benzoic acid, 2-chloro-5-fluoro-, sodium salt [1:1]) in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Sodium 2-chloro-4-fluorobenzoate

CAS RN: [redacted]

Molecular formula: $C_7H_3ClFNaO_2$

Molecular weight: 196.54 g/mol

Synonyms: Benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1)

SMILES: [Na+].[O-]C(=O)C1=CC=C(F)C=C1Cl

Chemical Name (IUPAC): Sodium 2-chloro-5-fluorobenzoate

CAS RN: [redacted]

Molecular formula: $C_7H_3ClFNaO_2$

Molecular weight: 196.54 g/mol

Synonyms: Benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1)

SMILES: C1=CC(=C(C=C1F)C(=O)[O-])Cl.[Na+]

II. PHYSICO-CHEMICAL PROPERTIES

Key physical and chemical properties for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1)are shown in Table 1. Physico-chemical property data are not available for benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1).

Table 1: Overview of the physico-chemical properties of benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1)

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Liquid	-	SDS
Melting Point	169°C @ 101.3 kPa	2	US EPA Comptox
Boiling Point	273°C @ 101.3 kPa	2	US EPA Comptox
Density	Not available	-	-
Vapour Pressure	0.124 Pa @ 25°C	2	US EPA Comptox
Partition Coefficient (log K_{ow})	-1.36 @ 25°C	2	US EPA Comptox
Water Solubility	0.383 g/L @ 25°C	2	US EPA Comptox
Dissociation constant (pKa)	3.15 @ 25°C	2	US EPA Comptox
Flash Point	Not applicable because the substance is a solid	-	ECHA-
Auto flammability	Not applicable due to low melting point	-	ECHA-
Viscosity	Not applicable because the substance is a solid	-	ECHA
Henry's Law Constant	Not available	-	-

These halogenated sodium benzoate salts are expected to be soluble in water and will dissociate completely to form benzoic acid (Kneubehl *et al.*, 2003).

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1) are readily biodegradable and they are not expected to bioaccumulate. These compounds have a low potential to adsorb to soil or sediment.

B. Partitioning

The pKa value for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) is 3.15 (US EPA, 2023) [Kl.score=2]. This value indicates that that this compound will exist almost entirely in the anion form in the environment and anions generally do not adsorb more strongly to soils containing organic carbon and clay than their neutral counterparts. Volatilization from moist soil is not expected because the compound exists as an anion and anions do not volatilize.

Benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1) are expected to dissociate completely in water to form benzoic acid, a naturally occurring compound.

C. Biodegradation

No experimental data are available for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1). Similar to read-across substance, benzoic acid, these substances are expected to be readily biodegradable both aerobically and anaerobically (OECD SIDS). Some phototransformation of benzoic acid may also be possible in water (ECHA) [Kl.score=2].

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

D. Environmental Distribution

The reported organic carbon partition coefficient (K_{oc}) value for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) is 41.7 L/kg (US EPA,2023) [Kl.score=2]. Thus, the potential for adsorption to soil is expected to be low and it is expected to have a very high mobility.

Likewise, the K_{oc} value for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) along with its moderate water solubility value (0.383 g/L) indicates that this chemical will likely partition into the water column, if released to water, and not adsorb to suspended solids or sediments.

E. Bioaccumulation

No experimental data are available for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1). Benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) has a low potential for bioaccumulation based on a log octanol water partition coefficient (K_{ow}) value of -1.36 and a bioconcentration factor (BCF) value of 3.98 L/kg (US EPA, 2023) [Kl.score=2].

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

There are no experimental data for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1). Read-across substances benzoic acid (CAS RN [redacted] and sodium benzoate (CAS RN [redacted] were used as surrogates for the hazard assessment. Benzoic acid is metabolized to hippuric acid following oral ingestion or dermal absorption and it is not expected to accumulate in the body. Benzoic acid is not expected to be absorbed via inhalation. Based on data for the read-across substances, benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1) are considered to have low acute oral, inhalation, and dermal toxicity. They are considered irritating to the skin and severely irritating/corrosive to the eye. They are not considered skin sensitisers. They have low oral repeat dose toxicity, are not genotoxic nor carcinogenic. They are not a reproductive or developmental toxicant.

B. Metabolism

No experimental data are available for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1). Overall, there are signs of systemic absorption via oral and dermal exposures to benzoic acid (CAS RN [redacted] but there is no evidence of target organs or of excretion. After oral ingestion and dermal absorption, benzoic acid will be metabolised to hippuric

acid. Experiments on the distribution and elimination in the rat have shown no accumulation of benzoic acid in the body (ECHA) [Kl.score=2].

There is no information available on absorption via inhalation. The relatively low vapour pressure/high boiling point indicate that the test substance will not be available for inhalation as vapour. The particle size distribution of the test substance (1.5% will be present as <425 µm) indicates that there are no inhalable/respirable particles present. Based on these properties, no respiratory exposure and hence no inhalation absorption is to be expected (ECHA).

C. Acute Toxicity

Oral

No experimental data are available for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1).

An OECD Guideline 401 (Acute Oral Toxicity) range finding study was conducted using male and female Swiss albino mice exposed to 500, 1000, 2500, 5000, 7500 mg/kg or 1500, 2000, 2500, 3000, 3500, or 4000 mg/kg benzoic acid (CAS RN [redacted] via oral gavage. Benzoic acid produced signs of acute intoxication at doses > 2000 mg/kg bw/day. The LD_{50} was set at 2250 mg/kg bw/day (ECHA) [Kl.score=2].

An OECD Guideline 401 (Acute Oral Toxicity) studied was conducted using male and female Spartan rats exposed to 500, 1250, 1984, 3150, or 5000 mg/kg benzoic acid (CAS RN [redacted] via unspecified oral exposure. The acute oral toxicity LD_{50}s of test substance in male, female and combined male and female rats were 2742 mg/kg, 2360 mg/kg and 2565 mg/kg respectively (ECHA) [Kl.score=2].

Inhalation

Five male and female Spartan rats were exposed to a dynamic atmosphere containing 12200 mg/m^3 of benzoic acid (CAS RN [redacted] for four hours. The LC_{50} was reported as >12,200 mg/m^3 (ECHA) [Kl.score=2].

Dermal

Male and female New Zealand White rabbits were exposed to 2000 mg/kg of benzoic acid (CAS RN [redacted] via semiocclusive exposure for 24 hours. The LD_{50} was reported as > 2000 mg/kg bw/day (ECHA) [Kl.score=2].

D. Irritation

Skin

No experimental data are available for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1).

Hartley guinea pigs, Sprague-Dawley rats, and ICR mice were exposed to 50µL (guinea pigs), 20µL (rats), or 5µL (mice) of benzoic acid (CAS RN [redacted] for three hours. In the guinea pig, benzoic acid produced erythema and swelling of the earlobe. Benzoic acid did not produce reactions in the mouse and rat ear. This indicates that guinea pigs are more sensitive than either rat or mouse to irritant effects from the substance. Benzoic acid is considered irritating to the skin of guinea pigs, rats, and mice (ECHA) [Kl.score =2].

Eye

No experimental data are available for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1).

An EU Method B.5 (Acute Toxicity: Eye Irritation/Corrosion) test was conducted using New Zealand White rabbits exposed to 0.1mL of benzoic acid (CAS RN [redacted] for 21 days. Benzoic acid was reported as severely irritating to rabbit eyes (ECHA) [Kl.score=1].

E. Sensitisation

No experimental data are available for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1).

A mouse local lymph node assay was conducted using female CBA mice exposed to 5%, 10% or 20% benzoic acid. The Stimulation index (SI) values calculated for benzoic acid (CAS RN [redacted] concentrations 5%, 10% and 20% were 0.8, 0.9 and 0.8 respectively. There was no indication that benzoic acid could elicit an SI >=2 when tested on higher concentrations. Therefore, benzoic acid was not considered a skin sensitizer (ECHA) [Kl.score =2].

F. Repeated Dose Toxicity

Oral

Male and female Fischer 344 rats were exposed to 1% or 2% sodium benzoate daily via oral feed for 18-24 months. No adverse clinical signs directly attributable to sodium benzoate (CAS RN [redacted] were observed in treated animals. Differences in the average body weight, and mortality rates between treated and control groups were negligible. The results of the statistical test for dose-related trends were significant ($p<0.05$). Although a variety of tumours occurred among sodium benzoate treated and control rats of each sex, tumours appearing in treated rats were similar in type and number to those in controls. It was concluded that no evidence of carcinogenicity in rats from sodium benzoate was demonstrated. The NOAEL was reported as 1000 mg/kg bw/day (ECHA) [Kl.score=2].

Inhalation

An OECD Guideline 412 (Subacute Inhalation Toxicity: 28-Day Study) was conducted using male and female Sprague-Dawley rats exposed to 25, 250, 1200 mg/m^3 or 310, 2200, 16500 mg/m^3 or 20, 200, 2000 mg/m^3 benzoic acid (CAS RN [redacted] via whole body inhalation dust for four weeks. All test concentrations induced local effects: nasal redness and discharge and pulmonary fibrosis and inflammatory cell infiltrates in the lungs that can be related to the irritant properties of benzoic acid. No systemic effects were noted at 25 mg/m^3. At 250 mg/m^3 a very slight decrease in absolute kidney weight was seen in females only (body weight was also slightly lower (not significantly) than in control females). At the highest dose level mortality, decreased body weights as well as decreased liver kidney and lung weights were reported. No histopathological findings except in the lungs were reported. The NOAEL for local effects is < 25 mg/m3; The NOAEL for systemic effects is 250 mg/m^3 (ECHA) [Kl.score=1].

Dermal

An EPA OPP 82-2 (Repeated Dose Dermal Toxicity 21/28 day) study was conducted using male and female New Zealand White rabbits exposed to 100, 500, 2500 mg/kg benzoic acid (CAS RN [redacted]

via semiocclusive exposure for 6 hours. The NOAEL was reported as > 2500 mg/kg. Very slight dermal irritation was noted for one rabbit at this dosage level. No compound related changes were seen in general behaviour and appearance, body weight, clinical laboratory tests, organ weights or survival (ECHA) [Kl.score=1].

G. Genotoxicity

No experimental data are available for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1).

In Vitro Studies

The *in vitro* genotoxicity studies on benzoic acid (CAS RN [redacted] are presented in Table 2.

Table 2: *In vitro* genotoxicity studies on benzoic acid (CAS RN [redacted]

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
In vitro mammalian cell micronucleus test: mouse lymphoma L5178Y cells	-	-	2	ECHA
In vitro mammalian chromosome aberration test: Chinese hamster fibroblast cell line CHL	-	NA	2	ECHA

*+, positive; -, negative; NA: not applicable

In Vivo Studies

An OECD Guideline 475 (Mammalian Bone Marrow Chromosome Aberration Test) was conducted using male Sprague-Dawley rats exposed to 50, 500, 5000 mg/kg sodium benzoate (CAS RN [redacted] via oral gavage for 96 hours. Sodium benzoate did not produce any detectable significant increase in the number of aberrations in bone marrow metaphase chromosomes of rats administered orally at the dosage levels employed in this study. It was concluded that sodium benzoate does not induce genetic toxicity (ECHA) [Kl.score=2].

H. Carcinogenicity

Oral

No experimental data are available for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1).

Male and female Fischer 344 rats were exposed to 1% or 2% sodium benzoate (CAS RN [redacted] via oral feed for 18-24 months. No adverse clinical signs directly attributable sodium benzoate exposure were observed in treated animals. Differences in the average body weight, and mortality rates between treated and control groups were negligible. The results of the statistical test for dose-related trends were significant ($p<0.05$). Although a variety of tumours occurred among test and control rats of each sex, tumours appearing in treated rats were similar in type and number to those in controls. It was concluded that no evidence of carcinogenicity was observed in rats exposed to sodium benzoate. The NOAEL was reported as 1000 mg/kg bw/day (ECHA) [Kl.score=2].

Inhalation

There are no studies available for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1).

Dermal

There are no studies available benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1).

I. Reproductive Toxicity

A multi-generation reproductive toxicity study (OECD Guideline 416 Two Generation Reproduction) was conducted using rats exposed to 0, 0.5, or 1 mg/kg bw/day benzoic acid (CAS RN [redacted] via oral feed. The rats were treated 11-12 weeks prior to mating and through 4 generations. Feed consumption, body weights, and weight gain were unaffected by exposure to benzoic acid at concentrations up to 1% in the diet. Overall, the dose level from the 1% diet for the entire premating period was approximately 900 and 1176 mg/kg/day for the male and female rats, respectively. There was an unexplained statistically significant increase in the lifespan of rats in the 0.5% exposure group (i.e., a higher percentage of rats lived longer). There were no differences between the groups exposed to benzoic acid and the control group for fertility measures, delayed sexual maturity, total number of pups born, pup survival, onset of reproductive senescence or litter size. In addition, organ weights and histopathologic findings were similar for all groups. Under conditions of this study, there were no dose-related adverse effects on either reproductive or developmental parameters in both sexes of rats fed 1% benzoic acid in the diet over four generations. (ECHA) [Kl.score=2].

J. Developmental Toxicity

Oral

An OECD Guideline 414 (Prenatal Developmental Toxicity) study was conducted using Wistar rats exposed to 0, 699, 1306, 1874, or 965 mg/kg bw/day (0, 1%, 2%, 4%, or 8%) of sodium benzoate(CAS RN [redacted] via oral feed. Sodium benzoate (CAS RN [redacted] in the diet to pregnant rats throughout the entire gestation period, delivery and weaning had no adverse effects on any maternal or fetal parameters examined in this study and did not cause developmental delays. The number of abnormalities seen in either soft or skeletal tissues of foetuses and weanlings in the 1 and 2% test groups did not significantly differ from the number occurring spontaneously in offspring of the control group. The NOEL for maternal and developmental toxicity was considered to be 1306 mg/kg bw/day (2%)(ECHA) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

There are no studies available.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1) follow the methodology discussed in enHealth

(2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

A two-year dietary study in rats has been conducted on read-across substance sodium benzoate (CAS RN [redacted] The NOAEL from this study is 1,000 mg/kg-day based on based on no adverse effects at the highest dose tested. The NOAEL of 1,000 mg/kg-day will be used to derive an oral reference dose and drinking water guidance value for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) or benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1).

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 1000/(10 × 10 × 1 × 1 × 1) = 1000/100 = 10 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (10 × 70 × 0.1)/2 = 35 mg/L

B. Cancer

No experimental data are available for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1). However, it was concluded that no evidence of carcinogenicity was observed in rats exposed to sodium benzoate (CAS RN [redacted]

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) or benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1)does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

However, they are considered corrosive.

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Limited environmental effects data are available for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) or benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1). They are expected to have similar environmental effects to read-across substance benzoic acid (CAS RN [redacted] Under environmentally relevant conditions benzoic acid and its salts have very low acute and chronic toxicity to aquatic organisms. Aquatic toxicity is affected by pH levels for aquatic organisms

B. Aquatic Toxicity

Acute Studies

Table 3 lists the results of acute aquatic toxicity studies conducted on read-across substance benzoic acid (CAS RN [redacted]

Table 3: Acute aquatic toxicity studies on benzoic acid (CAS RN [redacted]

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Lepomis macrochirus	96-hr LC_{50}	44.6	2	OECD SIDS; ECHA
Oncorhynchus mykiss	96-hr LC_{50}	47.3	2	ECHA
Daphnia magna	48-hr EC_{50}	≥ 100	2	OECD SIDS; ECHA
Raphidocelis subcapitata	72-hr EC_{50}	33	2	ECHA

In most studies available the pH of the test medium was adjusted to neutral or slightly basic level. In a study by Lee (2009) reported in ECHA, the test substance's effects on growth of algae were tested at unadjusted pH and at pH 6.5, 7 and 7.5. Based on the endpoint of algal growth rate, the 48-hour EC_{50} values for the aforementioned pH values were reported as 83.3, 207.5, 342.8, and 37.1 mg/L, respectively (ECHA) [Kl.score=2]. These results indicate that neutralization of pH levels will reduce the acute toxicity of benzoic acid because the algal growth rate was impacted less at the higher pH levels compared to the lower pH levels. In most of the available studies, the pH of the test medium was adjusted to neutral or slightly basic level. Therefore, it is expected that the aquatic toxicity of benzoic acid under environmentally relevant conditions is correctly represented by the test conditions used in the aquatic toxicity studies that are listed above (ECHA) [Kl.score=2].

Chronic Studies

Table 4 lists the results of chronic aquatic toxicity studies conducted on read-across substance benzoic acid (CAS RN [redacted]

Table 4: Chronic aquatic toxicity studies on benzoic acid (CAS RN [redacted]

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Oncorhynchus mykiss	28-day EC_{50}	>120	2	ECHA
Daphnia magna	21-day EC_{50}	>25	2	ECHA
Anabaena inaequalis	14-day EC_{50}	>10	2	ECHA
Raphidocelis subcapitata	72-hr NOEC	7.5	2	ECHA

C. Sediment Toxicity

No studies are available. The read-across substance benzoic acid is readily biodegradable, it has a low bioaccumulation potential, and low acute toxicity to aquatic organisms. In addition to this, benzoic acid has a low log K_{ow}(1.88), so this chemical has a low potential to adsorb to organic particles and therefore exposure to the sediment compartment is expected to be low (ECHA) [Kl.score=2].

D. Terrestrial Toxicity

No studies are available. The read-across substance, benzoic acid, is readily biodegradable thus direct and indirect exposure to benzoic acid in the soil compartment is expected to be low. Because of the low bioaccumulation potential of the substance in aquatic and terrestrial organisms secondary poisoning is not considered to be a route of exposure that has to be further assessed for this substance (ECHA)

E. Calculation of PNEC

The PNEC calculations for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) or benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1)follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels. Acute $E(L)C_{50}$ values are available for fish (44.6 mg/L), *Daphnia* (>100 mg/L), and algae (33 mg/L). NOEC values from long-term studies are available for fish (120 mg/L), invertebrates (25 mg/L) and algae (7.5 mg/L). On the basis that the data consists of short-term and long-term results from three trophic levels, an assessment factor of 10 has been applied to the lowest reported NOEC value of 7.5 mg/L for algae. The $PNEC_{water}$ is 0.75 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 0.94 mg/kg sediment wet weight.

The calculations are as follows:

$$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$$
$$= (1.60/1280) \times 1000 \times 0.75$$
$$= 0.94 \text{ mg/kg}$$

Where:

$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)

BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]

$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$

$= 0.8 + [(0.2 \times 1.67/1000 \times 2400]$

$= 1.60\ m^3/m^3$

Where:

Kp_{sed} = solid-water partition coefficient (L/kg)

BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]

$Kp_{sed} = K_{oc} \times f_{oc}$

$= 41.7 \times 0.04$

$= 1.67$ L/kg

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The reported organic carbon partition coefficient (K_{oc}) value for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) is 41.7 L/kg (US EPA,2023) [Kl.score=2].

F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

<u>PNEC Soil</u>

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is <u>0.42 mg/kg soil dry weight</u>.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$

$= (0.83/1500) \times 1000 \times 0.75$

$= 0.42$ mg/kg

Where:

Kp_{soil} = soil-water partition coefficient (m^3/m^3)

BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]

$Kp_{soil} = K_{oc} \times f_{oc}$

$= 41.7 \times 0.02$

$= 0.834\ m^3/m^3$

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The reported organic carbon partition coefficient (K_{oc}) value for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) is 41.7 L/kg (US EPA,2023) [Kl.score=2].

F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Based on data available for read-across substance, benzoic acid, benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1) are readily biodegradable; thus, they do not meet the screening criteria for persistence.

Based on estimated log K_{ow} value of -1.36 for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1),benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1)do not meet the screening criteria for bioaccumulation.

The lowest chronic NOEC for the read-across substance, benzoic acid, is >0.1 mg/L. The acute $E(L)C_{50}$ values are >1 mg/L. Thus, benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1) do not meet the screening criteria for toxicity.

The overall conclusion is that benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1) are not PBT substances.

IX. CLASSIFICATION AND LABELLING

A. Classification

H315: Causes skin irritation
H318: Causes serious eye damage
H372: Causes damage to organs (lungs) through prolonged exposure by inhalation

B. Labelling

Danger

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

<u>Eye Contact</u>

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.

<u>Skin Contact</u>

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention.

Ingestion

Rinse mouth with water and then drink a glass of water. Get medical attention. Never give anything by mouth to an unconscious person.

B. Firefighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Keep product and empty container away from heat and sources of ignition. May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon dioxide.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Handle in accordance with good industrial hygiene and safety practice.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

For large amounts: dike spillage and pump off product. For residues: pick up with suitable absorbent material. Dispose of contaminated material as prescribed.

D. Storage and Handling

General Handling

Keep product and empty container away from heat and sources of ignition. Ensure adequate ventilation, especially in confined areas.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

There are no workplace exposure standards for benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1) in Australia..

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Respiratory protection is not required.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is recommended. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

Benzoic acid, 2-chloro-4-fluoro-, sodium salt (1:1) and benzoic acid, 2-chloro-5-fluoro-, sodium salt (1:1) is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

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U.S. Environmental Protection Agency [US EPA]. (2023). Comptox Chemicals Dashboard. https://comptox.epa.gov/dashboard/chemical/details/DTXSID501015322 (accessed November 29, 2023) Sodium 2-chloro-4-fluorobenzoate

BENZOIC ACID, 3-FLUORO-2-METHYL-, SODIUM SALT (1:1)

This dossier on benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) presents the most critical studies pertinent to the risk assessment of benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Sodium 3-fluoro-2-methylbenzoate

CAS RN: [redacted]

Molecular formula: $C_8H_6FNaO_2$

Molecular weight: 176.122 g/mol

Synonyms: benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1)

SMILES: [Na+].CC1=C(C=CC=C1F)C([O-])=O

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the physico-chemical Properties of benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1)

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Liquid	-	SDS
Melting Point	122°C @ 101.3 kPa	2	US EPA Comptox
Boiling Point	136°C @ 101.3 kPa	2	US EPA Comptox
Density	154,000 kg/m^3@ 25°C	2	US EPA Comptox
Vapour Pressure	0.00517 Pa @ 25°C	2	US EPA Comptox
Partition Coefficient (log K_{ow})	0.193 @ 25°C	2	US EPA Comptox
Water Solubility	1328 g/L @ 25°C	2	US EPA Comptox
Dissociation constant (pKa)	3.86 @ 25°C	2	US EPA Comptox
Flash Point	Not available	-	-

Property	Value	Klimisch Score	Reference
Auto flammability	Not available	-	-
Viscosity	Not available	-	-
Henry's Law Constant	Not available	-	-

Benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) is soluble in water, and it will dissociate completely in water to form benzoic acid (Kneubehl *et al.*, 2003).

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) is readily biodegradable and is not expected to bioaccumulate. This chemical has a low potential to adsorb to soil or sediment.

B. Partitioning

The pKa value for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) is 3.86 (US EPA, 2023). [Kl.score=2]. This value indicates that this compound will exist almost entirely in the anion form in the environment and anions generally do not adsorb more strongly to soils containing organic carbon and clay than their neutral counterparts. Volatilization from moist soil is not expected because the compound exists as an anion and anions do not volatilize.

Benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) dissociates completely in water to form benzoic acid, a naturally occurring compound.

C. Biodegradation

No experimental data are available for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1). Similar to read-across substance, benzoic acid, this chemical is expected to be readily biodegradable both aerobically and anaerobically (OECD SIDS). Some phototransformation of benzoic acid may also be possible in water (ECHA) [Kl.score=2].

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

D. Environmental Distribution

The reported organic carbon partition coefficient (Koc) value for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) is 45.7 L/kg (US EPA, 2023) [Kl.score=2]. Thus, the potential for adsorption to soil is expected to be low and it is expected to have a very high mobility.

Likewise, the Koc value for this chemical along with its high water solubility value (1,328 g/L) indicates that this chemical will likely partition into the water column, if released to water, and not adsorb to suspended solids or sediments.

E. Bioaccumulation

No experimental data are available for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1). This chemical has a low potential for bioaccumulation based on a log octanol water partition coefficient (Kow) value of 0.193 and a bioconcentration factor (BCF) value of 4.37 L/kg (US EPA, 2023) [Kl.score=2].

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

There are no experimental data for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1). Read-across substances benzoic acid (CAS RN [redacted] and sodium benzoate (CAS RN [redacted] were used as surrogates for the hazard assessment. Benzoic acid is metabolized to hippuric acid following oral ingestion or dermal absorption and it is not expected to accumulate in the body. Benzoic acid is not expected to be absorbed via inhalation. Based on data for the read-across substances, benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) is considered to have low acute oral, inhalation, and dermal toxicity. It is considered irritating to the skin and severely irritating/corrosive to the eye. It is not considered skin sensitisers. It has low oral repeat dose toxicity, it is not genotoxic nor carcinogenic. It is not a reproductive or developmental toxicant.

B. Metabolism

No experimental data are available for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1). Overall, there are signs of systemic absorption via oral and dermal exposures to benzoic acid (CAS RN [redacted] but there is no evidence of target organs or of excretion. After oral ingestion and dermal absorption, benzoic acid will be metabolised to hippuric acid. Experiments on the distribution and elimination in the rat have shown no accumulation of benzoic acid in the body (ECHA) [Kl.score=2].

There is no information available on absorption via inhalation. The relatively low vapour pressure/high boiling point indicate that the test substance will not be available for inhalation as vapour. The particle size distribution of the test substance (1.5% will be present as <425 µm) indicates that there are no inhalable/respirable particles present. Based on these properties, no respiratory exposure and hence no inhalation absorption is to be expected (ECHA).

C. Acute Toxicity

<u>Oral</u>

No experimental data are available for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1).

An OECD Guideline 401 (Acute Oral Toxicity) range finding study was conducted using male and female Swiss albino mice exposed to 500, 1000, 2500, 5000, 7500 mg/kg or 1500, 2000, 2500, 3000, 3500, or 4000 mg/kg benzoic acid (CAS RN [redacted] via oral gavage. Benzoic acid produced signs of acute intoxication at doses > 2000 mg/kg bw/day. The LD_{50} was set at 2250 mg/kg bw/day (ECHA) [Kl.score=2].

An OECD Guideline 401 (Acute Oral Toxicity) studied was conducted using male and female Spartan rats exposed to 500, 1250, 1984, 3150, or 5000 mg/kg benzoic acid (CAS RN [redacted] via unspecified oral exposure. The acute oral toxicity LD_{50}s of test substance in male, female and combined male and female rats were 2742 mg/kg, 2360 mg/kg and 2565 mg/kg respectively (ECHA) [Kl.score=2].

Inhalation

Five male and female Spartan rats were exposed to a dynamic atmosphere containing 12200 mg/m^3 of benzoic acid (CAS RN [redacted] for four hours. The LC_{50} was reported as >12,200 mg/m^3 (ECHA) [Kl.score=2].

Dermal

Male and female New Zealand White rabbits were exposed to 2000 mg/kg of benzoic acid (CAS RN [redacted] via semiocclusive exposure for 24 hours. The LD_{50} was reported as > 2000 mg/kg bw/day (ECHA) [Kl.score=2].

D. Irritation

Skin

No experimental data are available for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1).

Hartley guinea pigs, Sprague-Dawley rats, and ICR mice were exposed to 50µL (guinea pigs), 20µL (rats), or 5µL (mice) of benzoic acid (CAS RN [redacted] for three hours. In the guinea pig, benzoic acid produced erythema and swelling of the earlobe. Benzoic acid did not produce reactions in the mouse and rat ear. This indicates that guinea pigs are more sensitive than either rat or mouse to irritant effects from the substance. Benzoic acid is considered irritating to the skin of guinea pigs, rats, and mice (ECHA) [Kl.score=2].

Eye

No experimental data are available for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1).

An EU Method B.5 (Acute Toxicity: Eye Irritation/Corrosion) test was conducted using New Zealand White rabbits exposed to 0.1mL of benzoic acid (CAS RN [redacted] for 21 days. Benzoic acid was reported as severely irritating to rabbit eyes (ECHA) [Kl.score=1].

E. Sensitisation

No experimental data are available for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1).

A mouse local lymph node assay was conducted using female CBA mice exposed to 5%, 10% or 20% benzoic acid. The Stimulation index (SI) values calculated for benzoic acid (CAS RN [redacted] concentrations 5%, 10% and 20% were 0.8, 0.9 and 0.8 respectively. There was no indication that benzoic acid could elicit an SI >=2 when tested on higher concentrations. Therefore, benzoic acid was not considered a skin sensitizer (ECHA) [Kl.score=2].

F. Repeated Dose Toxicity

Oral

Male and female Fischer 344 rats were exposed to 1% or 2% sodium benzoate daily via oral feed for 18-24 months. No adverse clinical signs directly attributable to sodium benzoate (CAS RN [redacted] were observed in treated animals. Differences in the average body weight, and mortality rates between treated and control groups were negligible. The results of the statistical test for dose-related trends were significant ($p<0.05$). Although a variety of tumours occurred among sodium

benzoate treated and control rats of each sex, tumours appearing in treated rats were similar in type and number to those in controls. It was concluded that no evidence of carcinogenicity in rats from sodium benzoate was demonstrated. The NOAEL was reported as 1000 mg/kg bw/day (ECHA) [Kl.score=2].

Inhalation

An OECD Guideline 412 (Subacute Inhalation Toxicity: 28-Day Study) was conducted using male and female Sprague-Dawley rats exposed to 25, 250, 1200 mg/m^3 or 310, 2200, 16500 mg/m^3 or 20, 200, 2000 mg/m^3 benzoic acid (CAS RN [redacted] via whole body inhalation dust for four weeks. All test concentrations induced local effects: nasal redness and discharge and pulmonary fibrosis and inflammatory cell infiltrates in the lungs that can be related to the irritant properties of benzoic acid. No systemic effects were noted at 25 mg/m^3. At 250 mg/m^3 a very slight decrease in absolute kidney weight was seen in females only (body weight was also slightly lower (not significantly) than in control females). At the highest dose level mortality, decreased body weights as well as decreased liver kidney and lung weights were reported. No histopathological findings except in the lungs were reported. The NOAEL for local effects is < 25 mg/m^3; The NOAEL for systemic effects is 250 mg/m^3 (ECHA) [Kl.score=1].

Dermal

An EPA OPP 82-2 (Repeated Dose Dermal Toxicity 21/28 day) study was conducted using male and female New Zealand White rabbits exposed to 100, 500, 2500 mg/kg benzoic acid (CAS RN [redacted] via semiocclusive exposure for 6 hours. The NOAEL was reported as > 2500 mg/kg. Very slight dermal irritation was noted for one rabbit at this dosage level. No compound related changes were seen in general behaviour and appearance, body weight, clinical laboratory tests, organ weights or survival (ECHA) [Kl.score=1].

G. Genotoxicity

No experimental data are available for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1).

In Vitro Studies

The in vitro genotoxicity studies on benzoic acid are presented in Table 2.

Table 2: *In vitro* genotoxicity studies on benzoic acid

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
In vitro mammalian cell micronucleus test: mouse lymphoma L5178Y cells	-	-	2	ECHA
In vitro mammalian chromosome aberration test: Chinese hamster fibroblast cell line CHL	-	NA	2	ECHA

*+, positive; -, negative; NA: not applicable

In Vivo Studies

An OECD Guideline 475 (Mammalian Bone Marrow Chromosome Aberration Test) was conducted using male Sprague-Dawley rats exposed to 50, 500, 5000 mg/kg sodium benzoate (CAS RN 532-32-

1) via oral gavage for 96 hours. Sodium benzoate did not produce any detectable significant increase in the number of aberrations in bone marrow metaphase chromosomes of rats administered orally at the dosage levels employed in this study. It was concluded that sodium benzoate does not induce genetic toxicity (ECHA) [Kl.score=2].

H. Carcinogenicity

Oral

No experimental data are available for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1).

Male and female Fischer 344 rats were exposed to 1% or 2% sodium benzoate (CAS RN [redacted] via oral feed for 18-24 months. No adverse clinical signs directly attributable sodium benzoate exposure were observed in treated animals. Differences in the average body weight, and mortality rates between treated and control groups were negligible. The results of the statistical test for dose-related trends were significant ($p<0.05$). Although a variety of tumours occurred among test and control rats of each sex, tumours appearing in treated rats were similar in type and number to those in controls. It was concluded that no evidence of carcinogenicity was observed in rats exposed to sodium benzoate. The NOAEL was reported as 1000 mg/kg bw/day (ECHA) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

There are no studies available.

I. Reproductive Toxicity

A multi-generation reproductive toxicity study (OECD Guideline 416 Two Generation Reproduction) was conducted using rats exposed to 0, 0.5, or 1 mg/kg bw/day benzoic acid (CAS RN [redacted] via oral feed. The rats were treated 11-12 weeks prior to mating and through 4 generations. Feed consumption, body weights, and weight gain were unaffected by exposure to benzoic acid at concentrations up to 1% in the diet. Overall, the dose level from the 1% diet for the entire premating period was approximately 900 and 1176 mg/kg/day for the male and female rats, respectively. There was an unexplained statistically significant increase in the lifespan of rats in the 0.5% exposure group (i.e., a higher percentage of rats lived longer). There were no differences between the groups exposed to benzoic acid and the control group for fertility measures, delayed sexual maturity, total number of pups born, pup survival, onset of reproductive senescence or litter size. In addition, organ weights and histopathologic findings were similar for all groups. Under conditions of this study, there were no dose-related adverse effects on either reproductive or developmental parameters in both sexes of rats fed 1% benzoic acid in the diet over four generations (ECHA) [Kl.score=2].

J. Developmental Toxicity

Oral

An OECD Guideline 414 (Prenatal Developmental Toxicity) study was conducted using Wistar rats exposed to 0, 699, 1306, 1874, or 965 mg/kg bw/day (0, 1%, 2%, 4%, or 8%) of sodium benzoate(CAS RN [redacted] via oral feed. Sodium benzoate (CAS RN [redacted] in the diet to pregnant rats throughout the entire gestation period, delivery and weaning had no adverse effects on any

maternal or foetal parameters examined in this study and did not cause developmental delays. The number of abnormalities seen in either soft or skeletal tissues of foetuses and weanlings in the 1 and 2% test groups did not significantly differ from the number occurring spontaneously in offspring of the control group. The NOEL for maternal and developmental toxicity was considered to be 1306 mg/kg bw/day (2%) (ECHA) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

There are no studies available.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1)follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

A two-year dietary study in rats has been conducted on read-across substance sodium benzoate (CAS RN [redacted] The NOAEL from this study is 1,000 mg/kg-day based on based on no adverse effects at the highest dose tested. The NOAEL of 1,000 mg/kg-day will be used to derive an oral reference dose and drinking water guidance value for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1)

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 1000/(10 × 10 × 1 × 1 × 1) = 1000/100 = 10 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (10 × 70 × 0.1)/2 = 35 mg/L

B. Cancer

No experimental data are available for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1). However, it was concluded that no evidence of carcinogenicity was observed in rats exposed to sodium benzoate.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) is not expected to exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

However, it is considered corrosive

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Limited environmental effects data are available for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1). It is expected to have similar environmental effects to read-across substance benzoic acid. Under environmentally relevant conditions benzoic acid and its salts have very low acute and chronic toxicity to aquatic organisms. Aquatic toxicity is affected by pH levels for aquatic organisms.

B. Aquatic Toxicity

Acute Studies

Table 3 lists the results of acute aquatic toxicity studies conducted on read-across substance benzoic acid.

Table 3: Acute aquatic toxicity studies on benzoic acid

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Lepomis macrochirus	96-hr LC_{50}	44.6	2	OECD SIDS; ECHA
Oncorhynchus mykiss	96-hr LC_{50}	47.3	2	ECHA
Daphnia magna	48-hr EC_{50}	≥ 100	2	OECD SIDS; ECHA
Raphidocelis subcapitata	72-hr EC_{50}	33	1	ECHA

In most studies available the pH of the test medium was adjusted to neutral or slightly basic level. In a study by Lee (2009) reported in ECHA the test substance's effects on growth of algae were tested at unadjusted pH and at pH 6.5, 7 and 7.5. Based on the endpoint of algal growth rate, the 48-hour EC_{50} values for the aforementioned pH values were reported as 83.3, 207.5, 342.8, and 37.1 mg/L,

respectively (ECHA) [Kl.score=2]. These results indicate that neutralization of pH levels will reduce the acute toxicity of benzoic acid because the algal growth rate was impacted less at the higher pH levels compared to the lower pH levels. In most of the available studies the pH of the test medium was adjusted to neutral or slightly basic level. Therefore, it is expected that the aquatic toxicity of benzoic acid under environmentally relevant conditions is correctly represented by the test conditions used in the aquatic toxicity studies that are listed above (ECHA) [Kl.score=2].

Chronic Studies

Table 4 lists the results of chronic aquatic toxicity studies conducted on read-across substance benzoic acid.

Table 4: Chronic aquatic toxicity studies on benzoic acid

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Oncorhynchus mykiss	28-day EC_{50}	>120	2	ECHA
Daphnia magna	21-day EC_{50}	>25	2	ECHA
Anabaena inaequalis	14-day EC_{50}	>10	2	ECHA
Raphidocelis subcapitata	72-hr NOEC	7.5	2	ECHA

C. Sediment Toxicity

No studies are available. The read-across substance benzoic acid is readily biodegradable, it has a low bioaccumulation potential, and low acute toxicity to aquatic organisms. In addition to this, benzoic acid has a low log K_{ow} (1.88), so this chemical has a low potential to adsorb to organic particles and therefore exposure to the sediment compartment is expected to be low (ECHA) [Kl.score=2].

D. Terrestrial Toxicity

No studies are available. The read-across substance benzoic acid is readily biodegradable, thus direct and indirect exposure to benzoic acid in the soil compartment is expected to be low. Because of the low bioaccumulation potential of the substance in aquatic and terrestrial organisms secondary poisoning is not considered to be a route of exposure that must be further assessed for this substance (ECHA).

E. Calculation of PNEC

The PNEC calculations for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels. Acute $E(L)C_{50}$ values are available for fish (44.6 mg/L), *Daphnia* (>100 mg/L), and algae (33 mg/L). NOEC values from long-term studies are available for fish (120 mg/L), invertebrates (25 mg/L) and algae (7.5 mg/L). On the basis that the data consists of short-term and long-term results from three trophic levels, an assessment factor of 10 has been applied to the lowest reported NOEC value of 7.5 mg/L for algae. The $PNEC_{water}$ is 0.75 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 0.98 mg/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (1.68/1280) \times 1000 \times 0.75$
$= 0.98$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 1.83/1000 \times 2400]$
$= 1.68\ m^3/m^3$

Where:
Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 45.7 \times 0.04$
$= 1.83$ L/kg

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) was reported as 45.7 L/kg(US EPA, 2023)
F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 0.46 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (0.914/1500) \times 1000 \times 0.75$
$= 0.46$ mg/kg

Where:
Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]
$Kp_{soil} = K_{oc} \times f_{oc}$
$= 45.7 \times 0.02$
$= 0.914\ m^3/m^3$

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) was reported as 45.7 L/kg (US EPA, 2023) [Kl.score=2]

F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Based on data available for read-across substance benzoic acid, benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) is readily biodegradable; thus, it does not meet the screening criteria for persistence.

Based on the estimated BCF value of 4.37 L/kg, benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) does not meet the screening criteria for bioaccumulation.

The lowest chronic NOEC for read-across substance benzoic acid is >0.1 mg/L. The acute $E(L)C_{50}$ values are >1 mg/L. Thus, benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) does not meet the screening criteria for toxicity.

The overall conclusion is that benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

H315: Causes skin irritation
H318: Causes serious eye damage
H372: Causes damage to organs (lungs) through prolonged exposure by inhalation

B. Labelling

Danger

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

<u>Eye Contact</u>

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention.

Ingestion

Rinse mouth with water and then drink a glass of water. Get medical attention. Never give anything by mouth to an unconscious person.

B. Firefighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Keep product and empty container away from heat and sources of ignition. May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon dioxide.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Handle in accordance with good industrial hygiene and safety practice.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

For large amounts: dike spillage and pump off product. For residues: pick up with suitable absorbent material. Dispose of contaminated material as prescribed.

D. Storage and Handling

General Handling

Keep product and empty container away from heat and sources of ignition. Ensure adequate ventilation, especially in confined areas.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

There no workplace exposure standards for benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) in Australia..

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Respiratory protection is not required.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is recommended. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

Benzoic acid, 3-fluoro-2-methyl-, sodium salt (1:1) is not expected to be considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

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U.S. Environmental Protection Agency [USEPA]. (2023). Comptox Chemicals Dashboard. https://comptox.epa.gov/dashboard/chemical/details/DTXSID801015395 (accessed November 28, 2023) Sodium 3-fluoro-2-methyl-benzoate

BENZOIC ACID, 4-FLUORO-, SODIUM SALT (1:1)
BENZOIC ACID, 3-FLUORO-, SODIUM SALT (1:1)

This dossier on benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1) presents the most critical studies pertinent to the risk assessment of these substances in their use in coal seam gas extraction activities. These halogenated sodium benzoate salts have been assessed as a group. Limited information was available for benzoic acid, 3-fluoro-, sodium salt (1:1). However, it is expected to have similar environmental concerns as benzoic acid, 4-fluoro-, sodium salt (1:1). Therefore, information provided in this dossier is based on benzoic acid, 4-fluoro-, sodium salt (1:1) and read-across substance benzoic acid (CAS RN[redacted]

This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Sodium 4-fluorobenzoate

CAS RN: [redacted]

Molecular formula: $C_7H_4FNaO_2$

Molecular weight: 162.09 g/mol

Synonyms: benzoic acid, 4-fluoro-, sodium salt (1:1)

SMILES: [Na+].[O-]C(=O)C1=CC=C(F)C=C1

Chemical Name (IUPAC): Sodium 3-fluorobenzoate

CAS RN: [redacted]

Molecular formula: $C_7H_4FNaO_2$

Molecular weight:162.1 g/mol

Synonyms: benzoic acid, 3-fluoro-, sodium salt (1:1); benzoic acid, m-fluoro-, sodium salt; benzoic acid, 3-fluoro-, sodium salt; sodium m-fluorobenzoate; sodium 3-fluorobenzoate

SMILES: [Na+].[O-]C(=O)C1=CC(F)=CC=C1

II. PHYSICO-CHEMICAL PROPERTIES

Key physical and chemical properties for benzoic acid, 4-fluoro-, sodium salt (1:1) are shown in Table 1. Physico-chemical property data are not available for benzoic acid, 3-fluoro-, sodium salt (1:1).

Table 1: Overview of the physico-chemical properties of benzoic acid, 4-fluoro-, sodium salt (1:1)

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Liquid	-	SDS
Melting Point	164°C @ 101.3 kPa	2	US EPA Comptox
Boiling Point	305°C @ 101.3 kPa	2	US EPA Comptox
Density	1,320 kg/m^3 (temperature not indicated)	-	US EPA Comptox
Vapour Pressure	0.518 Pa @ 25°C	2	US EPA Comptox
Partition Coefficient (log K_{ow})	0.138 @ 25°C	2	US EPA Comptox
Water Solubility	2.269 g/L @ 25°C	2	US EPA Comptox
Dissociation constant (pKa)	4.26 @ 25°C	2	US EPA Comptox
Flash Point	Not available	-	-
Auto flammability	Not available	-	-
Viscosity	Not available	-	-
Henry's Law Constant	Not available	-	-

Benzoic acid, 4-fluoro-, sodium salt (1:1) is water soluble, and it will dissociate completely to form benzoic acid (Kneubehl *et al.,* 2003).

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1) are readily biodegradable and they arenot expected to bioaccumulate. These chemicals have a low potential to adsorb to soil or sediment.

B. Partitioning

The pKa value for benzoic acid, 4-fluoro-, sodium salt (1:1) is 4.26 (US EPA, 2023) [Kl.score=2]. This value indicates that this compound will exist almost entirely in the anion form in the environment and anions generally do not adsorb more strongly to soils containing organic carbon and clay than their neutral counterparts. Volatilization from moist soil is not expected because the compound exists as an anion and anions do not volatilize.

Benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1) dissociate completely in water to form benzoic acid, a naturally occurring compound.

C. Biodegradation

No experimental data are available for benzoic acid, 4-fluoro-, sodium salt (1:1). Similar to read-across substance benzoic acid, this chemical is expected to be readily biodegradable both aerobically and anaerobically (OECD SIDS). Some phototransformation of benzoic acid may also be possible in water (ECHA) [Kl.score=2].

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

D. Environmental Distribution

The reported organic carbon partition coefficient (K_{oc}) value for benzoic acid, 4-fluoro-, sodium salt (1:1) is 44.7 L/kg (US EPA, 2023) [Kl.score=2]. Thus, the potential for adsorption to soil is expected to be low and it is expected to have very high mobility.

Likewise, the K_{oc} value for this chemical along with its highwater solubility value (2.3 g/L) indicates that this chemical will likely partition into the water column, if released to water, and not adsorb to suspended solids or sediments

E. Bioaccumulation

No experimental data are available for benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1). This chemical has a low potential for bioaccumulation based on a log octanol water partition coefficient (K_{ow}) value of 0.138 and a bioconcentration factor (BCF) value of 4.79 L/kg (US EPA, 2023) [Kl.score=2].

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

There are no experimental data for benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1). Read-across substances benzoic acid (CAS RN [redacted] and sodium benzoate (CAS RN [redacted] were used as surrogates for the hazard assessment. Benzoic acid is metabolized to hippuric acid following oral ingestion or dermal absorption and it is not expected to accumulate in the body. Based on data for the read-across substances, benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1) are not expected to be absorbed via inhalation. They are expected to have low acute oral, inhalation, and dermal toxicity. They are considered irritating to the skin and severely irritating/corrosive to the eye. They are not considered skin sensitisers. They have low oral repeat dose toxicity, are not genotoxic nor carcinogenic. They are not a reproductive or developmental toxicant.

B. Metabolism

No experimental data are available for benzoic acid, 4-fluoro-, sodium salt (1:1). Overall, there are signs of systemic absorption via oral and dermal exposures to benzoic acid but there is no evidence of target organs or of excretion. After oral ingestion and dermal absorption, benzoic acid will be metabolised to hippuric acid. Experiments on the distribution and elimination in the rat have shown no accumulation of benzoic acid in the body (ECHA) [Kl.score=2].

There is no information available on absorption via inhalation. The relatively low vapour pressure/high boiling point indicate that the test substance will not be available for inhalation as

vapour. The particle size distribution of the test substance (1.5% will be present as <425 µm) indicates that there are no inhalable/respirable particles present. Based on these properties, no respiratory exposure and hence no inhalation absorption is to be expected (ECHA).

C. Acute Toxicity

Oral

No experimental data are available for benzoic acid, 4-fluoro-, sodium salt (1:1). An OECD Guideline 401 (Acute Oral Toxicity) range finding study was conducted using male and female Swiss albino mice exposed to 500, 1000, 2500, 5000, 7500 mg/kg or 1500, 2000, 2500, 3000, 3500, or 4000 mg/kg benzoic acid (CAS RN [redacted] via oral gavage. Benzoic acid produced signs of acute intoxication at doses > 2000 mg/kg bw/day. The LD_{50} was set at 2250 mg/kg bw/day (ECHA) [Kl.score=2].

An OECD Guideline 401 (Acute Oral Toxicity) studied was conducted using male and female Spartan rats exposed to 500, 1250, 1984, 3150, or 5000 mg/kg benzoic acid (CAS RN [redacted] via unspecified oral exposure. The acute oral toxicity LD_{50}s of test substance in male, female and combined male and female rats were 2742 mg/kg, 2360 mg/kg and 2565 mg/kg respectively (ECHA) [Kl.score=2].

Inhalation

Five male and female Spartan rats were exposed to a dynamic atmosphere containing 12200 mg/m^3 of benzoic acid (CAS RN [redacted] for four hours. The LC_{50} was reported as >12,200 mg/m^3 (ECHA) [Kl.score=2].

Dermal

Male and female New Zealand White rabbits were exposed to 2000 mg/kg of benzoic acid (CAS RN [redacted] via semiocclusive exposure for 24 hours. The LD_{50} was reported as > 2000 mg/kg bw/day (ECHA) [Kl.score=2].

D. Irritation

Skin

No experimental data are available for benzoic acid, 4-fluoro-, sodium salt (1:1).

Hartley guinea pigs, Sprague-Dawley rats, and ICR mice were exposed to 50 µL (guinea pigs), 20 µL (rats), or 5 µL (mice) of benzoic acid (CAS RN [redacted] for three hours. In the guinea pig, benzoic acid produced erythema and swelling of the earlobe. Benzoic acid did not produce reactions in the mouse and rat ear. This indicates that guinea pigs are more sensitive than either rat or mouse to irritant effects from the substance. Benzoic acid is considered irritating to the skin of guinea pigs, rats, and mice (ECHA) [Kl.score=2].

Eye

No experimental data are available for benzoic acid, 4-fluoro-, sodium salt (1:1).

An EU Method B.5 (Acute Toxicity: Eye Irritation/Corrosion) test was conducted using New Zealand White rabbits exposed to 0.1mL of benzoic acid (CAS RN [redacted] for 21 days. Benzoic acid was reported as severely irritating to rabbit eyes (ECHA) [KL.score=1].

E. Sensitisation

No experimental data are available for benzoic acid, 4-fluoro-, sodium salt (1:1).

A mouse local lymph node assay was conducted using female CBA mice exposed to 5%, 10% or 20% benzoic acid. The Stimulation index (SI) values calculated for benzoic acid (CAS RN [redacted] concentrations 5%, 10% and 20% were 0.8, 0.9 and 0.8 respectively. There was no indication that benzoic acid could elicit an SI >=2 when tested on higher concentrations. Therefore, benzoic acid was not considered a skin sensitizer (ECHA) [Kl.score=2].

F. Repeated Dose Toxicity

Oral

Male and female Fischer 344 rats were exposed to 1% or 2% sodium benzoate daily via oral feed for 18-24 months. No adverse clinical signs directly attributable to sodium benzoate (CAS RN [redacted] were observed in treated animals. Differences in the average body weight, and mortality rates between treated and control groups were negligible. The results of the statistical test for dose-related trends were significant ($p<0.05$). Although a variety of tumours occurred among sodium benzoate treated and control rats of each sex, tumours appearing in treated rats were similar in type and number to those in controls. It was concluded that no evidence of carcinogenicity in rats from sodium benzoate was demonstrated. The NOAEL was reported as 1000 mg/kg bw/day (ECHA) [Kl.score=2].

Inhalation

An OECD Guideline 412 (Subacute Inhalation Toxicity: 28-Day Study) was conducted using male and female Sprague-Dawley rats exposed to 25, 250, 1200 mg/m3 or 310, 2200, 16500 mg/m^3 or 20, 200, 2000 mg/m^3 benzoic acid (CAS RN [redacted] via whole body inhalation dust for four weeks. All test concentrations induced local effects: nasal redness and discharge and pulmonary fibrosis and inflammatory cell infiltrates in the lungs that can be related to the irritant properties of benzoic acid. No systemic effects were noted at 25 mg/m^3. At 250 mg/m^3 a very slight decrease in absolute kidney weight was seen in females only (body weight was also slightly lower (not significantly) than in control females). At the highest dose level mortality, decreased body weights as well as decreased liver kidney and lung weights were reported. No histopathological findings except in the lungs were reported. The NOAEL for local effects is < 25 mg/m^3; The NOAEL for systemic effects is 250 mg/m^3 (ECHA) [Kl.score =1].

Dermal

An EPA OPP 82-2 (Repeated Dose Dermal Toxicity 21/28 day) study was conducted using male and female New Zealand White rabbits exposed to 100, 500, 2500 mg/kg benzoic acid (CAS RN [redacted] via semiocclusive exposure for 6 hours. The NOAEL was reported as > 2500 mg/kg. Very slight dermal irritation was noted for one rabbit at this dosage level. No compound related changes were seen in general behavior and appearance, body weight, clinical laboratory tests, organ weights or survival. (ECHA) [Kl.score=1].

G. Genotoxicity

No experimental data are available for benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1).

In Vitro Studies

The *in vitro* genotoxicity studies on benzoic acid are presented in Table 2.

Table 2: *In vitro* genotoxicity studies on benzoic acid

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
In vitro mammalian cell micronucleus test mouse lymphoma L5178Y cells	-	-	2	ECHA
In vitro mammalian chromosome aberration test Chinese hamster fibroblast cell line CHL	-	NA	2	ECHA

*+, positive; -, negative; NA: not applicable

In Vivo Studies

An OECD Guideline 475 (Mammalian Bone Marrow Chromosome Aberration Test) was conducted using male Sprague-Dawley rats exposed to 50, 500, 5000 mg/kg sodium benzoate (CAS RN [redacted] via oral gavage for 96 hours. Sodium benzoate did not produce any detectable significant increase in the number of aberrations in bone marrow metaphase chromosomes of rats administered orally at the dosage levels employed in this study. It was concluded that sodium benzoate does not induce genetic toxicity (ECHA) [Kl.score=2].

H. Carcinogenicity

Oral

No experimental data are available for benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1).

Male and female Fischer 344 rats were exposed to 1% or 2% sodium benzoate (CAS RN [redacted] via oral feed for 18-24 months. No adverse clinical signs directly attributable sodium benzoate exposure were observed in treated animals. Differences in the average body weight, and mortality rates between treated and control groups were negligible. The results of the statistical test for dose-related trends were significant ($p<0.05$). Although a variety of tumors occurred among test and control rats of each sex, tumors appearing in treated rats were similar in type and number to those in controls. It was concluded that no evidence of carcinogenicity was observed in rats exposed to sodium benzoate. The NOAEL was reported as 1000 mg/kg bw/day (ECHA) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

There are no studies available.

I. Reproductive Toxicity

A multi-generation reproductive toxicity study (OECD Guideline 416 Two Generation Reproduction) was conducted using rats exposed to 0, 0.5, or 1 mg/kg bw/day benzoic acid (CAS RN [redacted] via oral feed. The rats were treated 11-12 weeks prior to mating and through 4 generations. Feed consumption, body weights, and weight gain were unaffected by exposure to benzoic acid at concentrations up to 1% in the diet. Overall, the dose level from the 1% diet for the entire premating period was approximately 900 and 1176 mg/kg/day for the male and female rats, respectively. There was an unexplained statistically significant increase in the lifespan of rats in the 0.5% exposure group (, i.e., a higher percentage of rats lived longer). There were no differences between the groups exposed to benzoic acid and the control group for fertility measures, delayed sexual maturity, total number of pups born, pup survival, onset of reproductive senescence or litter size. In addition, organ weights and histopathologic findings were similar for all groups. Under conditions of this study, there were no dose-related adverse effects on either reproductive or developmental parameters in both sexes of rats fed 1% benzoic acid in the diet over four generations (ECHA) [Kl.score =2].

J. Developmental Toxicity

Oral

An OECD Guideline 414 (Prenatal Developmental Toxicity) study was conducted using Wistar rats exposed to 0, 699, 1306, 1874, or 965 mg/kg bw/day (0, 1%, 2%, 4%, or 8%) of sodium benzoate (CAS RN [redacted] via oral feed. Sodium benzoate (CAS RN [redacted] in the diet to pregnant rats throughout the entire gestation period, delivery and weaning had no adverse effects on any maternal or foetal parameters examined in this study and did not cause developmental delays. The number of abnormalities seen in either soft or skeletal tissues of foetuses and weanlings in the 1% and 2% test groups did not significantly differ from the number occurring spontaneously in offspring of the control group. The NOEL for maternal and developmental toxicity was considered to be 1306 mg/kg bw/day (2%) (ECHA) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

There are no studies available.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1) follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

A two-year dietary study in rats has been conducted on read-across substance sodium benzoate (CAS RN [redacted] The NOAEL from this study is 1,000 mg/kg-day based on based on no adverse effects at the highest dose tested. The NOAEL of 1,000 mg/kg-day will be used to derive an oral

reference dose and drinking water guidance value for benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1).

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / (UF_A x UF_H x UF_L x UF_{Sub} x UF_D)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 1000/(1 x 10 x 1 x 1 x 1) = 1000/100 = 10 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) x (human weight) x (proportion of intake from water) / (volume of water consumed) x (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) x (human weight) x (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (10 x 70 x 0.1)/2 = 35mg/L

B. Cancer

There are no experimental data are available for benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1). However, it was concluded that no evidence of carcinogenicity was observed in rats exposed to sodium benzoate (CAS RN [redacted]

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1) do not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

However, they are considered corrosive.

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

No experimental data are available for benzoic acid, 4-fluoro-, sodium salt (1:1) or benzoic acid, 3-fluoro-, sodium salt (1:1). They are expected to have similar environmental effects to read-across substance benzoic acid (CAS RN [redacted] Under environmentally relevant conditions benzoic acid and its salts have very low acute and chronic toxicity to aquatic organisms. Aquatic toxicity is affected by pH levels for aquatic organisms.

B. Aquatic Toxicity

Acute Studies

Table 3 lists the results of acute aquatic toxicity studies conducted on read-across substance benzoic acid (CAS RN [redacted]

Table 3: Acute aquatic toxicity studies on benzoic acid (CAS RN [redacted]

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Lepomis macrochirus	96-hr LC_{50}	44.6	2	OECD SIDS; ECHA
Salmo gairdneri	96-hr LC_{50}	47.3	-	OECD SIDS
Oncorhynchus mykiss	96-hr LC_{50}	47.3	2	ECHA
Daphnia magna	48-hr EC_{50}	≥ 100	2	OECD SIDS; ECHA
Raphidocelis subcapitata	72-hr EC_{50}	33	2	ECHA

In most studies available the pH of the test medium was adjusted to neutral or slightly basic level. In a study by Lee (2009) reported in ECHA the test substance's effects on growth of algae were tested at unadjusted pH and at pH 6.5, 7 and 7.5. Based on the endpoint of algal growth rate, the 48-hour EC50 values for the aforementioned pH values were reported as 83.3, 207.5, 342.8, and 37.1 mg/L, respectively (ECHA) [Kl.score=2]. These results indicate that neutralization of pH levels will reduce the acute toxicity of benzoic acid because the algal growth rate was impacted less at the higher pH levels compared to the lower pH levels. In most of the available studies the pH of the test medium was adjusted to neutral or slightly basic level. Therefore, it is expected that the aquatic toxicity of benzoic acid under environmentally relevant conditions is correctly represented by the test conditions used in the aquatic toxicity studies that are listed above (ECHA) [Kl.score=2].

Chronic Studies

Table 4 lists the results of chronic aquatic toxicity studies conducted on read-across substance benzoic acid (CAS RN [redacted]

Table 4: Chronic aquatic toxicity studies on benzoic acid (CAS RN [redacted]

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Oncorhynchus mykiss	28-day EC_{50}	>120	2	ECHA
Daphnia magna	21-day EC_{50}	>25	2	ECHA
Anabaena inaequalis	14-day EC_{50}	>10	2	ECHA

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Raphidocelis subcapitata	72-hr NOEC	7.5	2	ECHA

C. Sediment Toxicity

No studies are available. The read-across substance benzoic acid is readily biodegradable, it has a low bioaccumulation potential, and low acute toxicity to aquatic organisms. In addition to this, benzoic acid has a low log K_{ow}(1.88), so this chemical has a low potential to adsorb to organic particles and therefore exposure to the sediment compartment is expected to be low (ECHA) [Kl.score=2].

D. Terrestrial Toxicity

No studies are available. The read-across substance benzoic acid is readily biodegradable, thus, direct and indirect exposure to benzoic acid in the soil compartment is expected to be low. Because of the low bioaccumulation potential of the substance in aquatic and terrestrial organisms secondary poisoning is not considered to be a route of exposure that must be further assessed for this substance (ECHA).

E. Calculation of PNEC

The PNEC calculations for benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1) follow the methodology discussed in DEWHA (2009).

<u>PNEC Water</u>

Experimental results are available for three trophic levels. Acute $E(L)C_{50}$ values are available for fish (44.6 mg/L), *Daphnia* (>100 mg/L), and algae (33 mg/L). NOEC values from long-term studies are available for fish (120 mg/L), invertebrates (25 mg/L) and algae (7.5 mg/L). On the basis that the data consists of short-term and long-term results from three trophic levels, an assessment factor of 10 has been applied to the lowest reported NOEC value of 7.5 mg/L for algae. The $PNEC_{water}$ is 0.75 mg/L.

<u>PNEC Sediment</u>

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is <u>0.97 mg/kg sediment wet weight</u>.

The calculations are as follows:

$$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$$
$$= (1.66/1280) \times 1000 \times 0.75$$
$$= 0.97 \text{ mg/kg}$$

Where:

$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)

BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]

$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$

$= 0.8 + [(0.2 \times 1.79/1000 \times 2400]$

$= 1.66\ m^3/m^3$

Where:

Kp_{sed} = solid-water partition coefficient (L/kg)

BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]

$Kp_{sed} = K_{oc} \times f_{oc}$

= 44.7 x 0.04

= 1.79 L/kg

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for benzoic acid, 4-fluoro-, sodium salt (1:1) is reported in EPA Comptox database as 44.7 L/kg (US EPA, 2023) [Kl.score=2].

F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 0.45 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$

= (0.894/1500) x 1000 x 0.75

= 0.45 mg/kg

Where:

Kp_{soil} = soil-water partition coefficient (m^3/m^3)

BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]

$Kp_{soil} = K_{oc} \times f_{oc}$

= 44.7 x 0.02

= 0.894 m^3/m^3

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for benzoic acid, 4-fluoro-, sodium salt (1:1) is reported in the US EPA Comptox database as 44.7 L/kg (US EPA, 2023) [Kl.score=2].

F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Based on data available for read-across substance benzoic acid, benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1) arereadily biodegradable; thus, they do not meet the screening criteria for persistence.

Based on the estimated BCF value of 4.79 L/kg for benzoic acid, 4-fluoro-, sodium salt (1:1), benzoic acid, 3-fluoro-, sodium salt (1:1) and benzoic acid, 4-fluoro-, sodium salt (1:1) do not meet the screening criteria for bioaccumulation.

The lowest chronic NOEC for read-across substance benzoic acid is >0.1 mg/L. The acute E(L)C_{50} values are >1 mg/L. Thus, benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1) do not meet the screening criteria for toxicity.

The overall conclusion is that benzoic acid, 4-fluoro-, sodium salt (1:1) and benzoic acid, 3-fluoro-, sodium salt (1:1) are not PBT substances.

IX. CLASSIFICATION AND LABELLING

A. Classification

No data are available for benzoic acid, 4-fluoro-, sodium salt (1:1). It is expected to have similar environmental effects to benzoic acid, 3-fluoro-, sodium salt (1:1). H315: Causes skin irritation

H319: Causes serious eye irritation
H335: May cause respiratory irritation

B. Labelling

Danger

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

Eye Contact

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention.

Ingestion

Rinse mouth with water and then drink a glass of water. Get medical attention. Never give anything by mouth to an unconscious person.

B. Firefighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Keep product and empty container away from heat and sources of ignition. May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon dioxide.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Handle in accordance with good industrial hygiene and safety practice.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

For large amounts: dike spillage and pump off product. For residues: pick up with suitable absorbent material. Dispose of contaminated material as prescribed.

D. Storage and Handling

General Handling

Keep product and empty container away from heat and sources of ignition. Ensure adequate ventilation, especially in confined areas.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

There are no workplace exposure standards for benzoic acid, 4-fluoro-, sodium salt (1:1) or benzoic acid, 3-fluoro-, sodium salt (1:1) in Australia .

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Respiratory protection is not required.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is recommended. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

Benzoic acid, 4-fluoro-, sodium salt (1:1) or benzoic acid, 3-fluoro-, sodium salt (1:1) are not expected to be considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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U.S. Environmental Protection Agency [USEPA]. (2023). Comptox Chemicals Dashboard. https://comptox.epa.gov/dashboard/chemical/details/DTXSID80198151 (accessed November 29, 2023) Benzoic acid, 4-fluoro-, sodium salt

CINNAMALDEHYDE

This dossier on cinnamaldehyde presents the most critical studies pertinent to the risk assessment of cinnamaldehyde in its use in coal seam or shale gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch *et al.*, 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): 3-phenylacryladehyde

CAS RN: [redacted]

Molecular formula: C_9H_8O

Molecular weight: 132.16 g/mol

Synonyms: Cinnamaldehyde; (2E)-3-phenylprop-2-enal; 3-phenylacrylaldehyde; cinnamal; (E)-cinnamaldehyde; 3-phenylpropenal; cinnamic aldehyde; phenylacrolein; cinnamylaldehyde; 3-phenyl-2-propenal; trans-cinnamaldehyde; (E)-3-phenylpropenal; (E)-3-phenyl-2-propenal; 3-phenylacrolein; 3-phenyl-2-propenaldehyde; 3-phenyl-2-propen-1-al; acrolein, 3-phenyl-; 2-propenal, 3-phenyl-; 2-propenal, 3-phenyl-, (2E)-

SMILES: C1=CC=C(C=C1)C=CC=O

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the Physico-chemical Properties of Cinnamaldehyde

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Light colorless clear liquid	1	ECHA
Melting point	-18°C @ 96.990 kPa	1	ECHA
Boiling point	>250°C @ 96.990 kPa	1	ECHA
Density	1,041 kg/m^3 @ 20°C and 96.75 kPa	1	ECHA
Vapor pressure	3.853 Pa @ 25°C	2	ECHA
Partition coefficient (log K_{ow})	2.107±0.0017 @ 25°C	1	ECHA
Water solubility	2.865 g/L @ 25°C	1	ECHA
Flash point	105°C @ 96.83 kPa	1	ECHA
Auto flammability	Not auto-flammable	1	ECHA
Viscosity	22.12 mPa s @ 20°C 18 mPa s @ 40°C	1	ECHA

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Cinnamaldehyde is expected to biodegrade and not expected to bioaccumulate to any significant extent. It has a low potential to adsorb to soil or sediment.

B. Biodegradation

Cinnamaldehyde is readily biodegradable. In an OECD 301B test, degradation of cinnamaldehyde was 89% after 7 days, 94% after 14 days, and 100% after 28 days, indicating ready biodegradation (ECHA) [Kl. score = 2]. In an OECD 301D test, biodegradation was 24.98% after 5 days. The BOD_5 value was 0.635 mg O_2/mg (ECHA) [Kl. score = 1].

If a chemical is found to be inherently biodegradable or readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

No experimental data are available for cinnamaldehyde. Using KOCWIN in EPISUITE™ (EPA, 2018), the estimated K_{oc} value from log K_{ow} of 2.107 is 55.82 L/kg. The estimated K_{oc} value from the molecular connectivity index (MCI) is 36.82 L/kg. Based on this estimated value, cinnamaldehyde is expected to have very high mobility in soil. If released to water, based on the K_{oc} value and its high water solubility, it is also not expected to adsorb to suspended solids and sediment.

D. Bioaccumulation

A bioaccumulation study in fish was conducted to estimate the bioconcentration factor (BCF) value for cinnamaldehyde. The BCF value was calculated using a log K_{ow} of 1.9 and a regression derived equation. The estimated BCF value for cinnamaldehyde was determined to be 8 which indicates that this chemical is non-bio accumulative in aquatic organisms (ECHA) [KI. score =2].

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Cinnamaldehyde is of relatively low acute toxicity by the oral, dermal, and inhalation routes of exposure. It is an irritant to skin and eyes and is considered a sensitizer per the guinea pig maximization test. Oral repeat dose studies suggest that cinnamaldehyde has relatively low toxicity. There are no studies on the inhalation routes of exposure. Dermal repeat studies suggest that cinnamaldehyde has low toxicity. Cinnamaldehyde was not mutagenic in *in vitro* and *in vivo* genotoxicity tests, and it is not carcinogenic. Cinnamaldehyde is a not a reproductive or developmental toxicant.

B. Metabolism

Male Fischer 344 rats were given doses of 5, 50, and 500 mg/kg bw/day of cinnamaldehyde by oral gavage for seven days. Cinnamaldehyde was rapidly absorbed within the body and distributed to the gastrointestinal tract, the kidneys, the liver, and a small amount distributed to fat. Benzoic acid is the major metabolic of cinnamaldehyde. After 24 hours more than 80% of cinnamaldehyde is excreted in the urine and a small amount (<7%) is excreted in the faeces (ECHA) [KI. score =2].

The metabolism of 2 and 250 mg/kg bw/day of cinnamaldehyde was evaluated using male and female CD-1 mice exposed via the intraperitoneal route of exposure for 72 hours. About 94% of the administered dose was recovered in the urine after 72 hours. Less than two percent of the administered dose was remained in the mice after 72 hours. The major urinary metabolites were hippuric acid, 3-hydroxy-3-phenylpropionic acid, benzoic acid, and benzyl glucuronide (ECHA) [KI. score = 2].

C. Acute Toxicity

The 14-day acute oral LD_{50} in male and female Osborne-Mendel rats administered 2220 mg/kg bw/day of cinnamaldehyde via oral gavage was determined to be 2,220 mg/kg bw/day (ECHA) [Kl. Score = 2].

An acute oral toxicity study was conducted using male and female guinea pigs given cinnamaldehyde by oral gavage. The LD_{50} was determined to be 3400 mg/kg bw/day (ECHA) [KI. score =2].

Inhalation

There are no acute inhalation studies are available for cinnamaldehyde. An acute inhalation LC_{50} was predicted for cinnamaldehyde using the QSAR toolbox. The 4-hour LC50 in male and female Wistar rats exposed to cinnamaldehyde was predicted to be 68.889 ppm (ECHA) [KI. score =2].

Dermal

An OECD Guideline (Acute Dermal Toxicity) study was conducted using male and female albino Wistar rats exposed to cinnamaldehyde using occlusive dressing for 14 days. The dermal LD_{50} was determined to be is >2,000 mg/kg bw/day (ECHA) [Kl. Score = 2].

D. Irritation

Skin

Application of 0.1 mL of cinnamaldehyde to the skin of New Zealand white rabbits for 4 hours under semi-occlusive conditions was considered slightly-to-moderate irritating. The primary dermal irritation index (PDII) for cinnamaldehyde after 24, 48, and 72 hours was determined to be 3.25. This data indicates that cinnamaldehyde was moderately severely irritating to the skin of New Zealand white rabbits(ECHA) [Kl. score = 2].

An OECD Guideline 439 (In Vitro Skin Irritation: Reconstructed Human Epidermis Test method) study was conducted using non-transformed keratinocytes in a human skin model. The man tissue viability for cinnamaldehyde, when compared to the control, was determined to be 4.1%. This data indicates that cinnamaldehyde is considered to be irritating to human skin (ECHA) [KI. score =1].

Cinnamaldehyde, at doses of 0.02, 0.1%, and 0.8% in ethanol, was applied to the skin (upper arm) of healthy humans over a six-week period Cinnamaldehyde was determined to be severely irritating to the skin based on results from a human patch test (ECHA)[KI. score =2].

Eye

Instillation of 0.1 mL cinnamaldehyde to the eyes of New Zealand rabbits for 24 hours was considering irritating. The mean of the 24-, 48-, and 72-hours scores were: 1.00 for corneal opacity,

0.00 for iridial lesions, 2.00 for conjunctival redness, and 1.22 for chemosis. All effects were resolved by Day 14 of the observation period (ECHA) [Kl. score = 1].

The ocular irritation potential of cinnamaldehyde was determined using an OECD 492 guideline (Reconstructed Human Cornea-like Epithelium RhCE test method for identifying chemicals not requiring classification and labelling for eye irritation or serious eye damage) study. The mean tissue viability of cinnamaldehyde was determined to be 4.1 %. Cinnamaldehyde was determined to be irritating to the human eye (ECHA) [KI. score =1].

Instillation of 8% of cinnamaldehyde to the human eye was determined to be irritating (ECHA)[KI. score =2].

E. Sensitisation

Cinnamaldehyde was considered a skin sensitizer when tested in a guinea pig maximization test (ECHA) [Kl. score = 2].

F. Repeated Dose Toxicity

Oral

Male and female F344 rats were given in their diet 0, 4,100, 8,200, 16,500, or 33,000 ppm cinnamaldehyde (microcapsulated) for three months in a study conducted by the National Toxicology Program. The average daily intake was 0, 275, 625, 1,300, and 4,000 mg/kg-day for males, and 0, 300, 570, 1,090, and 3,100 mg/kg bw/day-day for females. There was no mortality during the study. Mean body weights were reduced in the ≥16,500 ppm animals as a result of decreased feed consumption from unpalatability of the dosed feed. There was a non-significant increase in serum bile acid concentration at all dose levels suggesting an effect on the liver, but there were no corresponding histopathologic effects. An increase in lesions of the forestomach mucosa was seen in the ≥8,200 ppm animals and included squamous epithelial hyperplasia. There was also chronic active inflammation in the 33,000 ppm males and the ≥16,500 ppm females. The NOAEL was considered to be 4,100 ppm, which corresponds to 275 and 300 mg/kg bw/day in males and females, respectively (Hooth et al., 2004; as cited in ECHA) [Kl. score = 1].

Male and female rats were fed in their diet 0, 1,000, 2,100, or 4,100 ppm cinnamaldehyde for 12 weeks. The average daily intake was 0, 50, 100, or 200 mg/kg bw/day-day. There were no significantly differences between treated and control animals in urine sugar and albumin, blood haemoglobin levels, growth, food intake, or other physiological criteria. The NOAEL for this study is 4,100 ppm for males and females, which corresponds to 200 mg/kg bw/day (ECHA) [Kl. score = 2].

Male and female F344 rats were given in their diet 0, 1,000, 2,100, or 4,100 ppm cinnamaldehyde (microcapsulated) for two years in a study conducted by the National Toxicology Program. The average daily intake was 0, 50, 100, or 200 mg/kg bw/day. The survival of the 4,100 ppm males was greater than the controls. The mean body weights of the 4,100 ppm animals were generally less he controls throughout the study. Feed consumption of the ≥2,100 ppm males and the 4,100 ppm females was less than the controls at the beginning and end of the study. There were no non-neoplastic lesions that were considered to be treatment related. The NOAEL for this study is 4,100 ppm for males and females, which corresponds to 200 mg/kg bw/day (Hooth et al., 2004; as cited in ECHA) [Kl. score = 1].

Male and female B6C3F$_1$ mice were given in their diet 0, 1,000, 2,100, or 4,100 ppm cinnamaldehyde (microcapsulated) for two years in a study conducted by the National Toxicology Program. The average daily intake was 0, 125, 270, or 540 (males) and 570 (females) mg/kg bw/day. Mean body weights of the ≥2,100 ppm animals were generally less than the controls throughout the study. There were no non-neoplastic lesions that were considered to be treatment related. Incidences of minimal olfactory epithelial pigmentation was significantly increased in the 4,100 ppm males and the ≥2,100 ppm females. The NOAEL for this study is 1,000 ppm in males and females, which corresponds to 125 mg/kg bw/day, based on reduced body weights at 270 mg/kg bw/day (Hooth et al., 2004; as cited in ECHA) [Kl. score = 1].

An oral subacute toxicity was conducted using male and female B6C3F1 mice exposed 0,656, 1310,2620, 5250, or 10,500 mg/kg bw/day cinnamaldehyde for 14 days (2 weeks: 5 days/week for a total of 12 doses). There were no significant differences in body weight, liver weight, spleen weight, and kidney weight. There were no statistical differences in organ: body weight ratios between surviving treated mice and the control mice. All of the mice in the two highest dose groups, as well as the all the female mice and three male mice from the 2620 mg/kg bw/day dose group, died withing the first two days of dosing. There were no clinical signs or gross lesions observed in the surviving mice or the dead mice. Mild forestomach hyperplasia was observed in both sexes of mice exposed to cinnamaldehyde. Minimal kidney nephropathy was observed in the mice exposed to dose of more than 1310 mg/kg bw/day. A NOAEL of 656 mg/kg bw/day was established for this study. A LOAEL of 1,310 mg/kg bw/day was established in this study based on body weight, organ weight, and histopathological examinations (ECHA) [Kl. score = 2].

Inhalation

There are no studies are available. As shown in Table 1, cinnamaldehyde has a low vapor pressure which suggests that the generation of inhalable vapours is low. Under normal conditions, human exposure to cinnamaldehyde by the inhalation route of exposure is highly unlikely.

Dermal

A dermal sub chronic dermal toxicity study was conducted using female Balb/c mice exposed to 25µl 25 percent (v/v) solution of cinnamaldehyde for 4-5 days. The NOAEL was determined to be 25µl (ECHA) [Kl. score =2].

A dermal sub chronic dermal toxicity study was conducted using mice exposed to 750 mg/kg bw/day 3D (intermittent) of cinnamaldehyde. A LOAEL value of 750 mg/kg/3D was established for mice exposed to cinnamaldehyde for three days (ECHA) [Kl. score =2].

G. Genotoxicity

In Vitro Studies

The *in vitro* genotoxicity studies on cinnamaldehyde are presented in Table 2.

Table 2: *In vitro* Genotoxicity Studies on cinnamaldehyde

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
OECD Guideline 471 Bacterial Reverse Mutation Assay (S. typhimurium TA 98, TA100, TA 102, TA 1535, TA1537)	-	-	1	ECHA

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
OECD Guideline 471 (*In Vitro* Mammalian Chromosome Aberration Test)	-	-	1	ECHA
OECD Guideline 476 (*In Vitro* Mammalian Cell Gene Mutation Test using the Hprt and xprt genes)	-	-	1	ECHA
Bacterial reverse mutation assay (Salmonella typhimurium TA97, TA98, TA100, TA1335, and TA1537)	-	-	2	ECHA
In vitro mammalian cell micronucleus test	-	-	2	ECHA

*+, positive; -, negative

In Vivo Studies

Male and female B6C3F$_1$ mice were administered in their feed 0, 4,100, 8,200, 16,500, or 33,000 ppm cinnamaldehyde (microcapsulated) for three months in a study conducted by the National Toxicology Program. The average daily intake was 650, 1,320, 2,550, and 5,475 mg/kg bw/day for males, and 0, 625, 1,380, 2,680, and 5,200 mg/kg bw/day for females. There were no increases in the frequency of micronucleated normochromatic erythrocytes in the peripheral blood in the treated animals compared to the controls (ECHA) [Kl. score = 2].

A mouse bone marrow micronucleus test was used to evaluate the genotoxic potential of cinnamaldehyde in ddY mice. Male mice were given oral doses of 0, 250, 313, and 500 mg/kg of cinnamaldehyde for 24 hours. Cinnamaldehyde did not induce any gene mutations in male ddY mice (ECHA) [Kl. score = 2].

H. Carcinogenicity

Male and female F344 rats were administered in their diet 0, 1,000, 2,100, or 4,100 ppm cinnamaldehyde (microcapsulated) for two years in a study conducted by the National Toxicology Program. The average daily intake was 0, 50, 100, or 200 mg/kg bw/day-day. The tumour incidences were similar between the treated and control animals. A NOAEL of 200 mg/kg bw/day (4100 ppm) was reported for this study (Hooth et al., 2004; as cited in ECHA) [Kl. score = 2].

Male and female B6C3F$_1$ mice were administered in their diet 0, 1,000, 2,100, or 4,100 ppm cinnamaldehyde (microcapsulated) for two years in a study by the National Toxicology Program. The average daily intake was 0, 125, 270, or 540 (males) and 570 (females) mg/kg bw/day-day. The tumour incidences were similar between the treated and control animals. The NOAEL was considered to be 4100 ppm (540 mg/kg bw/day for males and 570 mg/kg bw/day females (Hooth et al., 2004; as cited in ECHA) [Kl. score = 1].

An OECD Guideline 451 (Carcinogenicity study) was conducted in male and female Fischer 344 rats exposed to 0, 235, 470, 940, 1880, 3750 mg/kg bw/day of cinnamaldehyde by oral gavage for 16 days. There were no effects observed at the lowest dose level while all the animals in the two highest dose groups died within the first seven days of dosing. There was minimal to moderate forestomach hyperplasia observed in the males who received a dose of ≥470 mg/kg bw/day. A NOAEL of 235 mg/kg bw/day was reported in this study based on no occurrence of hyperplastic lesions or forestomach hyperplasia. There was clear evidence of distended gastrointestinal tracts in

animals who were given doses of 1880 or 3750 mg/kg bw/day as well as slightly decreased body weights in females of the 940 mg/kg bw/day dose group. The target organ toxicity value was reported to be 470 mg/kg bw/day (ECHA) [KI. score = 2].

I. Reproductive Toxicity

There are no adequate studies are available.

J. Developmental Toxicity

Pregnant female CD-1 mice were dosed by oral gavage with 0 or 1,200 mg/kg bw/day cinnamaldehyde on gestational days 6 to 13. The dams were allowed to deliver, and the pups were weaned up to postnatal day 3. There was no effect on maternal survival or body weight development and all 34 litters were viable. The number of liveborn per litter, the survival and birthweight of pups and their weight gain was not affected by treatment. The LOAEL for maternal and developmental toxicity is 1,200 mg/kg-day (ECHA) [Kl. score = 2].

An OECD Guideline 414 (Prenatal Developmental Toxicity) study was conducted in Wistar rats exposed to 0, 125, 250, 500 mg/kg bw/day of cinnamaldehyde by oral gavage from gestation day five to gestation day 19. The NOAEL for maternal systemic toxicity was reported to be 250 mg/kg bw/day. This effect level was based on mortality, clinical signs of toxicity, statistically/biologically significant decreased in body weight on gestation day 17 and gestation day 20. There were significant decreased in food intake on gestation day 8 and 11 and several gross/histopathology findings. The NOAEL for developmental toxicity was reported to be 250 mg/kg bw/day based on decreased fetal body weights observed in the 500 mg/kg bw/day (ECHA) [KI. score =1].

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for cinnamaldehyde follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

<u>Oral</u>

A two-year oral repeat dose study was conducted by the national toxicology program in male and female F344 rats. The lowest NOAEL from this study was reported to be 4,100 ppm which corresponds to a dose level 200 mg/kg bw/day.
The NOAEL of 200 mg/kg bw/day will be used for determining the oral Reference dose (RfD) and the drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / (UF_A x UF_H x UF_L x UF_{Sub} x UF_D)

Where:

- UF_A (interspecies variability) = 10
- UF_H (intraspecies variability) = 10
- UF_L (LOAEL to NOAEL) = 1
- UF_{Sub} (subchronic to chronic) = 1
- UF_D (database uncertainty) = 1

Oral RfD = 200/ (10 x 10 x 1 x 1 x 1) = 200/100 = 2 mg/kg bw/day

Drinking water guidance value

Drinking water guidance value = (animal dose) x (human weight) x (proportion of intake from water) / (volume of water consumed) x (safety factor)

Using the oral RfD,
Drinking water guidance value = (oral RfD) x (human weight) x (proportion of water consumed) / (volume of water consumed)

Where:
Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)

Drinking water guidance value = (2x 70 x 0.1)/2 = 7 mg/L

B. Cancer

Cinnamaldehyde was not carcinogenic to rats or mice when given in the diet for two years. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Cinnamaldehyde does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidizing potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Cinnamaldehyde has low chronic toxicity potential to aquatic organisms. Since cinnamaldehyde is readily biodegradable in water, it was reported to be non-toxic to aquatic fish, invertebrates, and algae at environmentally relevant concentrations.

B. Aquatic Toxicity

Acute Studies

Table 2 lists the results of acute aquatic toxicity studies on cinnamaldehyde.

Table 2: Acute Aquatic Toxicity Studies on Cinnamaldehyde

Test Species	Endpoint	Results (mg/L)	Klimisch score	Reference
Danio rerio (Brachydanio rerio)	96-hr LC_{50}	4.3 (mortality)	1	ECHA
Danio rerio (Brachydanio rerio)	96-hr LC_{50}	2.35 (mortality)	1	ECHA

Test Species	Endpoint	Results (mg/L)	Klimisch score	Reference
Danio rerio (Brachydanio rerio)	96-hr LC_{50}	>3.9- <5.5 (mortality)	1	ECHA
Poecilia reticulata (Guppy fish)	96-hr LC_{50}	>3.5- <6.5	2	ECHA
Lepomis macrochirus (Bluegill fish)	96-hr LC_{50}	>20	2	ECHA
Daphnia magna	48-hr EC_{50}	3.21	2	ECHA
Daphnia magna	48-hr EC_{50}	3.86	2	ECHA
Daphnia magna	48-hr EC_{50}	11.5	2	ECHA
Desmodesmus subspicatus	72-hr EC_{50}	31.6	2	ECHA
Chlorella vulgaris	72-hr EC_{50}	16.09	2	ECHA

Since the test chemical is readily biodegradable in water, the chemical was considered to be non-toxic to aquatic fish, invertebrates and algae at environmentally relevant concentrations (ECHA).

Chronic Studies

In an OECD Guideline 211 (Daphnia magna reproduction test) study, the 21-day EC_{50} was reported to be 0.402 mg/L based on reproduction (ECHA) [KI. score =2].

Based on a prediction completed using ECOSAR version 1.11, a long-term toxicity value for fish was predicted for cinnamaldehyde. Based on effects observed in a flow through freshwater system in fish, the NOEC value for the substance was estimated to be 15.159 mg/L for fish for 28 days of exposure duration. (ECHA) [Kl. score = 2].

C. Terrestrial Toxicity

In a short-term toxicity study to birds (avoidance [repellency] test), the 5-day LOEL value was 1% w/w for *Colinus virginianus* (Northern Bobwhite Quail). (ECHA) [Kl. score = 2].

D. Calculation of PNEC

The PNEC calculations for cinnamaldehyde follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels. Acute $E(L)C_{50}$ values are available for fish (2.35 mg/L), *Daphnia* (3.21 mg/L), and algae (16.09 mg/L). Results from a chronic study in fish was reported to be 15.159 mg/L. On the basis that the data consists of short-term results from three trophic levels and chronic studies on one trophic levels, an assessment factor of 100 has been applied to the lowest reported NOEC of 15.159 mg/L for fish. The $PNEC_{water}$ is 0.152 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 0.179 mg/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (1.51/1280) \times 1000 \times 0.152$
$= 0.179$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 1.47/1000 \times 2400]$
$=1.51\ m^3/m^3$

Where:
Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 36.82 \times 0.04$
$=1.47$ L/kg

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for Cinnamaldehyde based on the molecular connectivity index (MCI) is 36.82 L/kg (EPA, 2019).
F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

<u>PNEC Soil</u>

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is <u>0.075 mg/kg soil dry weight</u>.
The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (0.74/1500) \times 1000 \times 0.152$
$= 0.075$

Where:
Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]
$Kp_{soil} = K_{oc} \times f_{oc}$
$= 36.82 \times 0.02$
$= 0.74$

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for cinnamaldehyde based on the molecular connectivity index (MCI) is 36.82 L/kg (EPA, 2019).
F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU Reach Criteria methodology (DEWHA, 2009; ECHA, 2017).

Cinnamaldehyde is readily biodegradable; thus, it does not meet the screening criteria for persistence.

Based on a measured log K_{ow} of 2.107± 0.0017, cinnamaldehyde does not meet the screening criteria for bioaccumulation.

The NOEC from a chronic fish study was>0.1 mg/L. The acute $E(L)C_{50}$ values for cinnamaldehyde are >1 mg/L. Thus, cinnamaldehyde does not meet the criteria for toxicity.

The overall conclusion is that cinnamaldehyde is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

H315-Skin Irritant Category 2
H319-Eye Irritant Category 2
H317-Skin Sensitizer Category 1
H312-Aquatic Acute Toxicity Category 2
H335-STOT SE3

B. Labelling

Warning!

According to the classification provided by companies to ECHA in REACH registrations this substance causes serious eye irritation, is harmful to aquatic life with long lasting effects, is harmful in contact with skin, causes skin irritation and may cause an allergic skin reaction.

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

<u>Eye Contact</u>

First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control centre. Do not put any ointments, oils, or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop. SKIN: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin

areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

Skin Contact

IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

Inhalation

IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

Ingestion

DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control centre. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious, do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital. (NTP, 1992)

Notes to Physician

Symptoms of exposure to this compound may include inflammation and erosion of gastrointestinal mucosa. The vapor or mist causes irritation of the eyes, mucous membranes and upper respiratory tract. ACUTE/CHRONIC HAZARDS: This chemical may be harmful by inhalation, ingestion or skin absorption. It may cause irritation of the skin, eyes, upper respiratory tract, and mucous membranes. When heated to decomposition it may emit toxic fumes of carbon monoxide and carbon dioxide.

Medical Conditions Aggravated by Exposure

Irritation properties of the substance may aggravate asthma and/or other respiratory conditions.

Emergency Personnel Protection

Personal protective equipment must be used in accordance with known hazards of the substance.

B. Fire Fighting Information

Extinguishing Media

This chemical is combustible. Fires involving this material can be controlled with a dry chemical, carbon dioxide or Halon extinguisher.

Specific Exposure Hazards

May ignite after a delay period in contact with NaOH.

Special Protective Equipment for Firefighters

Use respiratory protection equipment as deemed necessary by hazards associated with the substance.

C. Accidental Release Measures

Personal Precautions

Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if substance gets inside. Then wash thoroughly and put on clean clothing.

Environmental Precautions

Do not release to discharge into open drains or waterways.

Steps to be Taken if Material is Released or Spilled

If you spill this chemical, FIRST REMOVE ALL SOURCES OF IGNITION. Then, use absorbent paper to pick up all liquid spill material. Contaminated clothing and absorbent paper should be sealed in a vapor-tight plastic bag for eventual disposal. Solvent wash all contaminated surfaces with 60-70% ethanol followed by washing with a soap and water solution. Do not re-enter the contaminated area until the Safety Officer (or other responsible person) has verified that the area has been properly cleaned.

Wastewater from contaminant suppression, cleaning of protective clothing/equipment, or contaminated sites should be contained and evaluated for subject chemical or decomposition product concentrations. Concentrations shall be lower than applicable environmental discharge or disposal criteria. Alternatively, pre-treatment and/or discharge to a POTW is acceptable only after review by the governing authority. Due consideration shall be given to remediation worker exposure (inhalation, dermal and ingestion) as well as fate during treatment, transfer and disposal.

Do not contaminate water by cleaning of equipment or disposal of wastes

D. Storage and Handling

General Handling

Do not use, pour, spill or store near heat or open flame.

Other Handling Precautions

Observe label precautions. Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Storage

STORAGE PRECAUTIONS: You should keep this material in a tightly closed container under an inert atmosphere and store it at refrigerated temperatures. (NTP, 1992)

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure limit for cinnamaldehyde.

Engineering Controls

Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level.

Personal Protection Equipment

Respiratory Protection:
Where the neat test chemical is weighed and diluted, wear a NIOSH-approved half face respirator equipped with an organic vapor/acid gas cartridge (specific for organic vapors, HCl, acid gas and SO2) with a dust/mist filter. (NTP, 1992)

Hand Protection:
Chemical resistant gloves.

Skin Protection:
For agricultural use requirements, PPE required for early entry to treated areas that is permitted under applicable Worker Protection Standards and that involves contact with anything that has been treated, such as plants, soil, water, is: Coveralls, waterproof gloves, shoes plus socks.

Eye protection:
Protective eyewear shall be worn at all times.

Other Precautions:
None other specific precautions are stipulated.

F. Transport Information

Cinnamaldehyde is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

UN 1993

Class: 3

Packaging Group: II

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state, and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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CITRIC ACID

This dossier on citric acid presents the most critical studies pertinent to the risk assessment of citric acid in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The information presented in this dossier was obtained primarily from the OECD-SIDS documents on citric acid (OECD, 2001a,b) and the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

Based on an assessment of environmental hazards, NICNAS identified citric acid as a chemical of low concern to the environment (NICNAS, 2017). Chemicals of low concern are unlikely to have adverse environmental effects if they are released to the environment from coal seam gas operations. In addition, NICNAS has assessed citric acid in an IMAP Tier 1 assessment and concluded that it poses no unreasonable risk to the environment.[1]

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): 2-hydroxypropane-1,2,3-tricarboxylic acid

CAS RN: [redacted]

Molecular formula: $C_6H_8O_7$

Molecular weight: 192.122 g/mol

Synonyms: citric acid; 1,2,3-propanetricarboxylic acid, 2-hydroxy-; 2-hydroxy-1,2,3-propanetricarboxylic acid

SMILES: C(C(=O)O)C(CC(=O)O)(C(=O)O)O

Citric acid is a ubiquitous natural substance that is an intermediate in the basic physiological tricarboxylic acid (TCA) cycle in every eukaryote cell.

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the physico-chemical properties of citric acid

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	White crystalline odorless solid	2	ECHA
Melting Point	153°C @ 101.3 kPa	2	ECHA
Boiling Point	Not available due to substance decomposition	2	ECHA
Density	1670 kg/m^3 @ 20° C (relative density)	2	ECHA
Vapor Pressure	2.21×10^{-6} Pa @ 25° C	2	ECHA

[1] https://www.industrialchemicals.gov.au/chemical-information/search-assessments?assessmentcasnumber=[redacted]

Property	Value	Klimisch Score	Reference
Partition Coefficient (log K_{ow})	-1.5 to -1.8 (temperature not indicated)	2	ECHA
Water Solubility	592 g/L @ 20°C (very soluble)	2	ECHA
Flash Point	345°C @ 101.3 kPa	4	ECHA
Flammability	Not flammable	2	ECHA
Auto flammability	1010°C	4	ECHA

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Citric acid is readily biodegradable. It is not expected to bioaccumulate. Due to its high-water solubility, citric acid is unlikely to adsorb to soil or sediment.

B. Biodegradation

Citric acid can be considered readily biodegradable based on the results of the ready and inherent aerobic biodegradation studies listed in Table 2. If a chemical is found to be readily biodegradable, it is categorized as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

Table 2: Biodegradation studies on citric acid (OECD 2001a, b)

Test System	Results*	Notes	Klimisch Score
Modified Sturm	97% (CO_2 evolution); 100% (DOC removal)	Readily biodegradable; exposure period not stated	2
Closed Bottle Test	BOD_{30}/COD Ratio = 90%	Readily biodegradable	2
BOD_5/COD Ratio	BOD_5 = 526 mg; COD = 728 mg; BOD_5/COD Ratio = 0.72	Readily biodegradable; concentration of test substance and activated sludge not stated	2
BOD_1/ThOD Ratio	BOD_1/ThOD Ratio = 13%	-	2
BOD_{20}/ThOD Ratio	BOD_{20}/COD Ratio = 98%	Readily biodegradable; initial test substance concentration 720 mg/L	2
Zahn-Wallen Test	85%, 1 day (DOC removal)	Inherently biodegradable	2
Zahn-Wallen Test	98%, 7 days (DOC removal)	Inherently biodegradable	
Coupled Units Test	93% (COD removal)	Ultimately biodegradable; exposure period not stated.	2

C. Environmental Distribution

No experimental data are available for citric acid. Using KOCWIN program in EPISuite™ (USEPA, 2016), the estimated K_{oc} value from the K_{ow} value of -1.08 is 0.3617 L/kg.

Based on this K_{oc} value, citric acid is not expected to adsorb to soil if released and has a high mobility. If citric acid is released to water, it is not expected to adsorb to suspended soils or sediment based on its K_{oc} value and rapid hydrolysis.

D. Bioaccumulation

The log K_{ow} for citric acid is -1.5 to -1.8. Thus, citric acid is not expected to bioaccumulate.

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Citric acid exhibits low toxicity by the oral and dermal routes. It is an eye irritant, but slightly to non-irritating to the skin. No adequate studies were found to evaluate the sensitization potential of citric acid. Minimal toxicity and no carcinogenic effects were observed in rats given oral doses of citric acid for up to two years. Citric acid was not mutagenic to bacteria, but *in vitro* studies using human lymphocytes showed genotoxic effects. *In vivo* genotoxicity studies were negative. There were no reproductive or developmental effects in rats given oral doses of citric acid.

B. Acute Toxicity

<u>Oral</u>

The acute oral LD_{50} in male and female Füllinsdorf albino (SPF) mice exposed to 0,3,4.2, 6, 8.5 and 13 g/kg bw of citric acid via oral gavage was reported to be 5,400 mg/kg bw/day (ECHA) [Kl.score=2].

The acute oral LD_{50} in male ICR-JCL male rats was reported to be 11,700 mg/kg (ECHA) [Kl.score=2].

The acute oral LD_{50} values in SD-JCL male mice are 5,400 and 5,790 mg/kg (ECHA) [Kl.score= 2].

<u>Inhalation</u>

There are no reliable studies available.

<u>Dermal</u>

The acute dermal LD_{50} value in rats is >2,000 mg/kg (ECHA) [Kl.score=1].

C. Irritation

<u>Skin</u>

Application of 0.5 g citric acid powder to the skin of New Zealand white rabbits for 4 hours under semi-occlusive conditions was slightly irritating. The mean of the 24, 48 and 72-hour scores were 0.3 for erythema and 0.0 for oedema (ECHA) [Kl.score=1].

Application of citric acid powder to the intact skin of New Zealand white rabbits for 4 hours under semi-occlusive conditions was reported to be non-irritating based on a primary dermal irritation index (PDII) score of 0.33/2 (ECHA) [Kl.score=1].

Application of a 30% solution of citric acid to the intact skin of New Zealand white rabbits was found reported to slightly irritating to rabbits with intact (abraded skin) and non-irritating to rabbits with non-abraded skin based on a primary dermal irritation index (PDII) scores of 0.8/8 and 0/8 respectively (ECHA) [KI.score=2].

Application of a 50% aqueous solution of citric acid to New Zealand white rabbits for 4 hours under occlusive conditions was reported to be non-irritating (ECHA) [KI.score=2].

Eye

Instillation of a 30% aqueous solution of citric acid into the eyes of New Zealand white rabbits produced well defined to moderate conjunctival irritation that did not fully resolve after the 14-day observation period (ECHA) [KI.score=1]. Given the fact that the 30% solution effects would have been allowed to dissipate for 21 days, it likely that the test substance would not be considered irritating to the eyes (ECHA).

Instillation of a 10% solution of citric acid into the eyes of New Zealand white rabbits was associated with weak to moderate conjunctival effects, which resolved after 7 days (ECHA) [Kl.score=1].

Respiratory

In a study preliminary to the evaluation of antitussive agents, citric acid was chosen as most consistent in the cough response elicited as measured by the mean number of coughs produced with five inhalations in human volunteers (ECHA). 10% citric acid gave the highest number of positive reactors.

In a study to develop a method for the use of citric acid in testing antitussive medicines with human volunteers, a training period was used to determine the concentration of citric acid solution able to produce three to six coughs after one inhalation (ECHA). There were three test periods one hour apart. 5 inhalations were administered at 3-minute intervals in each test period. The number of coughs was counted after each inhalation. Each subject was given a placebo tablet after the first test period but was informed that they could receive either a placebo or an anti-tussive tablet.

The total number of coughs after each inspiration over the three test periods was compared among subjects and between test periods and inspirations. Statistical variance and F-values were analysed.

The concentration of citric acid producing between three and six coughs after a single inhalation was found to vary from 5% to 25%. Adaptation to the citric acid aerosol occurred during the initial training period, but further adaptation during the test period was low, except between the first and second inhalation.

Some reduction in response between the first and second test periods might be attributable to a placebo reaction. It was concluded that the administration of citric acid to induce coughing using the method described would be useful in evaluating antitussive medicines, providing that a double-blind trial using a placebo was used.

A study was conducted to evaluate the effect of inspiratory flow rate on the cough response in humans to citric acid (ECHA). It was considered by the authors that the cough response to citric acid is produced mainly by irritation of the larynx and trachea. Variations in the inspiratory flow rate might lead to changes in deposition of the drug, and consequently in the cough threshold. The effect of inspiratory flow rate was studied in 11 healthy non-smoking volunteers aged 23 to 29 years

(9 male, 2 female). The citric acid was administered by inhalation of a nebulized solution via apparatus which limited and measured the inspiratory flow rate to 50, 100 and 150 l/minute of increasing concentrations of citric acid.

The test was finished when a cough was produced after each inhalation at one concentration (cough threshold) or the maximum concentration was reached. Each concentration was given at three different flow rates. The exposures were repeated on 3 days at least 48 hours apart.

The mean cough threshold was determined to be 21 (±9-54) mg/l at an inspiratory flow rate of 50 l/min and 43 (±13-141) mg/l at 150 l/minute. It was concluded that inspiratory flow rate should be controlled when cough challenges with citric acid are performed.

Inhalation of citric acid was shown to cause cough and bronchoconstriction in the guinea pig. The bronchoconstriction seems to involve cholinergic and capsaicin sensitive neurons (ECHA).

Citric acid was seen to elicit a cough response in the guinea pig (ECHA) in a study in which the time-response relationship observed with citric acid showed a maximum response around 5 to 10 minutes of exposure for isolated coughs and a fade in response as the exposure continued.

D. Sensitisation

In a skin prick test, with very limited provided details, it was reported that citric acid, caused positive results in 3 of 91 patients whereof one of the patients also reacted to benzoic and propionic acids (ECHA) [KI.score=4].

In a skin sensitisation, study with limited details, citric acid was concluded to not be a skin irritant or a sensitizer when tested to human volunteers (ECHA) [KI.score=4]. At induction, patches of 4% citric acid in a cuticle cream were applied onto the skin of 56 human volunteers, under a semi-occlusive dressing, three times a week for three weeks. At challenge, 4% citric acid in a cuticle cream was applied dermally to 56 human volunteers two weeks after the last induction (ECHA) [KI.score=4].

E. Repeated Dose Toxicity

<u>Oral</u>

Male and female rats were administered 2000, 4000, 8000 and 16000 mg/kg bw/day of citric acid via oral gavage daily for five successive days. A NOAEL of 4000 mg/kg bw/day was established for both male and female rats based on overall clinical signs, mortality, and body weight. A LOAEL of 8000 mg/kg bw/day was established for male and female rats based on clinical signs, increased mortality and body weight gain. A 10-day LD_{50} value of 55560 ± 0.44 mg/kg bw/day was also reported in rats (gender not specified) (ECHA) [KI.score=2].

Mice were administered 1000, 2000, 4000 and 8000 mg/kg bw/day of citric acid via oral gavage daily for ten successive days. A NOAEL of 1000 mg/kg bw/day was established based on clinical signs, mortality, and body weight. A LOAEL of 2000 mg/kg bw/day was established based on clinical signs, increased mortality and body weight gain (ECHA) [KI.score=2].

Male rats were given 0, 1.2, 2.4 or 4.8% citric acid in their feed for 6 weeks. The daily intakes were reported to be 1,150, 2,260 or 4,670 mg/kg-day. The high-dose animals had mild blood and urine parameter changes and slight degeneration of the thymus gland and spleen. The NOAEL is 2.4% in the diet or 2,260 mg/kg-day (OECD, 2001a,b) [KI.score=4]

Rats were given 3% or 5% citric acid in their diet for two years. The estimated daily intakes were 1,200 and 2,000 mg/kg/day, respectively. A slight decrease in growth was reported in the 2% group, but no tissue abnormalities in the major organs. The NOAEL is 1,200 mg/kg/day (OECD, 2001a,b). [Kl.score=4]

Inhalation

No studies are available.

Dermal

No studies are available.

F. Genotoxicity

In vitro Studies

Table 2 presents the results of the *in vitro* genotoxicity studies on citric acid.

Table 2: *In vitro* genotoxicity studies on citric acid

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
In vitro mammalian cell micronucleus test (lymphocytes: peripheral human)	-	+	2	ECHA
Bacterial Reverse Mutation Assay (S. typhimurium TA 1535, TA 100, TA 98, TA 1537, TA 92, and TA 94)	-	-	2	ECHA
Comet assay (human lymphocytes)	+	NA	2	ECHA
Chromosome aberration test (human peripheral lymphocytes)	+	NA	2	ECHA

*+, positive; -, negative; NA, not applicable

Citric acid was not mutagenic in bacterial reverse mutation assays with strains of *S. typhimurium* or *E. coli* with and without metabolic activation (OECD, 2001a,b; ECHA) [Kl.score=2].

Peripheral human lymphocytes were treated with 50 to 3,000 µg/ml citric acid. A statistically significant dose-dependent increase in the micronuclei was observed. In another set of studies by the same laboratory, there was a statistically significant and dose-related increase in the number of cells with aberrations, including sister chromatid unions. The study authors reported that the pH of the medium was unchanged (ECHA) [Kl.score=2].

In vivo Studies

Citric acid was reported to be non-mutagenic in a rodent dominant lethal assay when male Sprague-Dawley rats were given either a single oral dose of citric acid (1.2, 12.0 or 120 mg/kg) or a single oral dose on five consecutive days (300, 500 or 3,500 mg/kg) (OECD 2001a,b; as reported in ECHA) [Kl.score=2].

There were no treatment related increases in cells with chromosomal aberrations in observed in the bone marrow of male Sprague-Dawley rats given either a single oral dose of citric acid (1.2, 12.0 or 120 mg/kg) or a single oral dose on five consecutive days (300, 500, 3000 or 3,500 mg/kg) (ECHA) [Kl.score=2].

G. Carcinogenicity

Oral

There was no evidence of carcinogenicity in rats given 3% or 5% citric acid in feed (1,200 or 2,000 mg/kg/day, respectively) for two years (OECD, 2001a,b) [Kl.score=4].

In a rat feeding study, animals dosed with 5% citric acid in the diet did not show an excess of tumors in comparison with control animals when tested over a period of 2 years (Horn et al., 1957, as reported in ECHA). However, there was limited evidence that high doses of citrate salts increased the incidence of tumors produced by co-administration of known bladder carcinogens (Inouea et al., 1988; Ono et al., 1992; de Camargo et al., 1991; Fukushima et al.,1986; Behnke et al., 1964; as reported in ECHA). Where citric acid or citrate salts were administered alone during these studies, no dose-related tumors were noted (ECHA).

H. Reproductive Toxicity

In a non-standard repeat dose dietary study (duration and frequency not specified), 5% citric acid in feed did not affect either the number of young born to mice or rats or their subsequent survival up to the point of weaning (ECHA) [Kl.score=4].

In a reproductive toxicity study, 1.2% w/w citric acid was administered in feed given daily to male and female rats over a period of 90 weeks and it was reported that citric acid did not give rise to any reproductive effects (ECHA).

The no adverse effect level (NOAEL) for reproductive toxicity in rats has been reported as 2500 mg/kg/bw/day (Kim et al., 2013, citing Citric acid SIDS initial assessment report [OECD SIDS, 2001]; as cited in ECHA).

I. Developmental Toxicity

Hamsters were administered citric acid via oral gavage daily from gestation day 0 to gestation day 10 resulted in a NOAEL of > 272 mg/kg bw/day based on teratogenicity (ECHA) [KI.score=2].

Wistar rats were exposed to citric acid by oral gavage from gestation day 6 to gestation day 15. A NOAEL of >295 was established for this study based on teratogenicity (ECHA) [KI.score=2].

Albino CD-1 mice were exposed to citric acid by oral gavage from gestation day 6 to gestation day 15. A NOAEL of >241 mg/kg bw/day was established for this study based on teratogenicity (ECHA) [KI.score=2].

Pregnant female rats were dosed by oral gavage with 0, 2.95, 13.7, 63.6 or 295 mg/kg citric acid on GD 6-15. No maternal or developmental effects were noted. The NOAEL for maternal and developmental toxicity is 295 mg/kg-day, the highest dose tested (OECD, 2001a,b; ECHA) [Kl.score= 2].

Pregnant female rats were dosed by oral gavage with 0, 2.41, 11.2, 52 or 241 mg/kg citric acid on GD 6-15. No maternal or developmental effects were noted. The NOAEL for maternal and developmental toxicity is 241 mg/kg-day, the highest dose tested (OECD, 2001a,b; ECHA) [KI.score=2].

Pregnant female rabbits were dosed by oral gavage with 0, 4.25, 19.75, 91.70 or 425 mg/kg citric acid on GD 6-18. No maternal or developmental effects were noted. The NOAEL for maternal and developmental toxicity is >425 mg/kg-day, the highest dose tested (OECD, 2001a,b; as cited in ECHA) [KI.score=2].

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for citric acid follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

In a two-year dietary study, the only effect seen in rats fed either 3 or 5% citric acid (approx. 1,200 or 2,000 mg/kg/day) was a slight decrease in growth in the 5% dose group. In the absence of statistical analysis of the body weight gain data, a conservative approach was taken, and the 5% dose group was considered an LOAEL. The NOAEL of 3% citric acid in the diet (1,200 mg/kg/day) will be used for determining the oral reference dose (RfD) and the drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

- UF_A (interspecies variability) = 10
- UF_H (intraspecies variability) = 10
- UF_L (LOAEL to NOAEL) = 1
- UF_{Sub} (subchronic to chronic) = 1
- UF_D (database uncertainty) = 1

Oral RfD = 1,200/(10 × 10 × 1 × 1 × 1) = 1,200/100 = <u>12 mg/kg/day</u>

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

- Human weight = 70 kg (ADWG, 2011)
- Proportion of water consumed = 10% (ADWG, 2011)
- Volume of water consumed = 2L (ADWG, 2011)

Drinking water guidance value = (12 × 70 × 0.1)/2 = 42 mg/L

B. Cancer

Citric acid was not carcinogenic to rats in a chronic dietary study. Thus, no cancer reference value was derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Citric acid does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidizing potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Citric acid is of low toxicity concern to aquatic organisms.

B. Aquatic Toxicity

Acute Studies

The 48-hour LC_{50} values in *Leuciscus idus melanotus* (golden orfe) from two separate laboratories were 440 mg/L and 760 mg/L (ECHA) [Kl.score=2]. The 96-hour LC_{50} in *Lepomis macrochirus* (fathead minnow) is >100 mg/L (ECHA) [Kl.score=2).

The 24-hour EC_{50} in *Daphnia* is 85 mg/L in un-neutralized test solution and 1,535 mg/L in a neutralized solution (OECD, 2001a,b; as cited in ECHA) [Kl.score=2].

The 8-day toxicity threshold value (EC_0) of 640 mg/L and a NOEC of 425 mg/L was determined for citric acid in Scenedesmus quadricauda (ECHA; OECD, 2001a,b) [Kl. score=2].

Chronic Studies

Citric acid is essential in the Krebs cycle (or TCA cycle), which in turn is an essential chemical cycle that takes place in all living organisms to generate energy, via the generation of adenosine triphosphate (ATP). This means that citric acid is naturally present inside all living organisms, and it is very unlikely that it will be found in the environment at concentrations high enough to exert hazards to organisms (ECHA). Short-term aquatic toxicity data indicate that citric acid is of low toxicity. Further, the substance is readily biodegradable, has a log K_{ow} <3 and is highly soluble. Therefore, it is very unlikely to persist in the environment long enough to cause long-term effects. As a result, the completion of chronic studies was not required, and no studies are available.

C. Terrestrial Toxicity

No studies are available.

D. Calculation of PNEC

The PNEC calculations for citric acid follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for two trophic levels. Acute $E(L)C_{50}$ values are available for fish (440 mg/L) and *Daphnia* (1,535 mg/L, neutralized). On the basis that the data consist of short-term results from two trophic levels, an assessment factor of 1,000 has been applied to the lowest reported effect concentration of 440 mg/L for fish. The $PNEC_{water}$ is 0.44 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 0.277 mg/kg wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (0.807/1280) \times 1000 \times 0.44$
$= 0.277$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]

$K_{sed\text{-}water} = 0.8 + [0.2 \times Kp_{sed}/1000 \times BD_{soilid}]$
$= 0.8 + [0.2 \times 0.014/1000 \times 2400]$
$= 0.807\ m^3/m^3$

Where:
Kp_{sed} = solid-water partition coefficient (L/kg).

BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]

$Kp_{sed} = K_{oc} \times f_{oc}$
$= 0.3617 \times 0.04$
$= 0.014$ L/kg

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for citric acid is estimated to be 0.3617 L/kg.
F_{oc} = fraction of organic carbon suspended sediment = 0.04 [default].

PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 0.002 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (0.007/1500) \times 1000 \times 0.44$
$= 0.002$ mg/kg

Where:

Kp_{soil} = soil-water partition coefficient (m^3/m^3)

BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]

$Kp_{soil} = K_{oc} \times f_{oc}$

$= 0.3617 \times 0.02$

$= 0.007\ m^3/m^3$

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for citric acid is estimated to be 0.3617 L/kg.

F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU Reach Criteria methodology (IChEMS, 2022; ECHA, 2023).

Citric acid is readily biodegradable; thus, it does not meet the screening criteria for persistence.

The log K_{ow} values for citric acid are -1.5 to -1.8. Thus, citric acid does not meet the screening criteria for bioaccumulation.

There are no chronic aquatic toxicity studies on citric acid. The acute $E(L)C_{50}$ values for citric acid are >1 mg/L in fish and invertebrates. Thus, it does not meet the screening criteria for toxicity.

The overall conclusion is that citric acid is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

The information in this section is for a citric acid solution.

A. Classification

H315: Causes skin irritation
H319: Causes serious eye irritation
H335: May cause respiratory irritation
Eye irritation-category 2A
Skin irritation-category 2
Specific target organ toxicity (single exposure)- category 3

B. Labelling

Warning

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Eye Contact

In the case of contact, immediately flush eyes with plenty of water for at least 15 minutes. If symptoms persist, seek medical advice.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion

Rinse mouth with water and then drink plenty of water. Never give anything by mouth to an unconscious person. If symptoms develop, seek medical advice.

B. Firefighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

No data are available.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilt

Pick up with absorbent material. Dispose of contaminated material as prescribed.

D. Storage and Handling

General Handling

No special measures necessarily provided product is used correctly.

Other Handling Precautions

Avoid eye and skin contact.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for citric acid.

Engineering Controls

None

Personal Protection Equipment

Respiratory Protection:

Respiratory protection is not required.

Hand Protection:

Chemical resistant protective gloves.

Skin Protection:

Body protection must be chosen depending on activity and possible exposure.

Eye protection:

Safety glasses with side-shields.

Other Precautions:

Handle in accordance with good industrial hygiene and safety practice. Eyewash fountains and safety showers must be easily accessible.

F. Transport Information

Citric acid is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods Code is not required.

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

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ACRYLAMIDE/SODIUM ACRYLATE COPOLYMER (CAS NO. [redacted]
ACRYLAMIDE/AMMONIUM ACRYLATE COPOLYMER (CAS NO. [redacted]
ACRYLAMIDE, SODIUM ACRYLATE POLYMER (CAS NO. [redacted]
2-PROPENOIC ACID, POTASSIUM SALT, POLYMER WITH 2-PROPENAMIDE (CAS NO. [redacted]
ACRYLATE TERPOLYMER (CAS NO. [redacted][1]
SILICONE BASED EMULSION NEUTRALISED POLYACRYLIC BASED STABILISER (NO CAS NO.)

This group contains a sodium salt of a polymer consisting of acrylic acid, methacrylic acid or one of their simple esters and five similar polymers. They are expected to have similar environmental concerns and have consequently been assessed as a group. Information provided in this dossier is based on acrylamide/sodium acrylate copolymer (CAS RN [redacted]

This dossier on acrylamide/sodium acrylate copolymer and similar polymers presents the most critical studies pertinent to the risk assessment of these polymers in their use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): 2-Propenoic acid, sodium salt, polymer with 2-propenamide

CAS RN: [redacted]

Molecular formula: $(C_3H_5NO.C_3H_4O_2.NA)_x$-

Molecular weight: No information is available. Based on the type and intended use of the copolymer, the molecular weight would likely range from 100,000 to > 3,000,000 Daltons (Hamilton et al., 1997).

Synonyms: Acrylamide/sodium acrylate copolymer; 2-propenamide, polymer with 2-propenoic acid, sodium salt; 2-propenoic acid, sodium salt, polymer with 2-propenamide; 2-Propenamide-sodium 2 propenoate copolymer; sodium acrylate acrylamide polymer; sodium acrylate-acrylamide copolymer

SMILES: Not applicable.

II. PHYSICO-CHEMICAL PROPERTIES

No information is available.

III. ENVIRONMENTAL FATE PROPERTIES

No studies are available. The acrylamide/sodium acrylate copolymer is not expected to be readily biodegradable. The physico-chemical properties of the copolymer would preclude it from undergoing significant biodegradation (Guiney et al., 1997). Biodegradation is limited due to the very high molecular weight and the low water solubility of the copolymer. The copolymer will likely bind

[1] CAS name: 2-Propenoic acid, polymer with sodium 2-hydroxy-3-(2-propen-1-yloxy)-1-propanesulfonate (1:1) and alpha-sulfo-omega-(2-propen-1-yloxy)poly(oxy-1,2-ethanediyl) ammonium salt (1:1), sodium salt

tightly to organic matter found within soils and sediments (Guiney et al., 1997). The copolymer is not expected to bioaccumulate because of its poor water solubility and high molecular weight.

IV. HUMAN HEALTH HAZARD ASSESSMENT

No studies are available.

NICNAS has assessed acrylamide/sodium acrylate copolymer (CAS RN [redacted] acrylamide, sodium acrylate polymer (CAS RN [redacted] and 2-propenoic acid, potassium salt, polymer with 2-propenamide (CAS RN [redacted] in an Inventory Multi-tiered Assessment and Prioritisation (IMAP) Tier 1 assessment and considers each a polymer of low concern.[3]

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

No toxicological reference values or drinking water guidance values were developed.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Acrylamide/sodium acrylate copolymer does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

No studies are available. Acrylamide/sodium acrylate copolymer is expected to be a low concern for toxicity to aquatic organisms (Guiney et al., 1997). Due to its poor solubility and high molecular weight, it is not expected to be bioavailable. It does not contain any reactive functional groups (i.e., cationic groups).

A. Calculation of PNEC

No PNEC values were calculated.

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Acrylamide/sodium acrylate copolymer is not readily biodegradable; thus, it meets the screening criteria for persistence.

Acrylamide/sodium acrylate copolymer is expected to have a very high molecular weight and poor water solubility. It is not expected to be bioavailable. Thus, this copolymer does not meet the criteria for bioaccumulation.

There are no aquatic toxicity studies on acrylamide/sodium acrylate copolymer. It is expected to have low concern for aquatic toxicity because of its very high molecular weight and poor water solubility. Thus, the copolymer does not meet the criteria for toxicity.

[3] https://www.industrialchemicals.gov.au/help-and-guides/polymer-low-concern-plc-criteria

The overall conclusion is that acrylamide/sodium acrylate copolymer is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

Not classified.

B. Labelling

No signal word.

C. Pictograms

None.

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Eye Contact

In case of contact, immediately flush eyes with plenty of water for at least 5 minutes. If symptoms persist, seek medical advice.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion

Rinse mouth with water and then drink plenty of water. Never give anything by mouth to an unconscious person. If symptoms develop, seek medical advice.

B. Firefighting Information

Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Burning produces harmful and toxic fumes. Heat from fire may melt, decompose polymer and generate flammable vapours. Combustion products may include nitrogen oxides, carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke). Dust can accumulate static charges which can

cause an incendiary electrical discharge. Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source, is a potential dust explosion hazard.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Potential combustible dust hazard. Avoid generating dust. Creates dangerous slipping hazard on any hard smooth surface.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

Scoop up and remove.

D. Storage and Handling

General Handling

Avoid dust accumulation in enclosed space. Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard. Electrostatic charge may build up during handling. Equipment, container and metal containers should be grounded and bonded.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place. Use adequate ventilation to avoid excessive dust accumulation. Store away from excessive heat and away from strong oxidising agents. Take measures to prevent the buildup of electrostatic charge.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure limit for acrylamide/sodium acrylate copolymer.

Engineering Controls

Use in a well-ventilated area. Avoid creating dust. Take precautionary measures against static charge.

Personal Protection Equipment

Respiratory Protection: Not normally needed; however, if significant exposures are possible, then the following respirator is recommended: Dust/mist respirator.

Hand Protection: Normal work gloves.

Skin Protection: Normal work coveralls.

Eye Protection: Wear safety glasses or goggles to protect against exposure.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Eyewash fountains and safety showers must be easily accessible.

F. Transport Information

Acrylamide/sodium acrylate copolymer is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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DIETHYLENE GLYCOL

This dossier on diethylene glycol presents the most critical studies pertinent to the risk assessment of diethylene glycol in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

NICNAS has assessed diethylene glycol in an Inventory Multi-tiered Assessment and Prioritisation (IMAP) Tier 1 assessment and concluded that it poses no unreasonable risk to the environment[1] .

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): 2-(2-hydroxyethoxy)ethan-1-ol

CAS RN: [redacted]

Molecular formula: $C_4H_{10}O_3$ or $(CH_2CH_2OH)_2O$

Molecular weight: 106.12 g/mol

Synonyms: Diethylene glycol; 2,2'-oxydiethanol; diglycol; bis(2-hydroxyethyl) ether; 2-hydroxyethyl ether; 2,2'-oxybisethanol; 2-(2-hydroxyethoxy)ethanol; ethanol, 2,2'-oxybis-; 2-(2-hydroxyethoxy)ethan-1-ol; glycol ethyl ether; ethylene diglycol

SMILES: C(COCCO)O

II. PHYSICAL AND CHEMICAL PROPERTIES

Table 1: Overview of the physico-chemical properties of diethylene glycol

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	A colourless viscous liquid	2	ECHA
Melting point	-6.5°C @ 101.3 kPa	2	ECHA
Boiling point	244.9°C @ 101.3 kPa	2	ECHA
Density	1,118 kg/m^3 @ 20°C	2	ECHA
Vapour pressure	0.008 hPa @ 25°	2	ECHA
Partition coefficient (log K_{ow})	-1.98 (calculated)	2	ECHA
Water solubility	1,000 g/L @ 20°C	2	ECHA
Flash point	138°C	2	ECHA
Auto flammability	372°C	2	ECHA

[1] https://www.industrialchemicals.gov.au/chemical-information/search-assessments?assessmentcasnumber [redacted] %2C+

Property	Value	Klimisch Score	Reference
Viscosity	30 mPa s (dynamic) @ 25°C	2	ECHA

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

The substance is readily biodegradable, is unlikely to bioaccumulate, nor is it likely to adsorb or desorb to soil or sediment to a great extent.

B. Biodegradation

Diethylene glycol is readily biodegradable. In an OECD 301B test, there was 70-80% and 90-100% degradation after 28 days, as determined by CO_2 evolution and DOC removal respectively (ECHA) [Kl.score=2].

In an OECD 301A test, there was 90-100% degradation after 28 days, although the 10-day window was missed (ECHA) [Kl.score=1]. In a modified MITI I test (OECD 301C), there was up to 92% degradation after 28 days (ECHA) [Kl.score=2].

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

No experimental data are available for diethylene glycol. Using KOCWIN in EPI Suite™ (USEPA, 2017), the estimated K_{oc} value from the molecular connectivity index (MCI) and log K_{oc} are 1 and -0.08 L/kg, respectively (ECHA) [Kl Score = 2]. Based on these K_{oc} values, if released to soil, diethylene glycol is expected to not adsorb to soil and have a very high mobility. If released to water, based on the K_{oc} value and its water solubility, it is also not expected to adsorb to suspended solids and sediment.

D. Bioaccumulation

The calculated log K_{ow} for diethylene glycol is -1.98 (Verschueren, 1983). Diethylene glycol has low potential to bioaccumulate. In a 3-day bioaccumulation fish study with *Leuciscus idus melanotus*, the BCF was determined to be 100 (Freitag et al., 1985) [Kl score = 2].

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

The substance exhibits low oral acute toxicity. It is not a significant skin or eye irritant, nor is it considered to be a skin sensitiser. No dermal or inhalation repeat dose studies were available but oral repeat does studies suggest moderate urinary dysfunction with oxalate formation in rats. The substance is not genotoxic, carcinogenic nor developmentally toxic.

B. Acute Toxicity

The oral LD_{50}'s in rats is 19,600 mg/kg (Lenk et al., 1989; ECHA) [Kl.score=2] and 16,500 mg/kg (Laug et al., 1939; ECHA) [Kl.score=2].

No deaths were reported in rats exposed to a saturated vapour for 6 hours (OECD, 2007) [Kl score = 2]. No deaths were also reported in male and female Aplk:APfSD (Wistar-derived) rats exposed to 5,080 mg/m^3 diethylene glycol aerosol (MMAD = 2.83 µm, GSD = 2.05) for 4 hours (OECD, 2007) [Kl.score=2].

The dermal LD_{50} in rabbits was reported to be 12,500 mg/kg (OECD, 2007) [Kl score = 2]. The dermal LD_{50} in rabbits was reported to be 13,300 mg/kg (ECHA) [Kl.score=4].

C. Irritation

When applied to the skin of rabbits for 24 hours under occlusive conditions, diethylene glycol was essentially non-irritating with a PII score of 0.04 (Guillot et al., 1982, ECHA) [Kl.score=2]. In a human repeated irritation patch test, diethylene glycol was minimally irritating to the skin (OECD, 2007) [Kl.score=2].

Diethylene glycol was not considered a skin irritant in an *in vitro* reconstructed human epidermis test (ECHA) [Kl.score=1].

Instillation of 0.1 mL diethylene glycol into the eyes of rabbits produced minor, transient irritation; no corneal lesions were observed (OECD, 2007) [Kl score = 2]. When instilled into the eyes of rabbits, the ocular irritancy was 11.67 based on a modified Kay Calandra scale of 0 to 110 (Guillot et al., 1982, ECHA) [Kl.score=2].

D. Sensitisation

Diethylene glycol was not a skin sensitiser to guinea pigs in a maximisation test (OECD, 2007; ECHA) [Kl.score=1]. Diethylene glycol was not a skin sensitiser in a human repeat irritation patch test (OECD, 2007; ECHA) [Kl.score=4].

E. Repeated Dose Toxicity

<u>Oral</u>

Male and female Wistar rats were given 0, 0.085, 0.17, 0.4 and 2.0% diethylene glycol in their diet for 225 days. The corresponding average daily intakes were 0, 51, 105, 234 and 1,194 mg/kg/day for males, and 0, 64, 126, 292 and 1462 mg/kg/day for females. In the 0.4% and 2% groups, there were oxalate crystalluria and mild defects of renal function (increased urine volume), as measured by concentration tests. The only finding in the 0.17% group was a 13.2% increase in urinary oxalate excretion in males; no effects were observed in the 0.085% group. The NOAEL and NOEL for this study was 0.17% (approximately 105 mg/kg/day) and 0.085% (approximately 51 mg/kg/day), respectively (ECHA) [Kl score = 2].

<u>Inhalation</u>

No studies are available.

<u>Dermal</u>

No studies are available.

F. Genotoxicity

In Vitro Studies

The *in vitro* genotoxicity studies on diethylene glycol are shown in Table 2.

Table 2: *In vitro* genotoxicity studies on diethylene glycol

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Bacterial reverse mutation (*S. typhimurium* strains)	-	-	1	OECD (2007), ECHA
Bacterial reverse mutation (*S. typhimurium* strains)	-	-	1	ECHA
Chromosomal aberration (CHO cells)	-	-	2	OECD (2007), ECHA
Sister chromatid exchange (CHO cells)	-	-	2	OECD (2007), ECHA

*+, positive; -, negative

In Vivo Studies

Micronuclei were not increased in the bone marrow of NMRI mice given a single intraperitoneal injection of 0, 500, 1,000 or 2,000 mg/kg diethylene glycol (ECHA) [Kl score = 1].

G. Carcinogenicity

Oral

Male and female F344 rats were given 0, 1.25 or 2.5% diethylene glycol (97% purity) in their drinking water for two years. The daily intake was estimated to be 0, 1,210 and 2,630 mg/kg/day for males and 0, 1,160 and 2,550 mg/kg/day for females. Mortality was increased in the 2.5% males; drinking water consumption was increased in the 2.5% males and females. There were no significant differences in the incidence of tumours between treated and control animals (Hiasa et al., 1990; ECHA) [Kl score = 2].

Male Osborne-Mendel rats were given 0, 1, 2 or 4% diethylene glycol in their feed for two years. During the first 26 weeks of the study, weight gain was significantly reduced at all dose levels. After the first year, the growth of rats fed the 4% diets was significantly reduced relative to the controls. There were no significant differences in food consumption at any treatment level. Mortality in rats fed the 4% diet was significantly higher than the control group; all animals were found dead before the end of the study (most dying during the last 12 months), compared with 7/12 control deaths. The incidence of bladder stones and bladder tumours increased with diethylene glycol exposure, with 0, 0, 6 and 5 bladder tumours observed in the control, 1, 2 and 4% DEG groups, respectively. Bladder stones were observed in 0, 2, 7 and 11 rats in the control, 1, 2 and 4% groups, respectively. In all but one case, bladder stones were present when bladder tumours were observed, suggesting that chronic irritation was a factor in the production of bladder tumours. The severity and incidence of signs of kidney damage (hydronephrosis, hydroureter, focal tubular atrophy, hyalin cast formation, glomerular atrophy) increased in a treatment-related manner, with gross kidney lesions observed in 1/12, 3/12 and 8/12 of the rats in the low-, mid- and high-dose groups, respectively. Liver damage observed histologically also increased with the level of diethylene glycol exposure. It

cannot be ruled out that this older study, which showed a significant increase in bladder stones and bladder tumours, may have been influenced by the presence of ethylene glycol as an impurity (Fitzhugh and Nelson, 1946) [Kl score = 3].

Male and female rats were given 0, 2 or 4% diethylene glycol (containing 0.031% ethylene glycol) in their feed for two years. Rats were either just weaned, 2 months old or 12 months old at the initiation of the exposure. The dietary concentration of diethylene glycol was adjusted for the food consumption and body weight of each group. For 4% diet, the dosage in weanlings was 5,400 mg/kg/day for the first 28 days, approximately 3,700 mg/kg/day during the next two-week period, gradually declined to about 2,000 mg/kg/day over the next three months and remained at that level for the rest of the study. A study average of 2,300 mg/kg/day for weanlings fed 4% in the diet was calculated from data provided by the authors. None of the 12-month old male rats included in the study survived, whereas all the females in that group survived to termination of the study. Although weanling rats developed more bladder stones than the other groups, the difference was insignificant. The yearling rats developed their bladder stones somewhat earlier. The yearling rats in the 4% groups had the highest stone formation (8 out of 20 rats) and had the only bladder tumour in this dose group; the rat with the bladder tumour also had bladder stones. No bladder stones or tumours were observed in rats of any age in the control or in the 2% groups. The bladder tumours associated with the stones were considered to be the result of mechanical irritation, and diethylene glycol was not considered to be a primary rat carcinogen. The LOAEL and NOAEL for this study were dietary concentrations of 4% and 2% (approximately 2,300 and 1,200 mg/kg), respectively. It cannot be ruled out that this older study, which showed a significant increase in bladder stones and bladder tumours, may have been influenced by the presence of ethylene glycol as an impurity (Weil et al., 1965) [Kl score = 3].

H. Reproductive Toxicity

In a two-generation study, male and female rats were dosed by oral gavage with 1 mL/100 g body weight of a 20% aqueous solution of diethylene glycol (approximately 2 mL/kg/day) for 8 weeks. A control group was given daily oral gavage doses of 1 mL/100 g body weight distilled water. Five of the treated females were dosed with diethylene glycol until parturition, the other five until the pups were weaned. Treatment of the P-generation with diethylene glycol for 12 weeks did not impair reproduction. The test animals and the controls became pregnant at almost the same time, litter size averaged 8-10 young, and the young exhibited similar, uniform development. Growth and onset of oestrus were not affected by treatment. The endocrine glands investigated showed no differences from the controls with regard to weight and fine structure. The receptiveness and litter size of the untreated F_1 generation were the same as those of the P-generation, and the F_2 generation was normal with regard to weight gain, onset of sexual maturity and weight as well as histology of the organs examined. The NOAEL for this study was calculated to be 2,200 mg/kg/day (Wegener, 1953; ECHA) [Kl score = 2].

A continuous breeding protocol (RACB) was used to study the reproductive toxicity of diethylene glycol in mice. Male and female CD-1 mice were administered in their drinking water 0, 0.35, 1.75 or 3.5% diethylene glycol. Mice were exposed for 7 days prior to mating, 98 days during cohabitation of breeding pairs and a further 23 days after segregation of each pair.

Breeding study: The mice given 1.75% or 3.5% diethylene glycol consumed significantly more drinking water than did the controls. Based on water consumption and body weight data, the 0, 0.35, 1.75 and 3.5% dose groups were equivalent to average daily intakes of 0, 612, 3,062 or 6,125 mg/kg/day, respectively. There was no treatment-related mortality. In the 3.5% dose group, there was significant decreases in the number of litters produced per pair, number of live pups per litter,

proportion of pups born alive, and the absolute and adjusted pup weights. A significant dose-related trend for reduced absolute pup weights was also observed. Exposure to the 3.55 dose group also resulted in a significant increase in the cumulative days to litter and fewer breeding pairs were able to produce litters: 82%, 76%, and 59% of the pairs exposed to 3.5% in the diet produced the third, fourth or fifth litters, respectively, whereas 97-100% of the control group produced litters.

Crossover mating: The mating index and the fertility of the 3.5% dosed males or females were unaffected compared with the control mice. However, live pup weight was decreased in the highest-dose group, in which a 9% difference was observed for the offspring of the control males and the treated females. At the end of this test the parental animals (F0 of breeding study) were necropsied. For the male mice there were no significant differences in the body or organ weights, either absolute or adjusted for body weight. Analysis of the cauda epididymal contents of F0 males at necropsy indicated that there were no effects of diethylene glycol in the highest-doses group on the sperm concentration or the percentage of motile or abnormal sperm. The mean body weight of the 3.5% dosed F0 females was significantly decreased relative to the control females. The magnitude of this decrease was approximately 7%. These animals also exhibited significantly decreased absolute liver and pituitary weights, but their organ-to body weight ratios were not different from controls. There were no significant treatment-related gross or histopathological lesions in the organs examined from the male and female F0 mice (Williams et al., 1990) [Kl score = 2].

I. Developmental Toxicity

Time-pregnant CD rats were dosed by oral gavage with 0, 1,118, 4,472 or 8,944 mg/kg on gestational days 6-15. In the high-dose females, there were reduced body weight gain, reduced food consumption, increased water consumption, increased liver and kidney weights and histopathological changes in the kidney. The mid-dose females exhibited only increased water consumption. There were no treatment-related effects on corpora lutea or implantations. Foetal body weights were reduced in the high-dose animals. Total or individual external or visceral variations were similar between treated and control groups; however, individual skeletal variations were significantly increased in the mid- and high- dose groups. The pattern of delayed ossification was considered consistent with reduced foetal body weight. Malformations were similar between treated and control groups. The maternal and developmental NOELs for this study were 1,118 mg/kg/day (Ballantyne and Snellings, 2005) [Kl score = 2].

Time-pregnant CD-1 mice were dosed by oral gavage with 0, 559, 2,795 or 11,180 mg/kg/day during gestational days 6-15. In the high-dose females, there was mortality, clinical signs, and increased water consumption; only increased water consumption was observed in the mid-dose females. Foetal body weights were significantly reduced in the high-dose animals. There were no increases in variations or malformations between treated and control animals. The maternal and developmental NOELs were 559 and 2,795 mg/kg/day, respectively (Ballantyne and Snellings, 2005) [Kl score = 2].

Groups of 15 pregnant Himalayan rabbits were administered oral (gavage) doses of 0, 100, 400 or 1,000 mg/kg DEG on gestational days 7-19. No maternal toxicity was observed at any of the DEG doses administered. The foetal and litter incidence of skeletal, soft tissue and external anomalies or variations were comparable to those of the control and/or historical control groups. The authors set the maternal and developmental toxicity NOEL at greater than 1,000 mg/kg (Hellwig et al., 1995) [Kl score = 1].

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for diethylene glycol follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2021).

A. Non-Cancer

Oral

The lowest NOAEL reported in the repeat dose toxicity study is 105 mg/kg/day based on the 225-day rat dietary study. Although, there was a 13.2% increase in oxalate excretion at this dose level, this was considered a biomarker and not an indicator of toxicity. At 0.4% (the LOAEL), there were oxalate crystalluria and mild defects of renal function (increased urine volume), as measured by concentration tests. The NOAEL of 105 mg/kg/day will be used for determining the oral reference dose (RfD) and the drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times U_{FD}$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 105/(10 × 10 × 1 × 1 × 1) = 105/100 = 1.0 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2021)
Proportion of water consumed = 10% (ADWG, 2021)
Volume of water consumed = 2L (ADWG, 2021)
Drinking water guidance value = (1.05 × 70 × 0.1)/2 = 3.7 mg/L

B. Cancer

A two-year study of in rats showed no carcinogenic effects when diethylene glycol was administered in drinking water (Hiasa et al., 1990). In older studies, bladder tumours were observed in rats given diethylene glycol in feed; the tumours are considered to be the result of physical irritation from the bladder stones that also were noted in the same animals (Fitzhugh & Nelson, 1946; Weil et al.,

1965). It cannot be ruled out that these older studies, which showed a significant increase in bladder stones and bladder tumours, may have been influenced by the presence of ethylene glycol as an impurity. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Diethylene glycol does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

The substance is of low toxicity concern to aquatic organisms.

B. Aquatic Toxicity

Acute Studies

Table 3 lists the results of acute aquatic toxicity studies conducted on diethylene glycol.

Table 3: Acute aquatic toxicity studies on diethylene glycol

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Pimephales promelas	96-hour LC_{50}	75,200	2	ECHA
Oncorhynchus mykiss	96-hour LC_5	66,000	2	ECHA
Daphnia magna	24-hour EC_{50}	>10,000	2	ECHA
Daphnia magna	48-hour EC_{50}	65,980	2	ECHA
Daphnia magna	48-hour EC_{50}	62,630	2	ECHA

Chronic Studies

In ECHA, the aquatic toxicity of the 'ethylene glycol and higher glycols' (mono-, di-, tri-, tetra- and pentaethylene glycol) is evaluated in a read-across approach. Data on all three trophic levels (fish, *daphnia*, algae) are available to describe the aquatic toxicity of the glycol read-across members. Due to the fact, that not for each single substance data for all required endpoints are available, a weight of evidence approach is used, which includes additional information based on QSAR calculation with the EpiWin-Program ECOSAR v1.11. Measured data, as well as estimated data, demonstrate that all glycols within the read-across are not harmful to aquatic organisms. No adverse effects on aquatic organisms occurred up to concentrations above 100 mg/L (ECHA).

No data for fish was available for diethylene glycol. However, chronic studies for fish are available for ethylene glycol (CAS No.: [redacted] The 7-day NOEC for the fathead minnow (*Pimephales promelas*) was determined to be 15,380 mg/L based on the weight of the test organisms (ECHA) [Kl.score=2].

No data for invertebrates was available for diethylene glycol. However, three studies were conducted with Dapnids (*Ceriodaphnia dubia* or *Daphnia magna*) for ethylene glycol (CAS-No.: [redacted] or triethylene glycol (CAS No.: [redacted] The study with ethylene glycol was conducted according to USEPA guideline 600/4-89/001 with *Ceriodaphnia dubia* as test species. The 7-day NOEC for reproduction was determined to be 8,590 mg/L ethylene glycol (nominal). Two studies measured the effect of triethylene glycol on the reproduction of *Daphnia magna*. One study was conducted according to the national standard ASTM (E 47.01, Draft No. 1, "Draft proposed standard practice for conducting renewal life cycle toxicity tests with Daphnia magna"). In this test the Daphnids were exposed to triethylene glycol for 21 days. Based on reproduction the reported NOEC is > 15,000 mg/L triethylene glycol (nominal) (ECHA) [Kl Score = 2].

Data for algae was available for diethylene glycol. The 8-day TGK to algae *Scenedesmus quadricauda* was determined to be 2,700 mg/L for diethylene glycol (ECHA) [Kl score = 2].

From the QSAR calculations it can be expected for diethylene glycol that algae are slightly more sensitive (ChV = 1,200 mg/L) than invertebrates (ChV = 1,891 mg/L) or fishes (ChV = 7,694 mg/L) (ECHA) [Kl Score = 2].

C. Terrestrial Toxicity

No studies are available.

D. Calculation of PNEC

The PNEC calculations for diethylene glycol follow the methodology discussed in DEWHA (2009).

<u>PNEC water</u>

Experimental results are available for three trophic levels. Acute E(L)C50 values are available for fish (66,000 mg/L), and Daphnia (> 10,000 mg/L). Results from a chronic algae study is available on diethylene glycol (2,700 mg/L). On the basis that the data consists of short-term results from two trophic levels and a long-term result from one trophic level, an assessment factor of 100 has been applied to the lowest reported value, which is the chronic value for algae. The $PNEC_{water}$ is <u>27 mg/L</u>.

<u>PNEC sediment</u>

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is <u>17.3 mg/kg sediment wet weight</u>.

The calculations are as follows:

$$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$$
$$= (0.89/1280) \times 1000 \times 27$$
$$= 17.3 \text{ mg/kg}$$

Where:

$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)

BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]

$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$

$= 0.8 + [(0.2 \times 0.04/1000 \times 2400]$

$= 0.89\ m^3/m^3$

Where:

Kp_{sed} = solid-water partition coefficient (L/kg)

BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]

$Kp_{sed} = K_{oc} \times f_{oc}$

$= 1 \times 0.04$

$= 0.04$ L/kg

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for diethylene glycol based on the molecular connectivity index (MCI) is 1 L/kg (USEPA, 2017).

F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 0.36 mg/kg soil dry weight.

The calculations are as follows:

$PNECsoil = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$

$= (0.02/1500) \times 1000 \times 27$

$= 0.36$ mg/kg

Where:

Kp_{soil} = soil-water partition coefficient (m^3/m^3)

BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]

$Kp_{soil} = K_{oc} \times f_{oc}$

$= 1 \times 0.02$

$= 0.02$ m^3/m^3

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for diethylene glycol based on the molecular connectivity index (MCI) is 1 L/kg (USEPA, 2017).

f_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Diethylene glycol has been shown to be readily biodegradable; thus, it does not meet the screening criteria for persistence.

The calculated log K_{ow} is -1.98, and the experimental BCF is 100. Thus, diethylene glycol does not meet the screening criteria for bioaccumulation.

The lowest chronic toxicity value for diethylene glycol is > 0.1 mg/L. Thus, diethylene glycol does not meet the criteria for toxicity.

Therefore, diethylene glycol is not a PBT substance.

IX. CLASSIFICATION AND LABELING (ABSTRACTED FROM PUBCHEM)

A. Classification

Irritant

B. Labelling

Danger

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS) (ABSTRACTED FROM PUBCHEM)

A. First Aid

Eye Contact

First check the victim for contact lenses and remove if present. Flush victim's eyes with water or normal saline solution for 20 to 30 minutes while simultaneously calling a hospital or poison control centre. Do not put any ointments, oils or medication in the victim's eyes without specific instructions from a physician. IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.\

Skin Contact

IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

Inhalation

IMMEDIATELY leave the contaminated area; take deep breaths of fresh air. If symptoms (such as wheezing, coughing, shortness of breath, or burning in the mouth, throat, or chest) develop, call a physician and be prepared to transport the victim to a hospital. Provide proper respiratory protection to rescuers entering an unknown atmosphere. Whenever possible, Self-Contained Breathing Apparatus (SCBA) should be used; if not available, use a level of protection greater than or equal to that advised under Protective Clothing.

Ingestion

DO NOT INDUCE VOMITING. If the victim is conscious and not convulsing, give 1 or 2 glasses of water to dilute the chemical and IMMEDIATELY call a hospital or poison control centre. Be prepared to transport the victim to a hospital if advised by a physician. If the victim is convulsing or unconscious,

do not give anything by mouth, ensure that the victim's airway is open and lay the victim on his/her side with the head lower than the body. DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital.

Notes to Physician (abstracted from PubChem)

The patient should be resuscitated with isotonic crystalloidal fluids, and acidosis should be corrected. Early treatment with a competitive ADH inhibitor (e.g., 4-methylpyrazole or ethanol), hemodialysis and supportive care offer the best hope for patient recovery.

Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device or pocket mask, as trained. Perform CPR as necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature.

Basic treatment: Establish a patent airway (oropharyngeal or nasopharyngeal airway, if needed). Suction if necessary. Watch for signs of respiratory insufficiency and assist ventilations if necessary. Administer oxygen by nonrebreather mask at 10 to 15 L/min. Monitor for pulmonary oedema and treat if necessary. Monitor for shock and treat if necessary. Anticipate seizures and treat if necessary. For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with 0.9% saline (NS) during transport. Do not use emetics. For ingestion, rinse mouth and administer 5 mL/kg up to 200 mL of water for dilution if the patient can swallow, has a strong gag reflex and does not drool. Administer activated charcoal.

Advanced treatment: Consider orotracheal or nasotracheal intubation for airway control in the patient who is unconscious, has severe pulmonary oedema or is in severe respiratory distress. Positive-pressure ventilation techniques with a bag-valve-mask device may be beneficial. Consider drug therapy for pulmonary oedema. Monitor cardiac rhythm and treat arrhythmias if necessary. Start IV administration of D5W /SRP: "To keep open", minimal flow rate. Use 0.9% saline (NS) lactated Ringer's (LR) if signs of hypovolemia are present. For hypotension with signs of hypovolemia, administer fluid cautiously. Consider vasopressors if patient is hypotensive with a normal fluid volume. Watch for signs of fluid overload. Treat seizures with diazepam or lorazepam. Use proparacaine hydrochloride to assist eye irrigation.

Medical Conditions Aggravated by Exposure

Respiratory conditions (asthma, etc.)

Emergency Personnel Protection

Wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool.

B. Fire Fighting Information (abstracted from Comet Chemical SDS 2013)

Extinguishing Media

Use powder, alcohol-resistant foam, water spray, carbon dioxide.

Specific Exposure Hazards

Combustible when exposed to heat or flame; can react with oxidising materials.

Special Protective Equipment for Firefighters

Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Firefighters should wear proper protective equipment and self-contained breathing apparatus with full face piece operated in positive pressure mode. Move containers from fire area if safe to do so. Water spray may be useful in cooling equipment exposed to heat and flame.

C. Accidental Release Measures

Personal Precautions

Restrict access to area until completion of clean-up. Ensure clean-up is conducted by trained personnel only. All persons dealing with clean-up should wear the appropriate protective equipment including self-contained breathing apparatus.

Environmental Precautions

Ventilate the area. Stop spill or leak at source if safely possible. Dike for water control. Contain and absorb spilled liquid with non-combustible, inert absorbent material (e.g., sand), then place absorbent material into a container for later disposal.

Steps to be Taken if Material is Released or Spilled

Absorb spill with inert material (e.g., vermiculite, sand or earth), then place in suitable container. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation.

D. Storage and Handling

General Handling

Wear protective gloves/clothing and eye/face protection. Use with adequate ventilation. Do not ingest. Do not breathe mist or vapour. Avoid contact with eyes, skin and clothing. Wash with soap and water after handling. Keep away from extreme heat and flame. Keep away from acids and other incompatibles. Keep containers tightly closed when not in use.

Other Handling Precautions

Wash thoroughly after handling. Use with adequate ventilation. Avoid breathing vapours from heated material. Avoid contact with eyes, skin and clothing. Keep container tightly closed. Wash clothing before reuse. Avoid breathing spray or mist.

Storage

Store in a cool, dry, well-ventilated area. Store away from areas of excessive heat, open flames, sparks and other possible sources of ignition. Keep away from incompatibles. Storage area should be

clearly identified, clear of obstruction and accessible only to trained and authorised personnel. Inspect periodically for damage or leaks.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for diethylene glycol.

Engineering Controls

Good general ventilation should be used. Localised ventilation should be used where vapours, mist or aerosols may be generated.

Personal Protection Equipment

Respiratory Protection: Wear an approved respirator with dust/mist pre-filters if any exposure to dust or mist is possible.

Hand Protection: Wear appropriate chemical-resistant gloves.

Skin Protection: Wear protective clothing to minimise skin contact.

Eye Protection: Wear chemical splash goggles and face shield.

Other Precautions: Wash hands, forearms and face thoroughly after handling chemical products; before eating, smoking and using the lavatory; and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

Diethylene glycol is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

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DISODIUM OCTABORATE TETRAHYDRATE

This dossier on disodium octaborate tetrahydrate presents the most critical studies pertinent to the risk assessment of disodium octaborate tetrahydrate in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): [Disodium octaborate]: disodium;(9,11-dioxido-5-oxoboranyloxy-2,4,6,8,10,12,13-heptaoxa-1,3,5,7,9,11-hexaborabicyclo[5.5.1]tridecan-3-yl)oxy-oxovorane

CAS RN: [redacted] (anhydrous form)

Molecular formula: $Na_2B_8O_{13}$

Molecular weight: 340.45 g/mol

Synonyms: Disodium octaborate tetrahydrate; disodium octaborate

SMILES: (disodium octaborate): B(=O)OB1OB2OB(OB(OB(O2)OB(O1)OB=O)[O-])[O-].[Na+].[Na]

Chemical Name (IUPAC): [Disodium octaborate]: disodium;(9,11-dioxido-5-oxoboranyloxy-2,4,6,8,10,12,13-heptaoxa-1,3,5,7,9,11-hexaborabicyclo[5.5.1]tridecan-3-yl)oxy-oxovorane

CAS RN: [redacted] (hydrated form)

Molecular formula: $Na_2B_8O_{13}\bullet 4H_2O$

Molecular weight: 412.4 g/mol

Synonyms: Disodium octaborate tetrahydrate; disodium octaborate

SMILES: (disodium octaborate): B(=O)OB1OB2OB(OB(OB(O2)OB(O1)OB=O)[O-])[O-].[Na+].[Na+]

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the physico-chemical properties of disodium octaborate tetrahydrate*

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	White, colourless, odourless, crystalline powder*	1	ECHA
Melting Point	>1,000°C @ 101.3 kPa	1	ECHA
Boiling Point	Study not relevant because the substance is a solid that melts >300°C	-	ECHA

Property	Value	Klimisch Score	Reference
Density	1874 kg/m^3 (temperature not indicated)	1	ECHA
Vapour Pressure	9.9×10^{-17} Pa @ 25°C	1	ECHA
Partition Coefficient (log K_{ow})	Not applicable because this substance is inorganic	-	ECHA
Water Solubility	223.65 g/L @ 20°C	1	ECHA
Flash Point	Not applicable because this substance is inorganic	2	ECHA
Auto flammability	Not a self-heating substance	1	ECHA
Viscosity	Not applicable because the substance is a solid	-	ECHA
Henry's Law Constant	Not available	2	ECHA

* CAS RN: [redacted] (anhydrous form).

Boron is almost exclusively found in the environment in the form of boron-oxygen compounds, which are often referred to as borates. The high strength of the B-O bond relative to those between boron and other elements makes boron oxide compounds stable compared to nearly all non-oxide boron materials. Indeed, the B-O bond is among the strongest found in the chemistry of naturally occurring inorganic substances (ECHA).

In the environment, the chemicals in this group will dissociate and/or hydrolyse to release boron as boric acid [B(OH) (also formulated as H BO)] and/or borate anions (NICNAS, 2019).

Exposure to borates are often expressed in terms of boron (B) equivalents based on the fraction of boron in the source substance on a molecular weight basis. The B equivalents used are a generic designation rather than a designation of the element boron. The factor for converting disodium octaborate tetrahydrate to B-equivalents is 0.2096.

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Disodium octaborate tetrahydrate as a natural element is not degradable. It is highly soluble in water. Some partitioning to soil and sediment does occur, but this adsorption is pH dependent. It has a low potential for bioaccumulation.

B. Partitioning

Chemicals in this group will transform into boric acid in the aquatic environment. In the environment boric acid is in equilibrium with borate anions. Both species are very stable as they do not undergo biotransformation or redox reactions under normal environmental conditions. Boric acid is highly water soluble and it tends to remain in surface waters. Although some partitioning from water to soil and sediment does occur, the adsorption is pH dependent with the greatest adsorption occurring under alkaline conditions (pH 7.5 to9.0) (NICNAS, 2019).

C. Biodegradation

Degradation is not applicable to inorganic borates, such as disodium octaborate tetrahydrate. It is not subject to hydrolysis, photodegradation, or biodegradation (ECHA). Inorganic borates are subject to chemical transformation processes (adsorption, complexation, precipitation, fixation) once released into the environment (ECHA).

D. Environmental Distribution

The Kp value for disodium octaborate tetrahydrate was calculated as the median of all measured Kp values from the GEMAS project (Geochemical Mapping of Agricultural and Grazing Land Soil project): 2.19 L/kg dry weight (ECHA) [Kl.score=2]. The chemistry of boron in soils and aquatic systems is simplified by the absence of oxidation- reduction reactions or volatilization. Redox processes can mobilize Fe oxides and Mn oxides, which may lead to a release of boron in aquatic systems. Generally, sediments are characterised with higher pH values than the soil matrix, which increases the boron sorption capacity (ECHA).

If released to soil, based on this low Kp value, low vapour pressure and high water solubility, disodium octaborate tetrahydrate is considered relatively mobile in the environment, under certain conditions (ECHA).

E. Bioaccumulation

The WHO review of boron (WHO, 1998) noted that “highly water-soluble materials are unlikely to bioaccumulate to any significant degree and that borate species are all present essentially as un-dissociated and highly soluble boric acid at neutral pH”. A BCF of <0.1 was reported in Chinook salmon fed boron-supplemented diets for 60 to 90 days (Hamilton & Wiedmeyer, 1990).

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Disodium octaborate tetrahydrate exhibits low acute toxicity by the oral and dermal routes. It is not a skin or eye irritant, or a skin sensitizer. Toxicity studies on boric acid, borax (disodium tetraborate decahydrate), and boron oxide have been used to read-across to disodium octaborate tetrahydrate. This is justified because, in aqueous media at physiological pH, all of these inorganic borate compounds will predominantly exist as un-dissociated boric acid. The developing fetus and the testes are the two most sensitive targets of boron toxicity in multiple species. The testicular effects include reduced organ weight and organ to body weight ratio, atrophy, degeneration of the spermatogenic epithelium, impaired spermatogenesis, reduced fertility, and sterility. The developmental effects from boron exposure include high prenatal mortality; reduced fetal body weight; and malformations and variations. Repeated inhalation exposure to boron oxide resulted in slight irritation to the respiratory tract, but no systemic toxicity. Boric acid was not genotoxic; and boric acid and borax was not carcinogenic to rodents.

B. Acute Toxicity

The oral LD_{50} of disodium octaborate tetrahydrate in rats is 2,550 mg/kg (ECHA) [Kl.score=1]. The oral LD_{50} of boric acid in rats is 3,450 mg/kg (ECHA) [Kl.score=1]. The oral LD_{50} of anhydrous boric acid in rats is >2,500 mg/kg [Kl.score=1].

There are no acute inhalation studies on disodium octaborate tetrahydrate. The 4-hour inhalation LC_{50} value for boric acid in rats is >2.01 mg/L. The mass median aerodynamic diameter (MMAD) was 2.8 µm (ECHA) [Kl.score=1]. In another study, the 4-hour inhalation LC_{50} value for boric acid in rats was >2.03 mg/L (ECHA) [Kl.score=1]. The 4-hour inhalation LC_{50} value for disodium tetraborate pentahydrate in rats is >2.04 mg/L (ECHA) [Kl.score=1].

The dermal LD_{50} of disodium octaborate tetrahydrate in rabbits is >2,000 mg/kg (ECHA) [Kl.score=1]. The dermal LD_{50} of boric acid in rabbits is >2,000 mg/kg (ECHA) [Kl.score=1]. The dermal LD_{50} of sodium tetraborate pentahydrate in rabbits is >2,000 mg/kg (ECHA) [Kl.score=1].

C. Irritation

Application of 0.5 g of disodium octaborate tetrahydrate to the skin of rabbits for 4 hours under occlusive conditions was not irritating. The mean of the 24-, 48-, and 72-hour scores were 0.22 for erythema and 0.00 for edema (ECHA) [Kl.score=1].

Application of 0.5 g of boric acid to the skin of rabbits for 24 hours under occlusive conditions was not irritating. The mean of the 24- and 72-hour scores were: 0.13 for erythema and 0.00 for edema (ECHA) [Kl.score=1]. Application of 0.5 g of sodium tetraborate pentahydrate to the skin of rabbits for 4 hours under occlusive conditions was not irritating. The mean erythema and edema scores were 0.00 (ECHA) [Kl.score=2].

Disodium octaborate tetrahydrate was not considered to be an eye irritant when 0.053 or 0.049 g was instilled into the eyes of rabbits (ECHA) [Kl.score=1]. Instillation of 0.08 mL boric acid into the eyes of rabbits was slightly irritating. The mean of 24-, 48-, and 72-hour scores were 0.22 for corneal opacity, 0.22 for iridial lesions, 2.8 for conjunctival redness, and 1.89 for chemosis (ECHA) [Kl.score=1].

D. Sensitisation

Disodium octaborate tetrahydrate was not a skin sensitizer to guinea pigs in a Buehler test (ECHA) [Kl.score=1].

Boric acid was not a skin sensitizer to guinea pigs in a Buehler test (ECHA) [Kl.score=1]. Sodium tetraborate pentahydrate was not a skin sensitizer to guinea pigs in a Buehler test (ECHA) [Kl.score=1]. Sodium tetraborate decahydrate was not a skin sensitizer to guinea pigs in a Buehler test (ECHA) [Kl.score=1].

E. Repeated Dose Toxicity

<u>Oral</u>

Male and female SD rats were given in their feed boric acid at doses of 0, 52.5, 175, 525, 1,750 or 5,250 ppm B equivalents for 90 days. The average intake has been estimated to be approximately 0, 2.6, 8.8, 26, 87.5 or 262.5 mg B/kg-day, respectively (EPA, 2004). By week 6, all animals in the highest dose died. Clinical signs in the top two dose levels were rapid respiration, inflamed eyes, swollen paws, and desquamated skin on the paws and tails. There was also reduced food consumption and body weight gain. The 1,750 ppm females showed reduced liver, spleen ovary, and adrenal weights; the 1,750 ppm males showed reduced liver, spleen, kidney, testes, and adrenal weights. The adrenals of 4 of the 1,750 ppm males showed minor increases in lipid content and size of the cells in the zona reticularis. Atrophied testis (complete atrophy of the spermatogenic epithelium and decreased in the size of the seminiferous tubules) was seen in all of the 1,750 ppm

males. One 525 ppm male had partial testicular atrophy. The NOAEL for this study is 175 ppm boron or 8.8 mg B/kg-day (Weir and Fisher, 1972) [Kl.score=2].

Male and female SD rats were given in their diet borax at doses of 0, 52.5, 175, 525, 1,750 or 5,250 ppm B equivalents for 90 days. The average intake has been estimated to be approximately 0, 2.6, 8.8, 26, 87.5 or 262.5 mg B/kg-day, respectively (EPA, 2004). By week 6, all animals in the highest dose died. Clinical signs in the top two dose levels were rapid respiration, inflamed eyes, swollen paws, and desquamated skin on the paws and tails. There was also reduced food consumption and body weight gain. The 1,750 ppm females showed reduced liver, spleen and ovary weights; the 1,750 ppm males showed reduced liver, spleen, kidney, testes, and brain weights. The adrenals of the majority of the 1,750 ppm males and females showed slight to moderate increases in lipid content and size of the cells in the zona reticularis. Atrophied testis (complete atrophy of the spermatogenic epithelium and decreased in the size of the seminiferous tubules) was seen in all of the 1,750 ppm males. Four 525 ppm males had partial testicular atrophy. Spermatogenic arrest was found in one 525 ppm male. The NOAEL for this study is 175 ppm boron or 8.8 mg B/kg-day (Weir and Fisher, 1972) [Kl.score=2].

Male and female $B6CF1_1$ mice were given in the diet 0, 1,200, 2,500, 5,000, 10,000 or 20,000 ppm boric acid for 13 weeks (control and highest dose group) or 16 weeks (remaining dose groups). These dietary levels correspond to approximately 0, 34, 70, 141, 281 and 563 mg B/kg-day for males, respectively, and 0, 47, 97, 194, 388 and 776 mg B/kg-day for females, respectively (EPA, 2004). There was mortality (8/10 males; 6/10, females) in the 20,000 ppm, as well as hyperkeratosis and acanthosis. One male also died in 10,000 ppm group. Degeneration or atrophy of the seminiferous tubules occurred in the ≥5,000 ppm males. Minimal to mild extramedullary hematopoiesis of the spleen was observed in all dose groups. The LOAEL for this study is 1,200 ppm, corresponding to 34 and 47 mg B/kg-day for males and females, respectively (NTP 1987) [Kl.score=2].

Male and female SD rats were given in their diet 0, 117, 350 or 1,170 ppm boric acid for two years. The average intake has been estimated to be approximately 0, 5.9, 17.5 or 58.5 mg B/kg-day, respectively (EPA, 2004). The 1,170 ppm rats had decreased food consumption during the first 13 weeks of the study and suppressed growth throughout the study. Signs of toxicity in the 1,170 ppm animals included swelling and desquamation of the paws, scaly tails, inflammation of the eyelids, and bloody discharge from the eyes. All of the 1,170 ppm males had testicular atrophy at the 6-, 12- and 24-month time points. The seminiferous epithelium was atrophied, and the tubular size in the testes was decreased. There were significant decreases in the absolute and relative testes weights. Brain and relative thyroid weights were increased. The NOAEL for this study is 350 ppm B equivalents or 17.5 mg B/kg-day (Weir and Fisher, 1972) [Kl.score=2].

Male and female $B6C3F_1$ mice were given 0, 2,500 or 5,000 ppm boric acid in their feed for 103 weeks (NTP, 1987). These dose levels were equivalent to 0, 275 or 550 mg/kg-day boric acid or 0, 48 or 96 mg B/kg-day (EPA, 2004). There was reduced survival in the male mice, which was significantly different from the controls in the 2,500 ppm mice after week 63 and in the 5,000 ppm mice after week 84. The survival rates by the end of the study were 82, 60 and 44% in the 0, 2,500, and 5,000 ppm males, respectively, and 66, 66 and 74% in the 0, 2,500, and 5,000 ppm females, respectively. Mean body weights were 10-17% lower in the 5,000 ppm animals after 32 (males) or 52 (females) weeks compared to the controls There was testicular atrophy and interstitial cell hyperplasia in the testes of the 5,000 ppm males. A dose-related increase in the incidences of splenic lymphoid depletion in male mice was also observed. NTP considered this lesion to be associated with stress and debilitation, and it is reflected in the increased mortality in these groups of male mice. The NOAEL for this study is <2500 ppm (NTP, 1987) [Kl.score=2].

Inhalation

Male and female rats were exposed by inhalation to 0, 77, 175, or 470 mg/m^3 boron oxide. The exposures were 6 hours/day, 5 days/week for 24, 12, and 10 weeks for the 77, 175, and 470 mg/m^3 concentrations groups, respectively. The MMAD were 2.5, 1.9, and 2.4 µm for the 77, 175, and 479 mg/m^3 concentrations groups, respectively. There was no evidence of systemic toxicity. Some of the 470 mg/m^3 had reddish exudate from the nose. As these animals were covered with dust, this effect may have been local irritation of the nose and from the animals scratching the nose. The NOAEL for systemic toxicity is 470 mg/m^3, the highest exposure concentration tested. The NOAEL for localized effects (irritation) is 175 mg/m^3 (ECHA) [Kl.score=2].

Dermal

No studies are available.

F. Genotoxicity

In Vitro Studies

There are no *in vitro* genotoxicity studies on disodium octaborate tetrahydrate. The *in vitro* genotoxicity studies on boric acid are presented in Table 2.

Table 2: *In vitro* genotoxicity studies on boric acid

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Bacterial reverse mutation (*S. typhimurium* strains)	-	-	1	ECHA
Bacterial reverse mutation (*S. typhimurium* strains)	-	-	2	ECHA
Mammalian cell gene mutation (mouse lymphoma L5178Y cells)	-	-	1	ECHA
Chromosomal aberrations (Chinese Hamster Ovary cells)	-	-	1	ECHA
Chromosomal aberrations (Chinese Hamster Ovary cells)	-	-	1	ECHA
Chromosomal aberrations (Human peripheral lymphocytes)	NS	+	2	ECHA
Unscheduled DNA synthesis (rat liver cells)	NA	-	1	ECHA

*+, positive; -, negative; NA, not applicable; NS, not specified.

In Vivo Studies

No studies are available on disodium octaborate tetrahydrate.

Male and female Swiss Webster mice were given two daily doses of 0, 225, 450, 900, 1,800, or 3,500 mg/kg boric acid. The frequency of micronucleated polychromatic erythrocytes were not increased at any dose level (ECHA) [Kl.score=1].

G. Carcinogenicity

Oral

No studies have been conducted on disodium octaborate tetrahydrate.

Male and female SD rats were given in their diet disodium tetraborate decahydrate (Borax) or boric acid at doses of 0, 117, 350, or 1,170 ppm as B equivalents (approximately 0, 5.9, 17.5, or 58.5 mg B/kg-day) for two years. There was no mention of tumours in the report. Nevertheless, NTP (1987) concluded that this study provided adequate data on the lack of carcinogenic effects of boric acid in rats (Weir and Fisher, 1972; EPA, 2004).

Male and female $B6C3F_1$ mice were given in their diet 0, 2,500, or 5,000 ppm boric acid for 103 weeks. The dietary levels are equivalent to 0, 446, or 1,150 mg/kg-day boric acid or 0, 78.1, or 201.3 mg B/kg-day. There was no evidence of carcinogenicity (NTP, 1987) [Kl.score=2].

Inhalation

No studies are available.

Dermal

No studies are available.

H. Reproductive Toxicity

A three-generation reproductive toxicity study was conducted in albino rats (strain not specified) with boric acid. Male and female rats were fed a diet containing 0, 117, 350 or 1,170 ppm boron (approximately 0, 5.9, 17.5 or 58.5 mg B/kg-day, respectively). In the lower two dose groups, there were no treatment-related effects on reproduction. Litter size, progeny weights, fertility, live birth indices, lactation, appearance were similar to the controls. No gross abnormalities were noted in these two dose groups. The 1,170 ppm dose group were found to be sterile, and there were no litters from mating the treated females with control males. Lack of viable sperm was found in the atrophied testes of all 1,170 ppm males. Decreased ovulation was also seen in most of the ovaries of the 1,170 ppm females. The NOAEL for this study is 350 ppm boron or approximately 17.5 mg B/kg-day (Weir and Fisher, 1972) [Kl.score=2].

A three-generation reproductive toxicity study was conducted in albino rats (strain not specified) with disodium tetraborate decahydrate. Male and female rats were fed a diet containing 0, 117, 350 or 1,170 ppm boron (approximately 0, 5.9, 17.5 or 58.5 mg B/kg-day, respectively). In the lower two dose groups, there were no treatment-related effects on reproduction. Litter size, progeny weights, fertility, live birth indices, lactation, appearance were similar to the controls. No gross abnormalities were noted in these two dose groups. The 1,170 ppm dose group were found to be sterile, and there were no litters from mating the treated females with control males. Lack of viable sperm was found in the atrophied testes of all 1,170 ppm males. Decreased ovulation was also seen in the majority of the ovaries of the 1,170 ppm females. The NOAEL for this study is 350 ppm boron or approximately 17.5 mg B/kg-day (Weir and Fisher, 1972) [Kl.score=2].

In a continuous breeding protocol, male and female CD-1 mice were given in their diet 0, 1,000, 4,500 or 9,000 ppm boric acid in their feed. The authors estimated that the average daily intakes were: 0, 26.6, 111, and 220 mg B/kg-day to males, and 0, 31.8, 152, 257 mg B/kg-day to females. Boric acid consumption did not differ among the groups. There were no litters in the 9,000 ppm

breeding pairs. At 4,500 ppm, there was a successful first litter, after which there was a progressive decrease in fertility, only one pair produced a fourth and fifth litter. All fertility indices were affected in the 4,500 ppm group. A complete crossover mating trial was conducted using control mice and the 4,500 ppm mice. The results showed that the probable cause of the reduced fertility was a decrement in male fertility. A dose-related decrease in body, testicular and epididymal weights was observed in the 4,500 and 9,000 ppm F_0 males. Sperm count was significantly decreased in these two dose groups, and percent motile sperm was decreased in all dose groups. Testicular histopathology showed seminiferous tubular atrophy in the 9,000 ppm males and partial atrophy of the seminiferous tubules in the 4,500 ppm males. There were no histopathologic changes in the 4,500 ppm females. No statistically significant decreases in mating index, fertility index, or live pups/litter in the 4,500 ppm females, but the number of days to litter in this dose group was increased. Estrous cyclicity was unaffected. Reproductive organ weights were unaffected, but relative maternal liver and kidney/adrenal weights were reduced. An F_1 fertility trial was performed using offspring from the 1,000 ppm groups. There were no decreases in mating, fertility or reproductive performance. The F_2 adjusted live pup weight was slightly, but significantly, reduced from controls. A clear NOAEL for reproductive toxicity in males was not seen in this study. The 1,000 ppm males had decreased sperm motility in the F_0 generation and decreased sperm concentration in the F_1 generation. Decreased F_2 pup relative body weight was statistically significant from controls. The NOAEL in this study for females is 1,000 ppm boric acid or 32 mg B/kg-day). The LOAEL in this study for males is 1,000 ppm or 27 mg B/kg-day; a NOAEL was not established (Fail et al. 1991) [Kl.score=2].

I. Developmental Toxicity

Oral

Pregnant female SD rats were given 0, 0.1, 0.2 or 0.4% boric acid in their feed on gestational days (GD) 0 to 20 or 0.8% boric acid on GD 6 to 15. The average amounts of boric acid ingested were estimated to be 0, 78, 163, 330 or 539 mg/kg-day (0, 13.6, 28.5 or 57.7 mg B/kg-day), respectively. Effects on the pregnant rats were altered food and/or water intake at $\geq$0.2% boric acid, increased liver and kidney weights relative to body weights at $\geq$0.2%, reduced weight gain at $\geq$0.4%, and increased corrected weight gain at 0.4% boric acid. There was a reduction in fetal body weights in all treated groups (94, 87, 63, and 47% of control weight, respectively). Increased malformations occurred at $\geq$0.2%, and prenatal mortality was increased at 0.8%. There was a dose-response for altered skeletal morphology in rats ($\geq$0.1%), and specific findings were significantly elevated above controls at $\geq$0.2%. Specifically, there was an increased incidence of short rib XIII (a malformation) and a decreased incidence or rudimentary or full rib(s) at lumbar I (an anatomical variation) (Heindel *et al.* 1992) [Kl.score=2].

Pregnant female SD rats were given 0, 0.025, 0.005, 0.075, 0.1 or 0.2% boric acid in their feed on GD 0 to 20. Approximately half of the dams were terminated on GD 20, and the remaining dams delivered their litters. Pup growth and viability were monitored until postnatal day (PND) 21. The average amounts of boron ingested on GD 20 were: 0, 3.3, 6.3, 9.6, 13.3, and 25 mg B/kg-day], respectively. The average amounts of boron ingested on PND 21 were, 0, 3.2, 6.5, 9.7, 12.9, and 25.3 mg B/kg-day, respectively. There were no maternal deaths and no treatment-related clinical signs. Maternal body weights were similar across all groups during gestation. However, decreased maternal body weights (GD 19 and 20 at sacrifice) and decreased maternal body weight gain (GD 15-18 and GD 0-20) were statistically significant in trend tests. There was a 10% reduction in gravid uterine weight (statistically significant) in the 0.2% group. Corrected maternal weight (maternal gestational weight minus reduced gravid uterine weight) was unaffected by treatment. Feed intake in the 1,000 ppm dams was minimally affected and only during the first three days of dosing. Water consumption was higher in the treated groups after GD 15. The number of corpora lutea and uterine implantation sites, and the percentage of preimplantation loss were similar across all groups.

Increased relative kidney weights were increased in the 0.2% group. There were no differences in the viability of the offspring between treated and controls. On GD 20, fetal body weight was 94% and 88% of controls in the 0.1% and 0.2% groups, respectively; recovery was complete at birth (~GD 22). The incidence of short rib XIII was increased on GD 20 in the ≥0.1% groups, but only in the 0.2% group at PND 21. The incidence of wavy rib was increased on GD 20 in the ≥0.1% group; the reversibility of this effect was confirmed on PND 21. There was a slight decrease in extra lumbar ribs in the 0.2% group on GD 20, and extra lumbar ribs were seen in the 0.2% group on PND 21. The developmental NOAEL was 0.075% boric acid or 9.6 mg B/kg-day on GD 20, and 0.1% boric acid or 12.9 mg B/kg-day on PND 21 (Price *et al.*, 1996a) [Kl.score=1].

Pregnant Swiss mice were given 0, 0.1, 0.2 or 0.4% boric acid in their diet on gestational days (GD) 0 to 17. The average amounts of boric acid ingested were estimated to be 248, 452 or 1,003 mg/kg-day (0, 43.4, 79.0 or 175.3 mg/B/kg-day), respectively. Maternal toxicity consisted of mild kidney lesions (≥0.1%), increased water intake and relative kidney weights (0.4%), and decreased water intake during treatment. Fetal body weights were reduced in the ≥0.2% groups, and there were increased incidences of resorptions and malformed fetuses per litter in the 0.4% group. The LOAEL for maternal toxicity is 248 mg/kg-day boric acid or 43.4 mg B/kg-day; a NOAEL was not established. The NOAEL for developmental toxicity is 248 mg/kg-day boric acid or 43.4 mg B/kg-day (Heindel *et al.*, 1992) [Kl.score=2].

Pregnant female New Zealand rabbits were dosed by oral gavage with 0, 62.5, 125 or 250 mg/kg boric acid (0, 10.9, 21.9 or 43.7 mg B/kg) during GD 6-19. Feed intake was in the 250 mg/kg maternal animals during the exposure period, but it was increased in the ≥125 mg/kg dose groups. In the 250 mg/kg group, maternal body weights during GD 9-30, weight gain during GD 6-19, gravid uterine weight, and number of corpora lutea per dam were significantly reduced. In the ≥125 mg/kg groups, maternal corrected gestational weight gain was increased compared to controls. Maternal liver weights were unaffected by treatment. In the 250 mg/kg group, relative, but not absolute, kidney weights were increased, although no effects in the kidney were noted in the histopathological examination. Prenatal mortality was increased in the 250 mg/kg group (90% resorptions/litter versus 6% for controls); the proportion of pregnant females with no live fetuses was increased (73% versus 0%), and live litter size was reduced (2.3 fetuses versus 8.8). Thus, there were only 14 live fetuses (6 live litters) available for evaluation in the 250 mg/kg group. The percentage malformed fetuses/litter was increased in the 250 mg/kg group, primarily due to cardiovascular defects (72% versus 3% of controls). There was no definitive maternal or developmental toxicity in the 62.5 or 125 mg/kg dose groups. The NOAEL for maternal and developmental toxicity is 125 mg/kg-day boric acid or 21.9 mg B/kg-day (Price *et al.*, 1996b) [Kl.score=1].

Inhalation

No studies are available.

Dermal

No studies are available.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for disodium octaborate tetrahydrate follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

The developing fetus and the testes are the two most sensitive targets of boron toxicity in multiple species (EPA, 2004; ECHA, 2010). The testicular effects include reduced organ weight and organ to body weight ratio, atrophy, degeneration of the spermatogenic epithelium, impaired spermatogenesis, reduced fertility, and sterility (EPA, 2004). The developmental effects from boron exposure include high prenatal mortality; reduced fetal body weight; and malformations and variations (EPA, 2004).

The U.S. Environmental Protection Agency (U.S. EPA) derived an Oral Reference Dose (RfD) for boron of 0.2 mg B/kg-day (U.S. EPA 2004) based on developmental effects in rats from two studies (Price *et al.* 1996a; Heindel *et al.* 1992).

The RfD was derived using the benchmark dose (BMD) method ($BMDL_{05}$ from Allen *et al.* 1996) using a data derived uncertainty factor of 66. Decreased fetal body weight ($BMDL_{50}$ = 59 mg boric acid/kg-day or 10.3 mg B/kg-day) was considered by Allen *et al.* (1996) as the most suitable endpoint for developing a point of departure, because the benchmark doses calculated for the other endpoints (incidence of total malformations, enlarged lateral ventricles in the brain, shortening of rib XIII, and variations of the first lumbar rib) were higher.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10.42 [3.16, toxicodynamics; 3.3, toxicokinetics]
UF_H (intraspecies variability) = 6.32 [3.16, toxicodynamics; 2.0, toxicokinetics]
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 10.3/(7.9 × 6.3 × 1 × 1 × 1) = 10.3/66 = 0.2 mg B/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (0.2 × 70 × 0.1)/2 = 0.7 mg/L

B. Cancer

There was no evidence of carcinogenicity in rat and mouse chronic studies conducted on disodium tetraborate decahydrate and/or boric acid. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Disodium octaborate tetrahydrate does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Disodium octaborate tetrahydrate has low acute and chronic toxicity to aquatic organisms.

B. Aquatic Toxicity

In ecotoxicological tests for boron, the exposure concentrations are expressed as boron equivalents i.e. mg B/L. This is because boric acid and borate salts will have the same boron speciation when dissolved in environmental matrices. Therefore, in the following sections toxicological values are given as mg B/L regardless of the form of boron that was tested.

Acute Studies

Table 3 lists the results of acute aquatic toxicity studies conducted on disodium octaborate tetrahydrate.

Table 3 Acute aquatic toxicity studies on disodium octaborate tetrahydrate

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Fathead minnow	96-hr LC_{50}	79.7	2	ECHA
Stonefly, Shortwing snowfly	96-hr LC_{50}	476	2	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	52.4 mg B/L	1	ECHA

Chronic Studies

Long-term effects (LC_{10}) on freshwater fish ranged from 3.5 to 47 mg B/L. Adequate long-term LC10 of 21.6 mg B/L was found for the fresh water fish *P. promelas* in a study according to EPA OPPTS 850.1400 (ECHA) [Kl.score=2].

Long-term effects (LC10/NOEC) on reproduction on freshwater vertebrates ranged from 6.6 to 32 mg B/L based on several well-accepted guideline studies (ECHA) [Kl.scores= 1 or 2].

Boric acid has been evaluated for its toxicity towards the fresh water alga *Pseudokirchneriella subcapitata* (formerly *Selenastrum capricornutum*) in an Alga growth inhibition test according to

OECD 201 under GLP requirements. The exposure duration was 72 hours under static conditions. The NOEC growth rate determined from the study was 17.5 mg B/L (ECHA) [Kl.score=1].

The ANZG water quality guideline (2021) derived a very high reliability default guideline value (DGVs) for (dissolved) boron in freshwater from 22 chronic (long-term) toxicity data, comprising eight fish, two amphibians, three crustaceans, one bivalve, three macrophytes, one green microalga, three diatoms and one blue–green alga. The summary of representative data used by ANZG to develop a water quality guideline for boron is presented in Table 4 below. These values are noted to be consistent with those reported in ECHA. Additional chronic aquatic toxicity data is found in the ANZG Technical Brief (ANZG, 2021).

Table 4 Chronic aquatic toxicity studies on boron[1]

Test Species	Endpoint	Results (mg/L)
Danio rerio	34-day NOEC (Biomass)	1.8
Pimephales promelas	32-day NOEC (Mortality)	11
Daphnia magna	14-day NOEC (Reproduction)	2.4
Pseudokirchneriella subcapitata	4-day NOEC (Growth)	2.8

1 - The DGVs are based on toxicity data for boron as either boric acid, H_3BO_3 (CAS [redacted] or borax, $Na_2B_4O_710H_2O$ (CAS [redacted] in freshwater.

In the chronic toxicity data set, fish sensitivity to boron ranged from the least sensitive species in the dataset (*Melanotaenia splendida*, LC10 102 mg/L) to the third most sensitive species in the dataset (*Danio rerio*, NOEC 1.8 mg/L). Of the crustaceans, *D. magna* was best represented in the literature, with 18 published NOEC values (ranging from 2.4 mg/L to 29 mg/L) for six different endpoints from six different publications. The final NOEC of 2.4 mg/L used in the DGV derivation was lower than that for *C. dubia* (NOEC 5.6 mg/L) and for the amphipod *H. azteca* (NOEC 6.6 mg/L).For *P. subcapitata*, there were three separate studies available with toxicity data for boron. The toxicity values from these studies ranged from a NOEC of 2.8 mg/L to a NEC of 27 mg/L, varying with endpoint, duration and test medium used. Boron was least toxic to *P. subcapitata* when tested in algal growth medium with added $NaHCO_3$, suggesting that carbonate addition may have influenced boron toxicity. Therefore, although NECs are preferred to NOECs or EC10s (Warne et al. 2018), in this instance, a reliable NOEC of 2.8 mg/L was the most sensitive toxicity value for *P. subcapitata* (ANZG, 2021).

C. Terrestrial Toxicity

Ecotoxicological tests with plants and soil invertebrates have recorded modest chronic toxicity values (NOECs/ECs) in the range of 15.3 to 84.0 and 5.2 to 315 mg total B/kg, respectively (ECHA, 2008). However, to predict the potential toxicity of boron to plants and soil organisms, measuring the total boron concentration may be unsuitable. Instead, potential toxicity is better predicted using boron concentrations in the soil solution (extractable boron) (Mertens, et al., 2011). In Australia, it is generally accepted that boron toxicity will pose a risk to terrestrial plants when soil concentrations exceed 15 mg/kg of extractable boron (NICNAS, 2019).

The avian toxicity studies conducted on disodium octaborate and boric acid are presented in Table 5.

Table 5: Avian toxicity studies on disodium octaborate and boric acid

Test Species	Test Substance	Endpoint	Results	Klimisch score	Reference
Mallard duck	Disodium octaborate	dietary LC_{50}	>2,100 mg B/kg food	1	EU, 2007
Bobwhite quail	Boric acid	dietary LC_{50}	>983 mg B/kg food	1	EU, 2007
Bobwhite quail	Disodium octaborate	Oral gavage LD_{50}	>527 mg B/kg bw	4	EU, 2007
Bobwhite quail	Disodium octaborate	dietary LC_{50}	>2,100 mg B/kg food	1	EU, 2007

D. Calculation of PNEC

The PNEC calculations for disodium octaborate follow the methodology discussed in DEWHA (2009).

PNEC Water

The ANZG water quality guideline (2021) derived a very high reliability DGV for (dissolved) boron in freshwater. The DGVs for 99, 95, 90 and 80% species protection are 340 µg/L, 940 µg/L, 1,500 µg/L and 2,500 µg/L, respectively. The 95% species protection level for boron in freshwater (940 µg/L) is recommended for adoption in the assessment of slightly-to-moderately disturbed ecosystems. (ANZG, 2021).PNEC Sediment

No experimental toxicity data on sediment organisms are available. Due to the high water solubility of disodium octaborate tetrahydrate and its low partitioning to sediment, sediment toxicity testing for boron compounds is particularly challenging. It is difficult to ensure that exposure is through the solid phase (i.e., sediment) and not from the aqueous boric acid in the overlying water (NICNAS, 2019). K_{ow} and K_{oc} parameters do not readily apply to inorganics, such as disodium octaborate tetrahydrate. Therefore, the equilibrium partitioning method cannot be used to calculate the $PNEC_{sed}$. As a result, the assessment of this compartment will be covered by the aquatic assessment.

PNEC Soil

In the ECHA REACH database (ECHA), a $PNEC_{soil}$ was derived for boron using the species sensitivity distribution method and an assessment factor of 2. The $PNEC_{soil}$ was determined to be 5.7 mg/kg soil dry weight.

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Disodium octaborate tetrahydrate is an inorganic compound that dissociates completely to boric acid and the borate anion in aqueous media. Biodegradation is not applicable to these inorganic compounds; both boric acid and borate are also ubiquitous and are present in most water, soil and sediment. For the purposes of this PBT assessment, the persistent criteria are not considered applicable to disodium octaborate tetrahydrate.

Disodium octaborate tetrahydrate is a water-soluble substance that is not expected to bioaccumulate. Limited data indicate that bioaccumulation (BCF values are low) is not significant in aquatic and terrestrial food chains. Thus, it does not meet the criteria for bioaccumulation.

The chronic aquatic toxicity data on disodium octaborate tetrahydrate has a NOEC > 0.1 mg/L. Thus, disodium octaborate tetrahydrate does not meet the criteria for toxicity.

The overall conclusion is that disodium octaborate tetrahydrate is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

H360FD:Reproductive Toxicant Category 1B

B. Labelling

Danger

According to the harmonised classification and labelling (ATP09) approved by the European Union, this substance may damage fertility and may damage the unborn child.

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

Eye Contact

Immediately flush open eyes with plenty of water for at least 15 minutes. Remove contacts, if present and easy to do. Get medical attention.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion

Swallowing small quantities (one teaspoon) will not cause any harm to adults. If larger amounts are swallowed, give two glasses of water to drink and seek medical attention. Never give anything by mouth to an unconscious person.

Notes to Physician

Observation only is required for adult ingestion of <5 grams. For ingestion of >5 grams, maintain adequate kidney function and force fluids.

B. Firefighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Disodium octaborate tetrahydrate is a flame retardant. It is not flammable, combustible, or explosive.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus and chemical-protective clothing.

C. Accidental Release Measures

Personal Precautions

Use personal protective clothing. Avoid dust formation. Ensure adequate ventilation. Do not breathe dust. Wear respiratory protection if ventilation is inadequate. Avoid contact with skin, eye, and clothing.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

Scoop up and remove.

D. Storage and Handling

General Handling

No special measures necessary provided product is used correctly.

Other Handling Precautions

Avoid eye and skin contact. Avoid creating or inhaling dust.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for disodium octaborate tetrahydrate.

[The workplace exposure standard for disodium tetraborate decahydrate (borax) in Australia is 5 mg/m^3 as an 8-hour TWA. The workplace exposure standard for disodium tetraborate pentahydrate in Australia is 1 mg/m^3 as an 8-hour TWA.]

Engineering Controls

Ensure adequate ventilation. Localized ventilation should be used to control dust levels below permissible exposure limits.

Personal Protection Equipment

Respiratory Protection: Use respiratory protection when airborne concentrations are expected to exceed exposure limits.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Eyewash fountains and safety showers must be easily accessible.

F. Transport Information

Disodium octaborate tetrahydrate is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

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DIETHYLENE TRIAMINE PENTA(METHYLENE PHOSPONIC ACID), SODIUM SALT

This dossier on diethylene triamine penta(methylene phosphonic acid), sodium salt (DTPMP sodium salt) presents the most critical studies pertinent to the risk assessment of DTPMP sodium salt in coal seam or shale gas extraction activities. It does not represent an exhaustive or critical review of all available data. The information presented in this dossier was obtained primarily from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA), and from the OECD-SIDS documents on the Phosphonic Acid Compounds Group 3 category, which includes DTPMP and its sodium salts (OECD, 2004a,b). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): [bis[2-[bis(phosphonomethyl)amino]ethyl]amino]methylphosphonic acid; sodium salt

CAS RN: [redacted]

Molecular formula: $C_9H_{28}N_3O_{15}P_5.xNa$

Molecular weight: Not applicable. This substance is a UVCB substance.

Synonyms: Diethylene triamine penta(methylene phosphonic acid), sodium salt; [[(phosphonomethyl)imino]bis[(ethylenenitrilo)bis(methylene)]]tetrakisphosphonic acid, sodium salt phosphonic acid, ((bis(2-(bis(phosphonomethyl)amino)ethyl)amino)methyl)-, sodium salt; hepta sodium salt of diethylene triamine penta (methylene phosphonic acid)

SMILES: [Na+].OP(=O)(O)CN(CCN(CP(=O)(O)O)CP(=O)(O)O)CCN(CP(=O)(O)O)CP(=O)(O)[O-]

II. PHYSICO-CHEMICAL PROPERTIES

Key physical and chemical properties for the substance are shown in Table 1.

Table 1: Overview of the Physico-Chemical Properties of DTPMP (CAS-RN [redacted] and DTPMP Sodium Salt

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Brown liquid	2	ECHA
Melting Point	>450°C (DTPMP) (pressure not provided)	1	ECHA
Boiling Point	>480°C (DTPMP) (pressure not provided_	1	ECHA
Density	1300 to 1400 kg/m^3 (DTPMP) @ 20°C	2	ECHA
Vapour Pressure	Negligible	2	ECHA
Partition Coefficient (log K_{ow})	-3.4 (DTPMP) (temperature not provided)	2	ECHA
Water Solubility	>520 g/L @ 25°C (DTPMP)	2	ECHA
Dissociation Constant (pKa)	1.03 – 12.58 (temperature not provided)	2	ECHA

DTPMP can ionise by loss of a hydrogen ion up to six times. Thus, it is a strong complexing agent and is highly hydrophilic. The sodium salts of DTPMP will dissolve readily in water to give a speciation state that is dictated by the pH of the aqueous medium. DTPMP has 10 possible ionisation states. Eight pK_a values were reported by Martell and Sillen (1968): 2.8, 4.45, 5.5, 6.38, 7.17, 8.15, 10.1, and 12.04, which were measured in 0.1 M potassium chloride. In a source giving no experimental details, DTPMP is described as having 10 pK_a values: 1.03, 2.08, 3.11, 4.15, 5.19, 6.23, 7.23, 8.30, 11.18, and 12.58 (Tomson et al., 1994).

At pH 7, DTPMP will be almost fully ionised in water five times, with a majority of the molecules ionised six times, and some seven or eight times.

DTPMP, sodium salt (CAS RN [redacted] is a UVCB substance (unknown variable composition or biological substance) that can potentially have 1-10 sodium salts.

This dossier contains information on DTPMP (CAS RN [redacted] as well as the sodium salts of DTPMP. The read-across of the acid to the sodium salts is justified because sodium is not significant with respect to the properties under consideration in this dossier. In dilute aqueous conditions of defined pH, a salt will be completely dissociated and will behave no differently to the parent acid, at the identical concentration of the particular speciated form present. Thus, some properties (measured or expressed in aqueous media) for a salt can be directly read-across (with suitable mass correction) to the parent acid and vice versa; the effect of the sodium ion, in this case, will not be significant. In biological systems and the environment, polyvalent metal ions will be present, and the phosphonate ions show very strong affinity to them (OECD, 2004b).

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

DTPMP sodium salt is not biodegradable, and it adsorbs strongly to sediment and soil. However, there are degradation modes operative in the environment which could prevent long-term persistence. DTPMP sodium salt has a low potential for bioaccumulation.

B. Partitioning

As discussed earlier, DTPMP acid and its salts behave in aqueous medium in accordance with the pH and composition of the medium. DTPMP acid and its salts will partition primarily to water and suspended sediments. It is highly soluble.

Photodegradation in the presence of common metal ions has been observed. Half-lives less than 1 hour were measured for sodium salt of DTPMP in water at pH 3, pH 5-6 and at pH 10, irradiated by a middle pressure mercury lamp emitting between 190 and 600 nanometres. Half-lives were found to be shorter in the presence of iron ions at environmentally relevant concentrations (Lesueur et al., 2005).

C. Biodegradation

In a Zahn-Wellens/EMPA (OECD 302B) test, there was no biodegradation after 28 days (ECHA) [Kl. score = 2]. There was also no biodegradation after 28 days in an OECD 301E test (ECHA) [Kl. score = 1].

Using [^{14}C]-DTPMP, there was 64% and 62.6% biodegradation in riverbank soil and silt loam soil, respectively, after 148 days (ECHA) [Kl. score = 2].

There are degradation modes operative in the environment that could prevent long-term persistence. For instance, although biodegradation in soil has not been demonstrated for DTPMP and its salts, the role of abiotic removal processes is significant. The key data for soil adsorption are from the study by Michael (undated). There is no evidence for desorption occurring. Effectively irreversible binding is entirely consistent with the known behaviour of complexation and binding within crystal lattices. Largely irreversible binding is interpreted as a removal process; 5% remaining after 40 to 50 days, which is equivalent to a half-life of 10 days (Monsanto internal report, cited by Gledhill and Feijtel, 1992). This abiotic removal rate is used in the chemical safety assessment of DTPMP and its salts. The available weight of evidence shows that removal from solution to a non-bioavailable bound form, and abiotic mechanisms, are important in the environmental exposure and risk assessment (ECHA).

D. Environmental Distribution

DTPMP sodium salt adsorbs strongly to inorganic surfaces, soils, and sediments. The nature of the adsorption is believed to be primarily due to interaction with inorganic substrates and not to organic carbon (OECD, 2004b).

A K_{oc} value of 9,748 was obtained for DTPMP by evaluating $K_{p(sediment\text{-}water)}$ data from a study by Michael (1979).

Based on this K_{oc} value and its solubility value (> 520 g/L), and assuming no biodegradability, if released to water DTPMP sodium salt will partition primarily to water and suspended sediments.

E. Bioaccumulation

DTPMP exhibits a low potential for bioaccumulation. After 28 days, the BCF values in carp were <10 and <94 for concentrations of 18.8 and 2.03 milligrams per litre (mg/L), respectively (ECHA). [Kl. score = 1]

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

The acute toxicity of DTPMP sodium salt is low by the oral and dermal routes. DTPMP sodium salt is slightly irritating to the skin and non-irritating to the eyes. DTPMP is not a skin sensitiser. Rats given repeated oral doses of DTPMP sodium salt in their diet showed alterations in iron and calcium homeostasis as evidenced by certain haematological changes and bone density, respectively. The changes in calcium homeostasis were not sufficient to alter serum calcium levels. While one *in vitro* genotoxicity study showed a positive response, other genotoxicity studies conducted both *in vitro* and *in vivo* showed no mutagenic or genotoxic response. Rat studies given high oral DTPMP sodium salt by oral gavage showed a low potential for reproductive and developmental toxicity.

B. Acute Toxicity

<u>Oral</u>

The oral LD_{50} of the heptasodium salt of DTPMP (CAS RN [redacted] in rats was >10 mL/kg, which was calculated to be equivalent to >5,838 mg active salt/kilogram (kg) (ECHA) [Kl. score = 1]. The oral LD_{50} of a heptasodium salt of DTPMP was <15 mL/kg or <6,881 mg active salt/kg (ECHA) [Kl. score = 1]. The oral LD_{50} of a heptasodium salt of DTPMP was >5,000 mg/kg or >1,650 mg active salt/kg

(ECHA) [Kl. score = 2]. The oral LD_{50} of a heptasodium salt of DTPMP was >9,000 mg/kg or >3,870 mg active salt/kg (ECHA) [Kl. score = 2].

Inhalation

No inhalation studies are available.

Dermal

The dermal LD_{50} of a sodium salt of DTPMP was >10 mL/kg, which was calculated to be >5,838 mg active salt/kg or >4,602 mg parent acid/kg (ECHA) [Kl. score = 1]. The dermal LD_{50} of a sodium salt of DTPMP was >2,000 mg/kg, which was calculated to be >860 mg active salt/kg (ECHA) [Kl. score = 2]. The dermal LD_{50} of a heptasodium salt of DTPMP was >5 mL/kg, which was calculated to be >2,145 mg active salt/kg (ECHA) [Kl. score = 2].

C. Irritation

Application of 0.5 millilitres (mL) DTPMP sodium salt to the skin of rabbits for four hours under semi-occlusive conditions was only slightly irritating. The primary dermal irritation index was 0.75 (ECHA). [Kl. score = 1]

Instillation of 0.1 mL DTPMP sodium salt into the eyes of rabbits was not irritating (ECHA). [Kl. score = 1

D. Sensitisation

DTPMP sodium salt was not a skin sensitizer in a guinea pig maximization test (ECHA). [Kl. score = 2]

E. Repeat Dose Toxicity

Oral

Male and female Wistar rats were given 0, 100, 1,000, or 10,000 parts per million (ppm) DTPMP sodium salt in their diet for 90 days. The calculated daily intakes were: 0, 8.2, 82.3, and 841.9 mg/kg-day for males; and 0, 9.2, 92.3, and 902.6 mg/kg-day for females. There were no deaths during the study. At 10,000 ppm, minor changes were seen in haematological parameters (red blood cell count was significantly increased; mean cell volume and mean cell haemoglobin concentration were significantly decreased). Total serum iron was decreased in the 10,000 ppm females only, while total serum iron binding capacity was increased in the 10,000 ppm males only. A reduction in iron complexes and reduced pigmentation for age was noted in the spleens of the 10,000 ppm animals. The changes in haematological parameters and serum iron and binding capacity were considered by the study authors to be perturbations of iron homeostasis as a result of the iron binding capacity of DTPMP, which is a chelating agent. Bone density was significantly increased in both sexes in the 10,000-ppm dose group, and the incidence of microlithiasis (formation of minute calculi) in the kidney was reduced in all dose groups; these changes were considered indicative of the effect of the test material on calcium homeostasis due to its chelating ability. There was, however, no change in calcium plasma levels. The no observed adverse effect level (NOAEL) for this study is 1,000 ppm based on the changes in hematology and bond density; this corresponds to 82.5 and 92.3 mg/kg-day for males and females, respectively (ECHA, OECD 2002a). [Kl. score = 1]

Inhalation

No studies are available.

Dermal

No studies are available.

F. Genotoxicity

The results of the *in vitro* genotoxicity studies on DTPMP sodium salts are presented in Table 2.

In vitro Studies

Table 2: *In vitro* Genotoxicity Studies on DTPMP Sodium Salts

Test System	Results*		Klimisch Score	References
	-S9	+S9		
Bacterial reverse mutation (S. typhimurium and E. coli strains)	-	-	1	ECHA, OECD (2004a, b)
Mammalian cell gene mutation (mouse lymphoma L5178Y cells)	-	-	2	ECHA, OECD (2004a, b)
Chromosomal aberration (Chinese hamster lung cells)	**	**	1	ECHA

*+, positive; -, negative
**For the 6-hour pulse treatment and the 24-hour continuous treatment, the results were negative with and without metabolic activation. For the 48-hour continuous treatment, the results were positive, but no information is provided on whether this occurred with and/or without metabolic activation.

In vivo Studies

Male and female SD rats were given a single oral dose of an aqueous solution containing 19.7% DTPMP sodium salt (neutralized to pH 7) at doses of 0, 200, 660, and 1,970 mg active acid/kg. At the high dose, 25% of the animals died, and there were mild clinical signs of toxicity and reduced body weights in both sexes. There was no evidence of chromosomal aberrations in the bone marrow cells in either sex at any dose level (ECHA; OECD, 2004a,b). [Kl. score = 2]

G. Carcinogenicity

No studies are available.

H. Reproductive Toxicity

A reproductive toxicity study was conducted on DTPMP sodium salt in rats via the diet. The females were treated over two generations and males over one generation. concentrations were 0, 300, 1,000, and 3,000 ppm; the daily intakes were calculated to be 0, 28, 97, and 294 mg/kg-day for males and 0, 32, 108, and 312 mg/kg-day for females. The 3,000 ppm F0 females delivered fewer live pups with lower body weights (both effects were not statistically significant). Pregnancy rate (not statistically significant) and a reduced pup weight (statistically significant) was seen in the F2a litters from the 3,000 ppm dams. These changes were not seen in the F1 litters or replicated in the F2b

litters. The NOAEL for reproductive toxicity was determined to be 3,000 ppm, which corresponds to 294 and 312 mg/kg-day for males and females, respectively (ECHA; OECD 2004a,b). [Kl. score = 2]

A three-generation reproductive toxicity study was conducted on DTPMP sodium salt in rats via the diet. The concentrations were 0, 300, 1,000, and 3,000 ppm. There was no systemic, reproductive or developmental toxicity at any dose level. The NOAEL for this study is 3,000 ppm, which was calculated to be 275 mg/kg-day for males and 310 mg/kg-day for females (ECHA). [Kl. score = 2]

I. Developmental Toxicity

Pregnant female SD rats were dosed by oral gavage with 0, 500, 1,000, or 2,000 mg/kg DTPMP during GD 6-15. Toxicity was observed in the 2,000 mg/kg dams as evidenced by an approximate 30% decrease in body weight gain and by the appearance of soft stools. There was no developmental toxicity. The NOAELs for maternal and developmental toxicity were 1,000 and 2,000 mg/kg-day, respectively (ECHA; OECD 2004a,b). [Kl. score = 2]

Pregnant female CD-1 mice were dosed by oral gavage with 0, 100, 500, or 1,000 mg/kg DTPMP during GD 6-15. There were no maternal or developmental toxicity. The NOAEL for maternal and developmental toxicity is 1,000 mg/kg-day, the highest dose tested (ECHA). [Kl. score = 2].

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for DTPMP follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

<u>Oral</u>

A 90-day dietary study was conducted on a sodium salt of DTPMP using rats. The rats of both sexes showed changes in hematology and bone density that were indicative of alterations in iron and calcium homeostasis, due to the chelating ability of DTPMP. The NOAEL for this study was 10,000 ppm, which corresponds to 82.5 and 92.3 mg/kg-day for males and females, respectively. The NOAEL of 82.5 mg/kg-day will be used for determining the oral Reference dose (RfD) and the drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / (UF_A x UF_H x UF_L x UF_{Sub} x UF_D)

Where:
UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 3
UF_D (database uncertainty) = 1

Oral RfD = 82.5/(10 x 10 x 1 x 3 x 1) = 82.5/300 = <u>0.3 mg/kg-day</u>

Drinking water guidance value

Drinking water guidance value = (animal dose) x (human weight) x (proportion of intake from water) / (volume of water consumed) x (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) x (human weight) x (proportion of water consumed) / (volume of water consumed)

Where:
Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)

Drinking water guidance value = (0.3 x 70 x 0.1)/2 = 1.0 mg/L

B. Cancer

There are no carcinogenicity studies on DTPMP and its sodium salts. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

DTPMP sodium salt does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

DTPMP and its sodium salts are of low toxicity concern to aquatic organisms.

B. Aquatic Toxicity

Acute Studies

No acute toxicity studies are available for the sodium salts of DTPMP. Table 3 lists the results of acute aquatic toxicity studies on DTPMP.

Table 3: Acute Aquatic Toxicity Studies on DTPMP

Test Species	Endpoint	Results (mg active acid/L)	Klimisch Score	Reference
Oncorhynchus mykiss	96-hour LC_{50}	180 - 252 (mean: 216)	2	ECHA
Chironomus tentans	48-hour EC_{50}	7,589	2	ECHA

Algal studies have also been conducted on DTPMP and its sodium salts, but the results have not been provided because of the following confounding factors:

1. Algal growth may be stimulated by the presence of supplementary phosphorus released by the photolytic degradation of phosphonic acids.
2. Algal growth may be inhibited by the complexation of micronutrients (trace metals) by phosphonic acids. This inhibition is an algistatic rather than algicidal effect. Under the standard test conditions used for most studies, the trace metals will be fully and strongly bound to the DTPMP, with the strong possibility that their bioavailability will have been reduced considerably.

Chronic Studies

The 60-day NOEC of DTPMP in *Oncorhynchus mykiss* was determined to be 25.6 mg active acid/L (ECHA). [Kl. score = 1]

The value of 25.6 mg equivalent active acid/L can be converted to units of mg DTPMP-xNa salt/L at relevant conditions of pH by considering the ionisation state of DTPMP (CAS No. [redacted] at the 25.6 mg/L concentration. At pH 6 (the expected value of the test medium), DTPMP is ionised six times (pK_a6 = pH 6.23). Also for the calculation, the number of hydrogen atoms substituted by the sodium salt is removed, which is seven. The calculation is as follows:

MW of DTPMP-7Na / MW of DTPMP = 573.2 + ((21.982 – 1.008) x 6) / 573.2 = 1.22

25.6 mg DTPMP/L x 1.22 = 31 mg DTPMP-xNa/L

C. Terrestrial Toxicity

The 14-day dietary LC_{50} values to the Mallard duck (*Anas platyrhynchos*) and Bobwhite quail (*Colunus virginianus*) are >454 mg/kg; there was no mortality at the highest dose tested (OECD, 2004a, b).

D Calculation of PNEC

The PNEC calculations for DTPMP sodium salt follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for two trophic levels for DTPMP, but not for the sodium salts of DTPMP. Acute E(L)C50 values are available for fish (216 mg/L) and invertebrates (7,589 mg/L). Results are available for a fish chronic study (31 mg DTPMP sodium salt/L). On the basis that the data consists of short-term results from two trophic levels and long-term results from onetrophic level, an assessment factor of 100 has been applied to the chronic NOEC of 31 mg/L for fish. The $PNEC_{water}$ is 0.31 mg DTPMP sodium salt/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 46 mg DTPMP sodium salt/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (188/1280) \times 1000 \times 0.31$
$= 46$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [0.2 \times (Kp_{sed}/1000) \times BD_{solid}]$
$= 0.8 + [0.2 \times (390/1000) \times 2400]$
$= 188\ m^3/m^3$

Where:
Kps_{ed} = solid-water partition coefficient (L/kg).
BD_{solid} = bulk density of the solid phase (kg/m3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 9{,}748 \times 0.04$
$= 390$ L/kg

Where:
K_{oc} = organic carbon normalized distribution coefficient (L/kg). The K_{oc} for DTPMP was estimated to be 9,748 L/kg (OECD 2004a,b).

F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

<u>PNEC Soil</u>

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is <u>40 mg DTPMP sodium salt/kg soil dry weight</u>.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (195/1500) \times 1000 \times 0.31$
$= 40$ mg/kg

Where:
Kpsoil = soil-water partition coefficient (m^3/m^3)
BDsoil = bulk density of soil (kg/m3) = 1,500 [default]

$Kp_{soil} = K_{oc} \times f_{oc}$
$= 9{,}748 \times 0.02$
$= 195\ m^3/m^3$

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for DTPMP was estimated to be 9,748 L/kg (OECD 2004a,b).
F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (DEWHA, 2009; ECHA, 2017).

DTPMP and its sodium salts are not readily biodegradable; thus, they meet the screening criteria for persistence.

The BCF values from a fish study are <10 and <94 for concentrations of 18.8 and 2.03 mg/L, respectively. Thus, DTPMP sodium salt does not meet the screening criteria for bioaccumulation.

The NOEC from a chronic fish study on DTPMP is >0.1 mg/L. Thus, DTPMP and its sodium salts do not meet the screening criteria for toxicity.

The overall conclusion is that DTPMP sodium salt is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

Metal Corrosive Category 1

B. Labelling

Warning

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

<u>Eye Contact</u>

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.

<u>Skin Contact</u>

Wash thoroughly with soap and water.

<u>Ingestion</u>

Rinse mouth with water and then drink plenty of water. Never give anything by mouth to an unconscious person.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention.

B. Fire Fighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Keep product and empty container away from heat and sources of ignition. May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide carbon dioxide nitrogen oxides phosphorus oxides, phosphine.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus and chemical-protective clothing.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Handle in accordance with good industrial hygiene and safety practice.

Environmental Precautions

Prevent from entering sewers, waterways, or low areas.

Steps to be Taken if Material is Released or Spilled

Soak up with inert absorbent material. Dispose of contaminated material as prescribed.

D. Storage And Handling

General Handling

Keep product and empty container away from heat and sources of ignition. Ensure adequate ventilation, especially in confined areas.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for DTPMP sodium salt.

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Respiratory protection is not required.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is recommended. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

UN 3265 CORROSIVE LIQUID, ACIDIC, ORGANIC N.O.S. (diethylene triamine penta(methylene phosphonic acid) sodium salt)

Class: 8

Packing Group: III

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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ETHYLENE OXIDE/PROPYLENE OXIDE COPOLYMER (CAS RN [redacted]
ETHYLENE OXIDE/PROPYLENE OXIDE COPOLYMER (CAS RN [redacted]
2-ETHYLHEXANOL EO/PO POLYMER (CAS RN. [redacted]
METHYLOXIRANE POLYMER WITH OXIRANE, ETHER WITH 1,2-PROPANEDIOL SALT (2:1) (CAS RN [redacted]

This group contains information on ethylene oxide/propylene oxide copolymers (CAS RN [redacted] and CAS RN [redacted] 2-ethylhexanol EO/PO polymer (CAS RN [redacted] and methyloxirane polymer with oxirane, ether with 1,2-propanediol (2:1) (CAS RN [redacted] They are expected to have similar environmental concerns and have consequently been assessed as a group.

This dossier presents the most critical studies pertinent to the risk assessment of EO/PO copolymer in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the Cosmetic Ingredient report (CIR, 2008) , the Dow Company report (Dow, 2014) and ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

NICNAS has assessed poloxalene (CAS RN [redacted] in an IMAP Tier 1 assessment and considers it a polymer of low concern.[1] AICIS has also assessed oxirane, methyl-, polymer with oxirane, mono(2-ethylhexyl) ether (CAS RN [redacted] and methyloxirane polymer with oxirane, ether with 1,2-propanediol (2:1) (CAS RN [redacted] and consider them a polymer of low concern.[2,3]

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Oxirane, methyl-, polymer with oxirane

CAS RN: [redacted]

Molecular formula: $(C_3H_6O.C_2H_4O)_x$-

Molecular weight: Variable (polymer)

Synonyms: ethylene oxide, propylene oxide block polymer; poloxalene; poloxamer; polyethylene glycol, propoxylated; polyethylene-polypropylene glycol; polyoxyethylene-oxy-propylene; oxirane, 2-methyl-, polymer with oxirane; oxirane, methyl-, polymer with oxirane

SMILES: Not applicable

The generic CAS RN [redacted] refers to polymers that are synthetic block copolymers of ethylene oxide and propylene oxide. There are over 50 various amphiphilic non-ionic block polymers of hydrophobic propylene oxide (PO) and hydrophilic ethylene oxide (EO) (CIR, 2008). These

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[1] https://www.nicnas.gov.au/chemical-information/imap-assessments/how-chemicals-are-assessed/Low-concern-polymers.

[2] https://www.industrialchemicals.gov.au/sites/default/files/2022-05/EVA00086%20-%20Evaluation%20statement%20-%2030%20May%202022.pdf

[3] https://services.industrialchemicals.gov.au/assessment-detail/?id=d383433e-f36b-1410-8419-00c0c86cba7c

copolymers consist of a central polyoxypropylene molecule, flanked on both sides by two hydrophilic polyoxyethylene chains.

EO/PO copolymers are also known as Poloxamers.

Chemical Name (IUPAC): Oxirane, methyl-, polymer with oxirane, ether with 1,2,3-propanetriol (3:1)

CAS RN: [redacted]

Molecular formula: $C_3H_8O_3.3(C_3H_6O.C_2H_4O)_x$-

Molecular weight: Variable (polymer)

Synonyms: Ethylene oxide-propylene oxide copolymer ether with glycerol (3:1); ethylene oxide-propylene oxide copolymer glycerol ether; glycerol, ethylene oxide, propylene oxide polymer;

glycerol poly (oxyethylene, oxypropylene) ether; propylene oxide ethylene oxide polymer, ether with glycerol (3:1); glycerol, propylene oxide, ethylene oxide polymer.

SMILES: Not applicable

Chemical Name (IUPAC): Oxirane, methyl-, polymer with oxirane, mono(2-ethylhexyl) ether

CAS RN: [redacted]

Molecular formula: C_8-H_{18}-O. $(C_3H_6$-O.C_2-H_4-O$)_x$-

Molecular weight: 232.35 g/mol (monomer); variable (polymer)

Synonyms: 2-ethylhexanol EO/PO polymer; oxirane, methyl-, polymer with oxirane, monoether with 2-ethylhexanol; oxirane, 2-methyl-, polymer with oxirane, mono(2-ethylhexyl) ether; oxirane, methyl-,polymer with oxirane, mono(2-ethylhexyl) ether2-((1-((2-ethylhexyl)poly-oxy)poly-propan-2-yl)oxy)ethanol; PEG-14 PPG-7 ethylhexyl ether; PEG-3 PPG-7 ethylhexyl ether; PEG-6 PPG-7 ethylhexyl ether; PEG-9 PPG-7 ethylhexyl ether.

SMILES: not applicable

Chemical Name (IUPAC): Oxirane, polymer with methyloxirane, ether with 1,2-propanediol (2:1)

CAS RN: [redacted]

Molecular formula: $C_{12}H_{26}O_6$

Molecular weight: 266.33 g/mol

Synonyms: Polypropoxylated, polyethoxylated, propylene glycol; Propane-1,2-diol, ethoxylated, propoxylated; Propylene glycol, propylene oxide, ethylene oxide polymer

SMILES: CC(COCCOCCOCCOCC(C)O)O

II. PHYSICO-CHEMICAL PROPERTIES

The physico-chemical properties of the EO/PO copolymers are listed in Table 1.

Table 1: Overview of the physico-chemical properties of selected EO/PO copolymers (CIR, 2008)

Properties	Poloxamer 124	Poloxamer 188	Poloxamer 407
Avg. molecular weight (g/mol)	2090-2360	7680-9510	9840-14600
Description	Colourless liquid	White solid	Solid
Wt. % oxyethylene	46.7 ± 1.9	81.8 ± 1.9	73.2 ± 1.7
Melting point (°C)	16	52	56
Solubility	Soluble in water	Soluble in water	Soluble in water

The Dow Chemical Company's Product Safety Assessment document (Dow, 2014) on their EO/PO copolymer products with CAS RN [redacted] and CAS RN [redacted] states the following: "Polyglycol EP Series Polymers are liquid polyalkylene glycol block copolymers that are colorless to yellow in appearance and odorless or with a mild, ether odor."

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

No studies are available.

The following information is from the Dow Chemical Company's Product Safety Assessment document on their EO/PO copolymer products with CAS RN [redacted] and CAS RN [redacted] (Dow, 2014):

> "Polyglycol EP Series Polymers are non-volatile (do not evaporate) and vary in water solubility. If released to water or soil, they would tend to remain in and be transported with the surface or ground water to which they are emitted and will be adsorbed to soil and sediment particles. Polyglycol EP Series Polymers are unlikely to persist in the environment, as all products are known or expected to be either readily biodegradable (>65% biodegraded in 28 days per OECD 301F test) or inherently biodegradable according to Organisation for Economic and Co-operation and Development (OECD) test guidelines. As such, these products will be efficiently removed during treatment in biological wastewater-treatment facilities.
>
> These products are not expected to accumulate in the food chain (low bioconcentration potential)."

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

The acute toxicity of EO/PO polymers are very low by the oral route. These polymers are not skin irritants or sensitisers. No systemic toxicity was observed in rats given very high oral doses of EO/PO polymers for up to two years. A slight inflammation response was seen in rats that inhaled a very

high concentration of an aerosol or dust of these polymers over a two-week period. Repeated dermal applications of an EO/PO polymer to the skin of rabbits produced a slight irritating response, but no systemic toxicity. An EO/PO polymer was not mutagenic when tested in a bacterial reverse mutation assay. No studies are available to evaluate reproductive or developmental toxicity.

B. Acute Toxicity

The oral LD_{50} values in rats for Poloxamer 124, 182, 188, and 235 were 5,000, 5,500, >15,000, and 34,600 mg/kg (Leaf, 1967). No acute dermal or inhalation studies were located.

C. Irritation

The EO/PO copolymers are not skin irritants to laboratory animals or humans (CIR, 2008).

D. Sensitisation

The EO/PO copolymers are not dermal sensitiser (CIR, 2008).

E. Repeated Dose Toxicity

Oral

Rats were fed diets containing 0, 3, or 5% Poloxamer 188 for 6 months. During the study, 2 and 14 animals died in the mid- and high-dose groups, respectively. Deaths were attributed to a combination of infection and inanition. There were no histopathologic effects that were considered to be treatment related (Leaf, 1967).

Rats were fed diets containing Poloxamers 331, 235, or 338 for 90 days. The doses were: 40, 200, or 500 mg/kg Poloxamer 331; 40, 200, or 500 mg/kg Poloxamer 235; 200, 1,000 or 5,000 mg/kg Poloxamer 338. There was no treatment-related mortality. The rats in the 5,000 mg/kg Poloxamer 338 dose group had diarrhoea. No other details were given (Leaf, 1967).

Rats were fed diets containing 0, 3, 5, or 7.5% Poloxamer 188 for two years. There was no treatment-related mortality. At the two higher doses, the rats had continuous moderate diarrhoea, but not other adverse reactions. A small decrease in growth was seen in the 7.5% group (no statistical analysis and not information on the amount of change), but there were no treatment-related histopathological effects at any dose level. The NOAEL for this study is 5% in the diet. Using 0.05 as the fraction of body weight that rats consume per day as food (U.S. EPA), the NOAEL corresponds to 2,500 mg/kg-day (Leaf, 1967).

Male and female rats were fed diets containing 0, 40, 200, or 500 mg/kg Poloxamer 182 for two years. Deaths occurred in all groups of rats due to chronic respiratory infections unrelated to administration of Poloxamer 182. There were no clinical signs of toxicity, and blood and urine chemistry parameters were comparable across all groups. There were no gross pathological changes noted. It is unclear from the summary in CIR (2008) whether a histopathologic examination was conducted. The NOAEL for this study is 500 mg/kg-day (Leaf, 1967).

Inhalation

Male SD rats were exposed by inhalation to 0 or 97 mg/m3 Poloxamer 101 aerosol for 6 hours/day, 5 days/week over a two-week period. A separate group of rats was exposed for two weeks followed by a two-week recovery period. All animals survived until the end of the study. The only adverse effect

observed was slight alveolitis in the Poloxamer 101-exposed rats, which subsided by the end of a two-week recovery (Ulrich et al., 1992).

Dermal

New Zealand rabbits were given dermal applications of 0, 100, 300 or 1,000 mg/kg Poloxamer 184 5 days/week for a total of 20 applications. The skin of the treated animals showed slight intradermal inflammatory responses, but no systemic effects (CIR, 2008).

F. Genotoxicity

Poloxomer 407 was not mutagenic to S. typhimurium strains TA97, TA98, TA100, TA1535, and TA1537 in the absence and presence of metabolic activation (CIR, 2008).

G. Carcinogenicity

Oral

There are no studies available.

Inhalation

There are no studies available.

Dermal

There are no studies available.

H. Reproductive Toxicity

There are no studies available.

I. Developmental Toxicity

Oral

There are no studies available.

Inhalation

There are no studies available.

Dermal

There are no studies available.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for EO/PO copolymers follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

EO/PO copolymers have been tested in two chronic rat dietary studies. In the first study, the only effect observed was slightly reduced growth in the rats fed 7.5% (3,750 mg/kg-day) EO/PO copolymer; no effects were seen in the 5% (2,500 mg/kg-day) and lower dose groups. No statistical analysis was provided on whether the change in body weight gain was statistically significant, or whether the change is of sufficient magnitude to be considered an adverse effect. For the purposes of this risk assessment, 3,750 and 2,500 mg/kg-day will be considered a LOAEL and NOAEL, respectively. In the second feeding study, there were no effects seen in the rats at oral doses up to 500 mg/kg-day (highest dose tested).

The NOAEL of 2,500 mg/kg-day EO/PO copolymer in the diet will be used to derive an oral reference dose (RfD) and a drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD =2,500 / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 2,500/ (10 × 10 × 1 × 1 × 1) = 2,500/100 = 25 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (25 × 70 × 0.1)/2 = 88 mg/L

B. Cancer

No carcinogenicity studies were located. Therefore, a toxicological reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

EO/PO copolymers do not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

EO/PO copolymers are practically acutely non-toxic to aquatic organisms.

B. Aquatic Toxicity

No studies are available.

The following information is from the Dow Chemical Company's Product Safety Assessment document on their EO/PO copolymer products with CAS RN [redacted] and [redacted] (Dow, 2014):

"[EO/PO copolymers] are practically non-toxic to aquatic organisms (LC_{50}/EC_{50} >100 mg/L for the most sensitive species tested) on an acute basis."

C. Terrestrial Toxicity

There are no studies available.

D. Calculation of PNEC

The PNEC calculations for EO/PO copolymers follow the methodology discussed in DEWHA (2009).

<u>PNEC Water</u>

No experimental studies were found. However, Dow Chemical's Product Safety Assessment document on their EO/PO copolymers indicates that acute toxicity testing has been conducted on these copolymers and the E(L)C50 value for the most sensitive species is >100 mg/L. On the basis of the short-term results, an assessment factor of 1,000 has been applied to the lowest reported effect concentration of 100 mg/L. The $PNEC_{water}$ is 0.1 mg/L.

<u>PNEC Sediment</u>

A $PNEC_{sed}$ value was not calculated for EO/PO copolymers. There are no experimental toxicity data on sediment organisms and a K_{oc} value EO/PO copolymer is unavailable for calculating the $PNEC_{sed}$ using the equilibrium partition method. A K_{oc} value for the EO/PO polymers has not been determined experimentally, and QSAR models are invalid for high molecular weight polymers, such as EO/PO polymers.

<u>PNEC Soil</u>

A $PNEC_{soil}$ value was not calculated for EO/PO copolymers. There are no experimental toxicity data on soil organisms and a K_{oc} value for EO/PO copolymer is unavailable for calculating the $PNEC_{soil}$ using the equilibrium partition method. A K_{oc} value for the EO/PO copolymers has not been

determined experimentally, and QSAR models are invalid for high molecular weight polymers, such as EO/PO polymers.

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

EO/PO copolymers are readily biodegradable or inherently biodegradable and thus does not meet the screening criteria for persistence.

EO/PO copolymers are expected to have high molecular weights and are not expected to be bioavailable. Thus, the copolymers do not meet the criteria for bioaccumulation.

There are no chronic aquatic toxicity studies on EO/PO copolymers. However, the acute E(L)C50 on these copolymers are >1 mg/L in aquatic organisms based on information from Dow Chemical's Product Safety Assessment (Dow, 2014). EO/PO copolymers also have a high molecular weight and are not expected to be bioavailable. Thus, they do not meet the screening criteria for toxicity.

The overall conclusion is that EO/PO copolymers are not PBT substances.

IX. CLASSIFICATION AND LABELLING

A. Classification

H412-Aquatic Chronic 3

B. Labelling

Warning

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

<u>Eye Contact</u>

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention.

Ingestion

Rinse mouth with water and then drink a glass of water. Get medical attention. Never give anything by mouth to an unconscious person.

B. Firefighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Keep product and empty container away from heat and sources of ignition. May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke).

Dust can accumulate static charges which can cause an incendiary electrical discharge. Fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source, is a potential dust explosion hazard.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Handle in accordance with good industrial hygiene and safety practice.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

For large amounts: dike spillage and pump off product. For residues: pick up with suitable absorbent material. Dispose of contaminated material as prescribed.

D. Storage and Handling

General Handling

Keep product and empty container away from heat and sources of ignition. Ensure adequate ventilation, especially in confined areas.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

There are no workplace exposure standards available for EO/PO copolymers in Australia.

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Respiratory protection is not required.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is recommended. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

EO/PO copolymers are not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

Australian Drinking Water Guidelines [ADWG]. (2011). National Water Quality Management Strategy. Australian Drinking Water Guidelines, Section 6, Australian Government, National Health and Medical Research Council, Natural Resource Management Ministerial Council. Updated January 2022. https://www.nhmrc.gov.au/about-us/publications/australian-drinking-water-guidelines

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GUAR GUM

This dossier on guar gum (CAS RN [redacted] presents the most critical studies pertinent to the risk assessment of the substance in its use in coal seam or shale gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The information presented in this dossier was obtained from the chemistry database PubChem. Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): disodium;[[[5-(6-aminopurin-9-yl)-3-hydroxyoxolan-2-yl]oxy-methoxyphosphoryl]oxy-oxidophosphoryl] hydrogen phosphate

CAS RN: [redacted]

Molecular weight: 535.15 g/mol; 200,000 to 300,000 daltons (Glickman, 1969)

Molecular formula: $C_{10}H_{14}N_5Na_2O_{12}P_3$

Synonyms: GU-052, guar flour, guaran, gum guar, slocose

SMILES:: COP(=O)(OC1C(CC(O1)N2C=NC3=C(N=CN=C32)N)O)OP(=O)([O-])OP(=O)(O)[O-].[Na+].[Na+]

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the Physico-Chemical Properties of Guar Gum

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Off-white to yellowish-white powder	-	PubChem
Vapour Pressure	Negligible	-	PubChem
Water Solubility	< 1 g/L @ 20°C (insoluble)	-	PubChem

III. ENVIRONMENTAL FATE PROPERTIES

Guar gum is a carbohydrate polymer consisting of D-mannose and D-galactose sugars from the guar plant or cluster bean. As a high molecular weight polysaccharide polymer, guar gum is expected to have a negligible vapour pressure. If released to air, a negligible vapour pressure indicates guar gum will exist solely in the particulate phase in the atmosphere. Particulate-phase guar gum will be removed from the atmosphere by wet and dry deposition. If released to soil, guar gum is expected to have no mobility since it is a polymer that binds strongly with soil particles. Volatilisation from moist soil surfaces is not expected to be an important fate process based upon a negligible Henry's Law constant. Likewise, guar gum is not expected to volatilise from dry soil surfaces based upon its vapour pressure. If released into water, guar gum is expected to adsorb to suspended solids and sediment (PubChem). Half-life data was not available.

Guar gum is expected to readily undergo microbial biodegradation in the environment (on the basis that it is a polysaccharide and expected to be readily biodegradable), and the potential to bioaccumulate in organisms is considered to be low (DoEE, 2017 and USEPA, 2005).

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Guar gum exhibits very low acute toxicity by the oral route. It is non-irritating to the skin and minimally irritating to the eyes. Repeated dose toxicity studies in rats showed minimal toxicity from exposure to guar gum in the diet. Guar gum is not genotoxic or carcinogenic. Oral exposure to guar gum did not affect fertility in rats; nor was there any indication of developmental toxicity in either rats or mice.

NICNAS has assessed Guar Gum in an IMAP Tier 1 assessment and concluded that it poses no unreasonable risk to human health[1]

B. Acute Toxicity

The oral LD_{50} in rats was reported to be 7,060 mg/kg (Graham *et al.*, 1981) [Kl. Score = 2].

C. Irritation

Guar gum is non-irritating to the skin and minimally irritating to the eyes (McCarty *et al.*, 1990). Nonetheless, ECHA warns that the substance may cause serious eye irritation.

D. Sensitisation

There were reports of workers sensitised to guar gum in a carpet-manufacturing plant. Immediate skin reactivity to guar gum was observed in 8 out of 162 employees, and 11 of 133 participants had serum IgE antibodies to guar gum. These findings are difficult to interpret since carbohydrates, such as guar gum, are generally not associated with allergenicity (Malo, 1990).

E. Repeated Dose Toxicity

<u>Oral</u>

Male and female Osborne-Mendel rats were given diets containing 0, 1, 2, 4, 7.5, or 15% guar gum for 91 days. The average daily intakes are: 0; 580; 1,187; 2,375; 4,561 and 10,301 mg/kg/day for males; and 0; 691; 1,362; 2,762; 5,770 and 13,433 mg/kg/day for females. There were no deaths during the study. Body weights were significantly decreased in the ≥1% females and the ≥7.5% males; biologically significant changes (>10%) were seen in the 7.5% females and the 15% males. Liver weights were decreased in the ≥1% dietary groups. Kidney weights were decreased in the ≥7.5% dietary groups and were borderline significant in the 4% group. The 15% group males had reduced bone marrow cellularity; although the level was within normal limits, several of the rats were at the lower end of the normal range. The NOAEL for this study is 4% in the diet or 2,762 mg/kg/day based on reduced body weights in the female rats (Graham *et al.*, 1981) [Kl. Score = 2].

Male and female F344 rats and $B6C3F_1$ mice were given diets containing 0; 6,300; 12,500; 25,000; 50,000 or 100,000 ppm guar gum for 13 weeks. Mean body weights were decreased in the 100,000 ppm male rats and in the ≥50,000 ppm female mice. A dose-related decrease in feed consumption was observed for male and female rats; male and female mice were comparable or higher than that of controls. There were no compound-related clinical signs or histopathological effects. The NOAELs

[1] https://www.industrialchemicals.gov.au/chemical-information/search-assessments?assessmentcasnumber=[redacted] 2C+

for this study are 50,000 and 25,000 ppm for rats and mice, respectively. Using the fraction of body weight that rats and mice consume per day as food (0.05 and 0.13, respectively; USEPA), the NOAELs corresponds to 2,500 mg/kg/day for rats and 3,250 mg/kg/day for mice (NTP, 1982) [Kl. Score = 2].

Male and female F344 rats and B6C3F$_1$ mice were given diets containing 0 ppm, 25,000 ppm or 50,000 ppm guar gum for 103 weeks. Mean body weights of the high-dose females were lower than those of the controls after week 20 for mice and week 40 for rats. No compound-related clinical signs or adverse effects on survival were observed. Feed consumption by dosed rats and mice of either sex was lower than that of controls. There were no non-neoplastic histopathological effects in either rats or mice that were treatment-related. The NOAEL for both rats and mice is 25,000 ppm. Using the fraction of body weight that rats and mice consume per day as food (0.05 and 0.13, respectively; USEPA), the NOAELs correspond to 1,250 mg/kg/day for rats and 3,250 mg/kg/day for mice (NTP, 1982) [Kl. Score = 2].

Inhalation

No studies are available.

Dermal

No studies are available.

F. Genotoxicity

In vitro Studies

Guar gum was not mutagenic to *S. typhimurium* strains TA 97, TA 98, TA 100, TA 102, TA 104, TA 1535, TA 1537, and TA1538 in the presence or absence of metabolic activation (Zeiger *et al.*, 1992) [Kl. Score = 2].

In vivo Studies

Guar gum was inactive in a rat bone marrow cytogenetic assay at doses up to 5,000 mg/kg (Johnson *et al.*, 2015) Kl. Score = 4].

In a rat dominant lethal mutation test, rats were dosed by oral gavage with either a single or multiple doses of up to 5,000 mg/kg guar gum. There was no indication of a mutagenic effect by guar gum (Lee *et al.*, 1983) [Kl. Score = 2].

G. Carcinogenicity

Male and female F344 rats were given diets containing 0 ppm, 25,000 ppm or 50,000 ppm guar gum for 103 weeks in an NTP chronic bioassay. There were increased incidences of adenomas of the pituitary in male rats and pheochromocytomas of the adrenal medulla in female rats that were statistically significant, but these differences were considered to be unrelated to guar gum administration. When pituitary adenomas or carcinomas and when pheochromocytomas or malignant pheochromocytomas were combined, the statistical differences disappeared. NTP concluded that, under conditions of this bioassay, guar gum was not carcinogenic for F344 rats (NTP, 1982) [Kl. Score = 2].

Male and female B6C3F$_1$ mice were given diets containing 0 ppm, 25,000 ppm or 50,000 ppm guar gum for 103 weeks in an NTP chronic bioassay. Hepatocellular carcinomas occurred in treated male

mice at incidences that were significantly lower than that in controls. The combined incidence of male mice with either hepatocellular adenomas or carcinomas was also significantly lower in the high-dose group. NTP concluded that, under conditions of this bioassay, guar gum was not carcinogenic for $B6C3F_1$ mice (NTP, 1982) [Kl. Score = 2].

H. Reproductive Toxicity

Oral

Male and female Osborne-Mendel rats were fed diets containing 0, 1, 3, 4, 7.5, or 15% guar gum for 13 weeks before mating, during mating and throughout gestation. The daily intakes for the female rats during gestation were 0; 700; 1,400; 2,700; 5,200 or 11,800 mg/kg/day. Fertility was unaffected by treatment. There were slightly fewer corpora lutea and implantations in the 15% dietary group, but implantation efficiency was unaffected. The NOAEL for reproductive toxicity is 5,200 mg/kg/day (Collins *et al.*, 1987) [Kl. Score = 2].

I. Developmental Toxicity

Oral

Male and female Osborne-Mendel rats were fed diets containing 0, 1, 3, 4, 7.5, or 15% guar gum for 13 weeks before mating, during mating and throughout gestation. The daily intake for the female rats during gestation were 0; 700; 1,400; 2,700; 5,200 or 11,800 mg/kg/day. There were no deaths during the study. In the 15% group, the number of viable foetuses per litter were slightly reduced but was not statistically significantly different from controls. The authors indicated that the reduction may have been an effect of the decreased number of corpora lutea because the number of resorptions was unaffected in this treatment group. There was no treatment-related effect on foetal development or sex distribution, and there were no teratogenic effects (Collins *et al.*, 1987) [Kl. Score = 2].

Pregnant female rats were dosed by oral gavage with 0, 9, 42, 200 or 900 mg/kg guar gum on GD 6 to 15. There was no maternal or developmental toxicity at any dose level. The NOAEL for maternal and developmental toxicity is 900 mg/kg/day (FDRL, 1973) [Kl. Score = 2].

Pregnant female CD-1 mice were dosed by oral gavage with 0, 8, 37, 170, or 800 mg/kg guar gum on GD 6 to 15. A significant number of deaths (6 out of 29) occurred in the 800 mg/kg dose group. There were indications of maternal toxicity in the surviving high-dose dams. There was no developmental toxicity at any dose level. The NOAELs for maternal and developmental toxicity are 170 and 800 mg/kg/day, respectively (FDRL, 1973) [Kl. Score = 2].

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for guar gum follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2021).

A. Non-Cancer

Oral

In a two-year NTP chronic bioassay, female rats and mice given 50,000 ppm guar gum in their feed had lower body weights. There were no treatment-related non-neoplastic lesions in either rats or

mice. The NOAEL for this study is 25,000 ppm for rats and mice, which corresponds to 1,250 mg/kg/day for rats and 3,250 mg/kg/day for mice.

The NOAEL of 1,250 mg/kg/day will be used for determining the oral reference dose (RfD) and the drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / (UF_A x UF_H x UF_L x UF_{Sub} x UF_D)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 1,250/(10 x 10 x 1 x 1 x 1) = 1,250/100 = <u>13 mg/kg/day</u>

Drinking water guidance value

Drinking water guidance value = (animal dose) x (human weight) x (proportion of intake from water) / (volume of water consumed) x (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) x (human weight) x (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2021)
Proportion of water consumed = 10% (ADWG, 2021)
Volume of water consumed = 2L (ADWG, 2021)
Drinking water guidance value = (13 x 70 x 0.1)/2 = <u>46 mg/L</u>

B. Cancer

Guar gum was not carcinogenic to rats or mice in two-year dietary studies. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Guar gum does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Guar gum is a polysaccharide polymer. It has low acute toxicity concern for fish but exhibits moderate acute toxicity to invertebrates (*Daphnia*).

B. Aquatic Toxicity

Acute Studies

The 96-hour LC_{50} for *Oncorhynchus mykiss* is 218 mg/L (Biesinger *et al.*, 1976) [Kl. Score = 2].

The 48-hour and 96-hour LC_{50} values for *Daphnia magna* are 42 mg/L and <6.2 mg/L, respectively (Biesinger *et al.*, 1976) [Kl. Score = 2].

Chronic Studies

No studies are available.

C. Terrestrial Toxicity

No studies are available.

D. Calculation of PNEC

The PNEC calculations for guar gum follow the methodology discussed in DEWHA (2009).

PNEC water

Experimental results are available for two trophic levels. The acute LC_{50} values are available for fish (218 mg/L) and *Daphnia* (<6.2 mg/L). No chronic studies are available. On the basis that the data consists of acute studies from two trophic levels, an assessment factor of 1,000 has been applied to the lowest reported LC_{50} value of 6.2 mg/L for *Daphnia*. The $PNEC_{water}$ is 0.006 mg/L.

PNEC sediment

No experimental toxicity data on sediment organisms are available. The K_{ow} and K_{oc} of guar gum cannot be calculated using EPI Suite because the molecular weight of guar gum greatly exceeds the limit of 1,000. Thus, the equilibrium partition method cannot be used to determine a $PNEC_{sediment}$ and the assessment of this compartment will be covered by the aquatic assessment.

PNEC soil

No experimental toxicity data on soil organisms are available. The K_{ow} and K_{oc} of guar gum cannot be calculated using EPI Suite because the molecular weight of guar gum greatly exceeds the limit of 1,000. Thus, the equilibrium partition method cannot be used to determine a $PNEC_{soil}$ and the assessment of this compartment will be covered by the aquatic assessment.

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU Reach Criteria methodology (DEWHA, 2009; ECHA, 2008).

Guar gum is a naturally occurring polysaccharide from the guar plant or cluster bean; it expected to be readily biodegradable. Thus it is not expected to meet the screening criteria for persistence.

The potential to bioaccumulate in organisms is considered to be low. Thus guar gum is not expected to meet the criteria for bioaccumulation.

There are no adequate chronic aquatic toxicity studies available on guar gum. The acute LC_{50} values for guar gum are >1 mg/L in fish and invertebrates. Therefore, guar gum does not meet the screening criteria for toxicity.

The overall conclusion is that guar gum is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

Acute Aquatic Toxicity Category 2

B. Labelling

Warning!

According to the classification provided by companies to ECHA in CLP notifications, this substance causes serious eye irritation.

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

<u>Eye Contact</u>

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.

<u>Skin Contact</u>

Remove contaminated clothing. Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion

Rinse mouth with water and then drink plenty of water. Never give anything by mouth to an unconscious person.

Notes to Physician

May cause asthma-like (reactive airways) symptoms.

B. Fire Fighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon dioxide.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus for fire fighting.

C. Accidental Release Measures

Personal Precautions

Avoid dust formation.

Environmental Precautions

No special environmental precautions required.

Steps to be Taken if Material is Released or Spilled

Sweep up and dispose in suitable, closed containers.

D. Storage And Handling

General Handling

Avoid creating or inhaling dust.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard specifically for guar gum.

Engineering Controls

Ensure adequate ventilation.

Personal Protection Equipment

Respiratory Protection: Respiratory protection is not required.

Hand Protection: Handle with gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Eyewash fountains and safety showers must be easily accessible.

F. Transport Information

Guar gum is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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BENZOIC ACID, 2-CHLORO-3-METHYL-, SODIUM SALT (1:1) (CAS RN [redacted]
BENZOIC ACID, 3-CHLORO-2-METHYL-, SODIUM SALT (1:1) (CAS RN [redacted]
BENZOIC ACID, 4-CHLORO-3-METHYL, SODIUM SALT (1:1) (CAS RN [redacted]

This dossier on three halogenated sodium benzoate salts (benzoic acid, 2-chloro-3-methyl-, sodium salt [1:1]; benzoic acid, 3-chloro-2-methyl-, sodium salt [1:1]; and, benzoic acid, 4-chloro-3-methyl, sodium salt [1:1]) presents the most critical studies pertinent to the risk assessment of these halogenated sodium benzoate salts in their use in coal seam gas extraction activities. These halogenated sodium benzoate salts have been assessed as a group. Limited information was available for benzoic acid, 4-chloro-3-methyl, sodium salt (1:1). However, it is expected to have similar environmental concerns as benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1) and benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1). Therefore, information provided in this dossier is based on these two halogenated sodium benzoate salts and read-across substance benzoic acid (CAS RN [redacted]

This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the OECD SIDS 2001 Initial Assessment Report for Benzoates, the US EPA's Comptox Chemicals dashboard that provides public access to chemical data and from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Sodium 2-chloro-3-methylbenzoate

CAS RN: [redacted]

Molecular formula: $C_8H_6ClNaO_2$

Molecular weight: 192.57 g/mol

Synonyms: benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1)

Chemical Name (IUPAC): Sodium 3-chloro-2-methylbenzoate

CAS RN: [redacted]

Molecular formula: $C_8H_6ClNaO_2$

Molecular weight: 192.57 g/mol

Synonyms: benzoic acid, 3-chloro-2-methyl-, sodium salt (1: 1)

Chemical Name (IUPAC): sodium; 4-chloro-3-methylbenzoate

CAS RN: [redacted]

Molecular formula: $C_8H_6ClNaO_2$

Molecular weight: 192.57 g/mol

Synonyms: benzoic acid, 4-chloro-3-methyl, sodium salt (1:1)

SMILES: CC1=C(C=CC(=C1)C(=O)[O-])Cl.[Na+]

II. PHYSICO-CHEMICAL PROPERTIES

Key physical and chemical properties for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1) and benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1)are shown in Table 1. Physico-chemical property data are not available for benzoic acid, 4-chloro-3-methyl, sodium salt (1:1).

Table 1: Overview of the physico-chemical properties of benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1) and benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1)

Property	Benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1)	Benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1)	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Liquid	Liquid	-	SDS
Melting Point	140°C @ 101.3 kPa	140°C @ 101.3 kPa	2	US EPA Comptox
Boiling Point	143°C @ 101.3 kPa	143°C @ 101.3 kPa	2	US EPA Comptox
Density	171,000 kg/m^3 (temperature not indicated)	171,000 kg/m^3 (temperature not indicated)	2	US EPA Comptox
Vapour Pressure	0.019 Pa @ 25°C	0.019 Pa @ 25°C	2	US EPA Comptox
Partition Coefficient (log K_{ow})	-5.57×10^{-2} @ 25°C	0.402 @ 25°C	2	US EPA Comptox
Water Solubility	1,639 g/L @ 25°C	1,639 g/L @ 25°C	2	US EPA Comptox
Dissociation constant (pKa)	3.1 @ 25°C	3.48 @ 25°C	2	US EPA Comptox
Flash Point	Not available	Not available	-	-
Auto flammability	Not available	Not available	-	-
Viscosity	Not available	Not available	-	US EPA Comptox
Henry's Law Constant	Not available	Not available	-	-

These halogenated sodium benzoate salts are very soluble in water and will dissociate completely in water to form benzoic acid (Kneubehl *et al.,* 2003).

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1) are readily biodegradable, and they are not expected to bioaccumulate. These chemicals have a low potential to adsorb to soil or sediment.

B. Partitioning

The pKa values for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1) and benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1) are 3.1 and 3.48, respectively (US EPA, 2023) [Kl.score=2]. These values indicate that these compounds will exist almost entirely in the anion form in the environment and anions generally do not adsorb more strongly to soils containing organic carbon and clay than their neutral counterparts. Volatilization from moist soil is not expected because these compounds exist as anions and anions do not volatilize.

These halogenated sodium benzoate salts are expected to dissociate completely in water to form benzoic acid, a naturally occurring compound.

C. Biodegradation

No experimental data are available for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), or benzoic acid, 4-chloro-3-methyl, sodium salt (1:1). Similar to read-across substance, benzoic acid, these substances are expected to be readily biodegradable both aerobically and anaerobically (OECD SIDS). Some phototransformation of benzoic acid may also be possible in water (ECHA) [Kl.score=2].

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

D. Environmental Distribution

The reported organic carbon partition coefficient (K_{oc}) values for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1) and benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1) are 28.8 and 28.8 L/kg, respectively (US EPA, 2023a and b) [Kl.score=2]. Thus, the potential for adsorption b to soil is expected to be low and they are expected to have a very high mobility.

Likewise, the K_{oc} values for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1) and benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1) along with their high water solubility value (1,639 g/L) indicate that these substances will likely partition into the water column, if released to water, and not adsorb to suspended solids or sediments.

E. Bioaccumulation

No experimental data are available for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1) or benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1). These substances have a low potential for bioaccumulation based on their log octanol water partition coefficient (K_{ow}) values of 5.57×10^{-2} and 0.402, respectively, and bioconcentration factors (BCF) values of 3.63 L/kg and 3.47 L/kg, respectively (US EPA, 2023a and b) [Kl.score=2].

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

There are no experimental data for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1). Read-across substances, benzoic acid (CAS RN [redacted] and sodium benzoate (CAS RN [redacted] were used as a surrogate for the hazard assessment. Benzoic acid (CAS RN [redacted] is metabolized to hippuric acid following oral ingestion or dermal absorption and it is not expected to accumulate in

the body. Benzoic acid is not expected to be absorbed via inhalation. Based on data for the read-across substances, benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1) are considered to have low acute oral, inhalation, and dermal toxicity. They are considered irritating to the skin and severely irritating/corrosive to the eye. They are not considered skin sensitisers. They have low oral repeat dose toxicity. They are not genotoxic nor are they carcinogenic. They are not reproductive or developmental toxicants.

B. Metabolism

No experimental data are available for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1).

Overall, there are signs of systemic absorption via oral and dermal exposures to benzoic acid but there is no evidence of target organs or of excretion. After oral ingestion and dermal absorption, benzoic acid will be metabolised to hippuric acid. Experiments on the distribution and elimination in the rat have shown no accumulation of benzoic acid in the body (ECHA) [Kl.score=2].

There is no information available on absorption via inhalation. The relatively low vapour pressure/high boiling point indicate that the test substance will not be available for inhalation as vapour. The particle size distribution of the test substance (1.5% will be present as <425 µm) indicates that there are no inhalable/respirable particles present. Based on these properties, no respiratory exposure and hence no inhalation absorption is to be expected (ECHA).

C. Acute Toxicity

<u>Oral</u>

No experimental data are available for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1).

An OECD Guideline 401 (Acute Oral Toxicity) range finding study was conducted using male and female Swiss albino mice exposed to 500, 1000, 2500, 5000, 7500 mg/kg or 1500, 2000, 2500, 3000, 3500, or 4000 mg/kg benzoic acid (CAS RN [redacted] via oral gavage. Benzoic acid produced signs of acute intoxication at doses > 2000 mg/kg bw/day. The LD_{50} was set at 2250 mg/kg bw/day (ECHA) [Kl.score=2].

An OECD Guideline 401 (Acute Oral Toxicity) studied was conducted using male and female Spartan rats exposed to 500, 1250, 1984, 3150, or 5000 mg/kg benzoic acid (CAS RN [redacted] via unspecified oral exposure. The acute oral toxicity LD_{50}s of test substance in male, female and combined male and female rats were 2742 mg/kg, 2360 mg/kg and 2565 mg/kg respectively (ECHA) [Kl.score=2].

<u>Inhalation</u>

Five male and female Spartan rats were exposed to a dynamic atmosphere containing 12200 mg/m3 of benzoic acid (CAS RN [redacted] for four hours. The LC_{50} was reported as >12,200 mg/m^3 (ECHA) [Kl.score=2].

Dermal

Male and female New Zealand White rabbits were exposed to 2000 mg/kg of benzoic acid (CAS RN [redacted] via semiocclusive exposure for 24 hours. The LD_{50} was reported as > 2000 mg/kg bw/day (ECHA) [Kl.score=2].

D. Irritation

Skin

No experimental data are available for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1).

Hartley guinea pigs, Sprague-Dawley rats, and ICR mice were exposed to 50µL (guinea pigs), 20µL (rats), or 5µL (mice) of benzoic acid (CAS RN [redacted] for three hours. In the guinea pig, benzoic acid produced erythema and swelling of the earlobe. Benzoic acid did not produce reactions in the mouse and rat ear. This indicates that guinea pigs are more sensitive than either rat or mouse to irritant effects from the substance. Benzoic acid is considered irritating to the skin of guinea pigs, rats, and mice (ECHA) [Kl.score =2].

Eye

No experimental data are available for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1).

An EU Method B.5 (Acute Toxicity: Eye Irritation/Corrosion) test was conducted using New Zealand White rabbits exposed to 0.1mL of benzoic acid (CAS RN [redacted] for 21 days. Benzoic acid was reported as severely irritating to rabbit eyes (ECHA) [Kl.score=1].

E. Sensitisation

No experimental data are available for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1).

A mouse local lymph node assay was conducted using female CBA mice exposed to 5%, 10% or 20% benzoic acid. The Stimulation index (SI) values calculated for benzoic acid (CAS RN [redacted] concentrations 5%, 10% and 20% were 0.8, 0.9 and 0.8 respectively. There was no indication that benzoic acid could elicit an SI >=2 when tested on higher concentrations. Therefore, benzoic acid was not considered a skin sensitiser (ECHA) [Kl.score=2].

F. Repeated Dose Toxicity

Oral

Male and female Fischer 344 rats were exposed to 1% or 2% sodium benzoate daily via oral feed for 18-24 months. No adverse clinical signs directly attributable to sodium benzoate (CAS RN [redacted] were observed in treated animals. Differences in the average body weight, and mortality rates between treated and control groups were negligible. The results of the statistical test for dose-related trends were significant ($p<0.05$). Although a variety of tumours occurred among sodium benzoate treated and control rats of each sex, tumours appearing in treated rats were similar in type and number to those in controls. It was concluded that no evidence of carcinogenicity in rats from

sodium benzoate was demonstrated. The NOAEL was reported as 1000 mg/kg bw/day (ECHA) [Kl.score=2].

Inhalation

An OECD Guideline 412 (Subacute Inhalation Toxicity: 28-Day Study) was conducted using male and female Sprague-Dawley rats exposed to 25, 250, 1200 mg/m3 or 310, 2200, 16500 mg/m^3 or 20, 200, 2000 mg/m^3 benzoic acid (CAS RN [redacted] via whole body inhalation dust for four weeks. All test concentrations induced local effects: nasal redness and discharge and pulmonary fibrosis and inflammatory cell infiltrates in the lungs that can be related to the irritant properties of benzoic acid. No systemic effects were noted at 25 mg/m^3. At 250 mg/m^3 a very slight decrease in absolute kidney weight was seen in females only (body weight was also slightly lower (not significantly) than in control females). At the highest dose level mortality, decreased body weights as well as decreased liver kidney and lung weights were reported. No histopathological findings except in the lungs were reported. The NOAEL for local effects is < 25 mg/m^3; The NOAEL for systemic effects is 250 mg/m^3 (ECHA) [Kl.score=1].

Dermal

An EPA OPP 82-2 (Repeated Dose Dermal Toxicity 21/28 day) study was conducted using male and female New Zealand White rabbits exposed to 100, 500, 2500 mg/kg benzoic acid (CAS RN [redacted] via semiocclusive exposure for 6 hours. The NOAEL was reported as > 2500 mg/kg. Very slight dermal irritation was noted for one rabbit at this dosage level. No compound related changes were seen in general behavior and appearance, body weight, clinical laboratory tests, organ weights or survival (ECHA) [Kl.score=1].

G. Genotoxicity

No experimental data are available for on benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1).

In Vitro Studies

The *in vitro* genotoxicity studies on benzoic acidare presented in Table 2.

Table 2: *In vitro* Genotoxicity Studies on benzoic acid

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
In vitro mammalian cell micronucleus test mouse lymphoma L5178Y cells	-	-	2	ECHA
In vitro mammalian chromosome aberration test Chinese hamster fibroblast cell line CHL	-	NA	2	ECHA

*+, positive; -, negative; NA: not applicable

In Vivo Studies

An OECD Guideline 475 (Mammalian Bone Marrow Chromosome Aberration Test) was conducted using male Sprague-Dawley rats exposed to 50, 500, 5000 mg/kg sodium benzoate (CAS RN 532-32-

1) via oral gavage for 96 hours. Sodium benzoate did not produce any detectable significant increase in the number of aberrations in bone marrow metaphase chromosomes of rats administered orally at the dosage levels employed in this study. It was concluded that sodium benzoate does not induce genetic toxicity (ECHA) [Kl.score=2].

H. Carcinogenicity

Oral

No experimental data are available for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1).

Male and female Fischer 344 rats were exposed to 1% or 2% sodium benzoate (CAS RN [redacted] via oral feed for 18-24 months. No adverse clinical signs directly attributable sodium benzoate exposure were observed in treated animals. Differences in the average body weight, and mortality rates between treated and control groups were negligible. The results of the statistical test for dose-related trends were significant ($p<0.05$). Although a variety of tumours occurred among test and control rats of each sex, tumours appearing in treated rats were similar in type and number to those in controls. It was concluded that no evidence of carcinogenicity was observed in rats exposed to sodium benzoate. The NOAEL was reported as 1000 mg/kg bw/day (ECHA) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

There are no studies available.

I. Reproductive Toxicity

A multi-generation reproductive toxicity study (OECD Guideline 416 Two Generation Reproduction) was conducted using rats exposed to 0, 0.5, or 1 mg/kg bw/day benzoic acid (CAS RN [redacted] via oral feed. The rats were treated 11-12 weeks prior to mating and through 4 generations. Feed consumption, body weights, and weight gain were unaffected by exposure to benzoic acid at concentrations up to 1% in the diet. Overall, the dose level from the 1% diet for the entire premating period was approximately 900 and 1176 mg/kg/day for the male and female rats, respectively. There was an unexplained statistically significant increase in the lifespan of rats in the 0.5% exposure group (, i.e., a higher percentage of rats lived longer). There were no differences between the groups exposed to benzoic acid and the control group for fertility measures, delayed sexual maturity, total number of pups born, pup survival, onset of reproductive senescence or litter size. In addition, organ weights and histopathologic findings were similar for all groups. Under conditions of this study, there were no dose-related adverse effects on either reproductive or developmental parameters in both sexes of rats fed 1% benzoic acid in the diet over four generations (ECHA) [Kl.score=2].

J. Developmental Toxicity

Oral

An OECD Guideline 414 (Prenatal Developmental Toxicity) study was conducted using Wistar rats exposed to 0, 699, 1306, 1874, or 965 mg/kg bw/day (0, 1%, 2%, 4%, or 8%) of sodium benzoate (CAS RN [redacted] via oral feed. Sodium benzoate (CAS RN [redacted] in the diet to pregnant rats

throughout the entire gestation period, delivery and weaning had no adverse effects on any maternal or fetal parameters examined in this study and did not cause developmental delays. The number of abnormalities seen in either soft or skeletal tissues of foetuses and weanlings in the 1% and 2% test groups did not significantly differ from the number occurring spontaneously in offspring of the control group. The NOEL for maternal and developmental toxicity was considered to be 1306 mg/kg bw/day (2%) (ECHA) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

There are no studies available.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1) follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

A two-year dietary study in rats has been conducted on read-across substance sodium benzoate (CAS RN [redacted] The NOAEL from this study is 1,000 mg/kg-day based on based on no adverse effects at the highest dose tested. The NOAEL of 1,000 mg/kg-day will be used to derive an oral reference dose and drinking water guidance value for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1).

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 1000/(1 × 10 × 1 × 1 × 1) = 1000/100 = 10 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (10 × 70 × 0.1)/2 = 35 mg/L

B. Cancer

There are no experimental data are available for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1). However, it was concluded that no evidence of carcinogenicity was observed in rats exposed to sodium benzoate (CAS RN [redacted]

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1)are not expected to exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

However, they are considered corrosive.

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Limited environmental effects data are available for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1). They are expected to have similar environmental effects to read-across substance benzoic acid (CAS RN [redacted] Under environmentally relevant conditions benzoic acid and its salts have very low acute and chronic toxicity to aquatic organisms. Aquatic toxicity is affected by pH levels for aquatic organisms.

B. Aquatic Toxicity

Acute Studies

Table 3 lists the results of acute aquatic toxicity studies conducted on read-across substance benzoic acid (CAS RN [redacted]

Table 3: Acute aquatic toxicity studies on benzoic acid (CAS RN [redacted]

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Lepomis macrochirus	96-hr LC_{50}	44.6	2	OECD SIDS; ECHA
Oncorhynchus mykiss	96-hr LC_{50}	47.3	2	ECHA

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Daphnia magna	48-hr EC_{50}	≥ 100	2	OECD SIDS; ECHA
Raphidocelis subcapitata	72-hr EC_{50}	33	2	ECHA

In most studies available the pH of the test medium was adjusted to neutral or slightly basic level. In a study by Lee (2009) reported in ECHA the test substance's effects on growth of algae were tested at unadjusted pH and at pH 6.5, 7 and 7.5. Based on the endpoint of algal growth rate, the 48-hour EC_{50} values for the aforementioned pH values were reported as 83.3, 207.5, 342.8, and 37.1 mg/L, respectively (ECHA) [Kl.score=2]. These results indicate that neutralization of pH levels will reduce the acute toxicity of benzoic acid because the algal growth rate was impacted less at the higher pH levels compared to the lower pH levels. In most of the available studies the pH of the test medium was adjusted to neutral or slightly basic level. Therefore, it is expected that the aquatic toxicity of benzoic acid under environmentally relevant conditions is correctly represented by the test conditions used in the aquatic toxicity studies that are listed above (ECHA) [Kl.score=2].

Chronic Studies

Table 4 lists the results of chronic aquatic toxicity studies conducted on read-across substance benzoic acid (CAS RN [redacted]

Table 4: Chronic aquatic toxicity studies on benzoic acid (CAS RN [redacted]

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Oncorhynchus mykiss	28-day EC_{50}	>120	2	ECHA
Daphnia magna	21-day EC_{50}	>25	2	ECHA
Anabaena inaequalis	14-day EC_{50}	>10	2	ECHA
Raphidocelis subcapitata	72-hr NOEC	7.5	2	ECHA

C. Sediment Toxicity

No studies are available. The read-across substance, benzoic acid, is readily biodegradable, it has a low bioaccumulation potential, and low acute toxicity to aquatic organisms. In addition to this, benzoic acid has a low log K_{ow} (1.88), so this chemical has a low potential to adsorb to organic particles and therefore exposure to the sediment compartment is expected to be low (ECHA) [Kl.score=2].

D. Terrestrial Toxicity

No studies are available. The read-across substance, benzoic acid, is readily biodegradable, thus, direct and indirect exposure to benzoic acid in the soil compartment is expected to be low. Because of the low bioaccumulation potential of the substance in aquatic and terrestrial organisms secondary poisoning is not considered to be a route of exposure that must be further assessed for this substance (ECHA).

E. Calculation of PNEC

The PNEC calculations for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1) follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels. Acute $E(L)C_{50}$ values are available for fish (44.6 mg/L), *Daphnia* (>100 mg/L), and algae (33 mg/L). NOEC values from long-term studies are available for fish (>120 mg/L), invertebrates (>10 mg/L) and algae (7.5 mg/L). On the basis that the data consists of short-term and long-term results from three trophic levels, an assessment factor of 10 has been applied to the lowest reported NOEC value of 7.5 mg/L for algae. The $PNEC_{water}$ is 0.75 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 0.79 mg/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (1.35/1280) \times 1000 \times 0.75$
$= 0.79$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 1.35/1000 \times 2400]$
$= 1.35\ m^3/m^3$

Where:
Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 28.8 \times 0.04$
$= 1.15$ L/kg

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1) and benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1) are reported as 28.8 L/Kg (US EPA. 2023b) [Kl.score=2].
F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 0.29 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (0.576/1500) \times 1000 \times 0.75$
$= 0.29 mg/kg$

Where:
Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]
$Kp_{soil} = K_{oc} \times f_{oc}$
$= 28.8 \times 0.02$
$= 0.576\ m^3/m^3$

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1) and benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1) are reported as 28.8 L/Kg (US EPA 2023b) [Kl.score=2].
F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Based on data available for read-across substance benzoic acid, benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1) are readily biodegradable; thus, they do not meet the screening criteria for persistence.

Based on estimated BCF values of 3.63 L/kg and 3.47 L/kg for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1) and benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), respectively, benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1) do not meet the screening criteria for bioaccumulation.

The lowest chronic NOEC for read-across substance, benzoic acid, is >0.1 mg/L. The acute $E(L)C_{50}$ values are >1 mg/L. Thus, benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1)do not meet the screening criteria for toxicity.

The overall conclusion is that benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1) are not PBT substances.

IX. CLASSIFICATION AND LABELLING

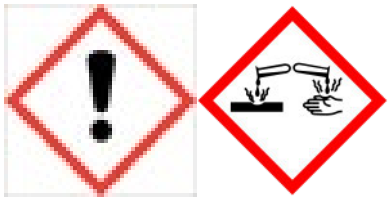
A. Classification

H315: Skin Irrit. 2 (CAS RN [redacted]
H319: Eye Irrit. 2 (CAS RN [redacted]

B. H335 STOT SE 3: lungs inhalation (CAS RN [redacted] Labelling

Warning

C. Pictogram



X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

Eye Contact

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention.

Ingestion

Rinse mouth with water and then drink a glass of water. Get medical attention. Never give anything by mouth to an unconscious person.

B. Firefighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Keep product and empty container away from heat and sources of ignition. May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon dioxide.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Handle in accordance with good industrial hygiene and safety practice.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

For large amounts: dike spillage and pump off product. For residues: pick up with suitable absorbent material. Dispose of contaminated material as prescribed.

D. Storage and Handling

General Handling

Keep product and empty container away from heat and sources of ignition. Ensure adequate ventilation, especially in confined areas.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

There are no workplace exposure standards for benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1) in Australia .

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Respiratory protection is not required.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is recommended. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

Benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1) are not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Benzoic acid, 2-chloro-3-methyl-, sodium salt (1:1), benzoic acid, 3-chloro-2-methyl-, sodium salt (1:1), and benzoic acid, 4-chloro-3-methyl, sodium salt (1:1) are not listed in the Australian Industrial Chemicals Introduction Scheme (AICIS) chemical inventory. The read across substance, benzoic acid, is listed on the AICIS chemical inventory with no known restrictions..

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U.S. Environmental Protection Agency [USEPA]. (2023b). Comptox Chemicals Dashboard. https://comptox.epa.gov/dashboard/chemical/details/DTXSID901015386 (accessed November 29, 2023) Sodium 3-chloro-2-methyl-benzoate

HYDROCHLORIC ACID

This dossier on hydrochloric acid presents the most critical studies pertinent to the risk assessment of hydrochloric acid in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from OECD-SIDS documents (OECD, 2002a,b) and the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

NICNAS has assessed hydrochloric acid in an IMAP Tier 1 assessment and concluded that it poses no unreasonable risk to the environment.

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Chlorane

CAS RN: [redacted]

Molecular formula: HCl

Molecular weight: 36.46 g/mol

Synonyms: Hydrochloric acid; HCl; chlorane; hydrogen chloride; muriatic acid; chlorohydric acid

SMILES: Cl

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the physico-chemical properties of hydrochloric acid

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Colourless to slightly yellow gas of fuming liquid with pungent, irritating odour.	2	ECHA
Melting Point	-114.22°C	2	ECHA
Boiling Point	-85°C	4	ECHA
Density	1.639 kg/m^3 @ 0°C (gas) 1190 kg/m^3 @ 15°C (liquid)	4	ECHA
Vapour Pressure	4,104 kPa 4,723 kPa @ 25°C	4	ECHA
Partition Coefficient (log K_{ow})	Not applicable	-	-
Water Solubility	Very soluble	4	ECHA
Viscosity	1.7×10^{-6} m^{2}s @ 20°C	1	ECHA

Hydrochloric acid can exist in a gaseous phase at room temperature and pressure. Hydrochloric acid is also very soluble in water and is a strong acid that dissociates completely in water to hydrogen (H^+) and chloride (Cl^-) ions.

III. ENVIRONMENTAL FATE PROPERTIES

Due to its high water solubility, hydrochloric acid will be found predominantly in the aquatic environment where it dissociates completely to hydrogen (H^+) and chloride (Cl^-) ions. Both ions are ubiquitous in the environment (UNEP, 1995).

The addition of hydrochloric acid to an aquatic ecosystem may decrease the pH depending on the buffer capacity of the receiving water. In general, the buffer capacity is regulated by the equilibria between CO_2, HCO_3^- and CO_3^{2-}:

$$CO_2 + H_2O \leftrightarrow HCO_3^- + H^+ \ (pKa_1 = 6.35)$$
$$HCO_3^- \leftrightarrow CO_3^{2-} + H^+ \ (pKa_2 = 10.33)$$

A release of hydrochloric acid into the aquatic environment from the use of HCl could potentially increase the chloride concentration and decrease the pH in the aquatic environment. Table 2 shows the amount of hydrochloric acid that would need to be added to bicarbonate solutions to obtain pH values of 6.0 and 4.0. The UNEP (1995) study reported that the 10th percentile, mean and the 90th percentile of bicarbonate concentrations in 77 rivers in North America, South America, Asia, Africa, Europe and Oceania were 20, 106 and 195 mg/L, respectively. The data show that the decrease in pH depends on the buffer capacity (bicarbonate concentration) of the receiving water. The calculated values in Table 2 were confirmed experimentally.

Table 2: Buffer capacity to maintain the pH based on bicarbonate concentration from UNEP monitoring data (de Groot and van Dijk, 2002; taken from OECD, 2002b)

Initial concentration of HCO_3^-	Final pH	Concentration of HCl required to obtain the final pH value
		Calculated (mg/L)
20 mg/L HCO_3^- (10th percentile 77 rivers)	6.0	8.28
	4.0	11.9
106 mg/L HCO_3^- (mean value of 77 rivers)	6.0	43.9
	4.0	63.2
195 mg/L HCO_3^- (90th percentile 77 rivers)	6.0	80.7
	4.0	116.3

H^+ and Cl^- ions will not adsorb on the particulate matter or surfaces and will not accumulate in living tissues (OECD, 2002a,b).

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Hydrochloric acid is a corrosive liquid. Depending on the concentration, aqueous solutions of hydrochloric acid (HCl) are either corrosive, irritating or non-irritating to the skin, eyes and gastrointestinal tract. Vapours from aqueous solutions of HCl can cause respiratory irritation. HCl is not a skin sensitiser. Subchronic inhalation studies show localised irritation to the upper respiratory tract of rats and mice, but no systemic toxicity. No repeated dose toxicity studies have been

conducted by the oral route. Positive findings have been reported in some *in vitro* genotoxicity studies, which are considered to be the result of the pH change in the test system. A lifetime inhalation study showed no carcinogenicity in rats exposed to HCl. No adequate reproductive or developmental studies have been conducted on HCl.

B. Acute Toxicity

The oral LD_{50} values in rats were reported to be 238 to 277 mg/kg and 700 mg/kg (OECD, 2002a,b) [Kl. scores = 2 and 4, respectively].

The lethal dose by dermal exposure is > 5,010 mg/kg for rabbits (OECD 2002a,b) [Kl.score=4].

The LC_{50} values in rats for HCl gas are 40,989 and 4,701 ppm for 5 and 30 minutes, respectively (ECHA) [Kl.score=2]. The LC_{50} values in rats for HCl aerosol are 31,008 and 5,666 ppm (45.6 and 8.3 mg/L) for 5 and 30 minutes, respectively (ECHA) [Kl.score=2].

C. Irritation

Application of a 37% aqueous solution of HCl for 1 or 4 hours was corrosive to the skin of rabbits (OECD, 2002a,b) [Kl.score=2]. Application of 0.5 mL of a 17% solution of aqueous solution of HCl for 4 hours was corrosive to the skin of rabbits (OECD, 2002a,b) [Kl.score=3]. Moderate skin irritation was observed in rabbits following an application of 0.5 mL of a 3.3% aqueous solution of HCl for five days; no irritation was observed with 0.5 mL of a 1% aqueous solution (OECD, 2002a,b) [Kl.score=2]. In humans, an aqueous solution of 4% of HCl was slightly irritating, while a 10% solution was sufficiently irritating to be classified as a skin irritant (OECD, 2002a,b).

Instillation of 0.1 mL of a 10% aqueous solution of HCl to the eyes of rabbits resulted in severe eye irritation (ECHA) [Kl.score=2]. Instillation of 0.1 mL of a 5% solution of HCl produced corneal opacity, iridial lesions, conjunctival redness and chemosis in 3/3 animals at 1 hour and at day one post-instillation. There was no recovery in any animal and the study was terminated on day two (ECHA) [Kl.score=1].

D. Sensitisation

Hydrochloric acid was not a skin sensitiser in a guinea pig maximisation test (ECHA) [Kl.score=2].

E. Repeated Dose Toxicity

<u>Oral</u>

No adequate studies were located.

<u>Inhalation</u>

Male and female SD rats and F344 rats were exposed by inhalation to 0, 10, 20 or 50 ppm 6 hours/day, 5 days/week for up to 90 days. Clinical signs were mainly indicative of the irritant/corrosive nature of HCl. Body weights were significantly decreased in the 50 ppm male F344 rats. There were no treatment-related effects on the haematology or clinical chemistry parameters or urinalysis. At study termination, heart, kidney and testes weights were increased in the 100 and/or 50 ppm groups; these changes were considered to be mainly related to the treatment-

related effect on body weight. Histopathological examination showed minimal to mild rhinitis in the ≥ 20 ppm dose groups of both strains of rats (both sexes). The NOAELs for systemic toxicity and localised irritation (site-of-contact) are 20 and 10 ppm, respectively (ECHA) [Kl.score=1].

Male and female B6C3F$_1$ mice were exposed by inhalation to 0, 10, 20 or 50 ppm HCl, 6 hours/day, 5 days/week for up to 90 days. Clinical signs were mainly indicative of the irritant/corrosive nature of HCl. Body weights were significantly decreased in the 50 ppm groups. At study termination, absolute liver weights were decreased in the 50 ppm males. Histopathologic examination showed only eosinophilic globules in the nasal epithelium in the 50 ppm animals. The NOAEL for this study is 20 ppm (ECHA) [Kl.score=1].

Male SD rats were exposed by inhalation to 0 or 10 ppm HCl 6 hours/day, 5 days/week for 128 weeks. Survival and body weights were similar between treated and control groups. There was a higher incidence of hyperplasia of the larynx compared to control, but no serious irritating effects of the nasal epithelium (ECHA) [Kl.score=2].

Dermal

No studies were located.

F. Genotoxicity

In vitro Studies

Table 3 presents the *in vitro* genotoxicity studies on hydrochloric acid.

Table 3: *In vitro* genotoxicity studies on hydrochloric acid

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Bacterial reverse mutation (*S. typhimurium* and *E. coli* strains)	-	-	2	ECHA
Mammalian cell gene mutation (mouse lymphoma L5178Y cells)	-	+	2	ECHA
Chromosomal aberration (CHO cells)	+	+	2	ECHA
Saccharomyces cerevisiae (mitotic recombination	-	-	2	ECHA
E. coli W3110 (pol A+) and P3078 (pol A-) repair assay	-	-	2	ECHA

* +, positive; -, negative

In the mouse lymphoma assay, the mutant frequency increased as the pH was lowered to 6.5 to 6.0 (from increased HCl) in the presence of metabolic activation. A decrease in pH from the addition of HCl to the medium also resulted in clastogenic effects to CHO cells in the absence or presence of metabolic activation. The positive findings in these two studies are considered to be the result of the pH change in the test media.

In vivo Studies

No adequate studies were located.

G. Carcinogenicity

Oral

No studies were located.

Inhalation

Male SD rats were exposed by inhalation to 0 or 10 ppm HCl 6 hours/day, 5 days/week for 128 weeks. Survival and body weights were similar between treated and control groups. There was a higher incidence of hyperplasia of the larynx compared to control, but no serious irritating effects of the nasal epithelium. There was no increased incidence of tumours in the HCl-treated rats compared with controls (ECHA) [Kl.score=2].

H. Reproductive Toxicity

No studies were located.

I. Developmental Toxicity

No adequate studies were located.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

Repeated dose, reproductive and developmental toxicity studies by the oral route have not been conducted on hydrochloric acid. These toxicity studies would have questionable usefulness because of the corrosive/irritating nature of hydrochloric acid, which would limit the amount of absorbed HCl. Hydrochloric acid dissociates to hydrogen and chloride ions in bodily fluids, and a significant amount of these ions are already ingested in foods. Furthermore, both ions are present in the body and are highly regulated by homeostatic mechanisms. Thus, an oral toxicological reference and drinking water guidance values were not derived from hydrochloric acid.

The Australian drinking water guideline values for pH (6.5 to 8.5) and chloride (250 ppm, aesthetics) may be applicable (ADWG, 2011).

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Hydrochloric acid does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

The hazard of hydrochloric acid for aquatic organisms is caused by the hydrogen ion (H^+). The toxicity values in terms of mg/L are not relevant because of the varying buffering capacity of different test systems and different aquatic ecosystems.

B. Aquatic Toxicity

Acute Studies

The acute aquatic toxicity studies on hydrochloric acid are listed in Table 4.

Table 4: Acute aquatic toxicity studies on hydrochloric acid

Test Species	Endpoint	Results	Klimisch Score	Reference
Lepomis macrochirus	96-hour LC_{50}	pH 3.25 – 3.5 (20 mg/L)	2	ECHA; OECD 2002a,b
Daphnia magna	48-hour EC_{50}	pH 4.92 (0.45 mg/L)	1	ECHA
Chlorella vulgaris	72-hour EC_{50} 72-hour EC_{10}	pH 4.7 [growth rate] (0.73 mg/L) PH 4.7 (0.364 mg/L)	1	ECHA

Chronic Studies

No chronic studies are available.

C. Terrestrial Toxicity

No studies are available.

D. Calculation of PNEC

PNEC values[1] were not derived for hydrochloric acid because factors such as the buffer capacity, the natural pH and the fluctuation of the pH are very specific for a certain ecosystem.

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Hydrochloric acid is an inorganic salt that dissociates completely to hydrogen and chloride ions in aqueous solutions. Biodegradation is not applicable to these inorganic ions; both hydrogen and

[1] An aquatic PNEC (mg/L) has been derived as part of the chemical assessment conducted under National Industrial Chemicals Notification and Assessment Scheme (NICNAS). However, the chronic aquatic toxicity data set used to derive the PNEC value was not available for review.

chloride ions are also ubiquitous and are present in water, soil and sediment. For the purposes of this PBT assessment, the persistent criteria are not considered applicable to this inorganic salt.

Hydrogen and chloride ions are essential to all living organisms, and their intracellular and extracellular concentrations are actively regulated. Thus, hydrochloric acid is not expected to bioaccumulate.

No chronic toxicity data exist on hydrochloric acid. The acute EC_{50} values are > 1 mg/L in fish, < 1 mg/L for invertebrates and algae. Thus, hydrochloric acid meets the screening criteria for toxicity.

The overall conclusion is that hydrochloric acid is a PBT substance based on toxicity to invertebrates and algae.

IX. CLASSIFICATION AND LABELLING

A. Classification

For HCl concentrations of >25%:

- Metal Corrosive Category 1
- Skin Corrosive 1B
- STOT SE Category 3 [Respiratory irritant]

In addition to the hazard statements corresponding to the GHS classification for corrosive, the following non-GHS hazard statement is to be added to the SDS: AUH071: Corrosive to the Respiratory Tract.

B. Labelling

<u>Danger</u>

According to the classification provided by companies to ECHA in REACH registrations this substance causes severe skin burns and eye damage, is toxic if inhaled, may damage fertility or the unborn child, causes serious eye damage, may cause damage to organs through prolonged or repeated exposure, may be corrosive to metals and may cause respiratory irritation.

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Eye Contact

Immediately flush open eyes with plenty of water for at least 15 minutes. Remove contacts, if present and easy to do. Get medical attention immediately, preferably a physician for an ophthalmologic examination.

Skin Contact

For minor skin contact, avoid spreading material on unaffected skin. Remove and isolate contaminated clothing. Wash the contaminated area of the body with soap and fresh water. Get medical attention immediately.

Inhalation

Move person to fresh air. Administer oxygen if breathing is difficult. Do not use mouth-to-mouth method if victim inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or another proper respiratory medical device. Give artificial respiration if the victim is not breathing. Get medical attention immediately.

Ingestion

Rinse mouth and lips with plenty of water if a person is conscious. Do not induce vomiting. Do not use mouth-to-mouth method if the victim ingested the substance. Obtain medical attention immediately if ingested.

Notes to Physician

Treat as corrosive due to pH of the material. All treatments should be based on observed signs and symptoms of distress in the patient.

B. Firefighting Information

Extinguishing Media

Use dry chemical, carbon dioxide, water spray or fog, or foam.

Specific Exposure Hazards

Containers may explode when heated. Emits toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following materials: halogenated compounds, may release dangerous gases (chlorine).

Special Protective Equipment for Firefighters

Structural firefighters' protective clothing provides limited protection in fire situations only; it is not effective in spill situations where direct contact with the substance is possible. Wear chemical protective clothing that is specifically recommended by the manufacturer. It may provide little or no thermal protection. Wear positive pressure self-contained breathing apparatus (SCBA). Move containers from the fire area if you can do it without risk.

C. Accidental Release Measures

Personal Precautions

Ventilate enclosed areas. Do not walk through spilt material. Do not touch damaged containers or spilt material unless wearing appropriate protective clothing. Wear appropriate personal protective equipment, avoid direct contact. Do not breath mist, vapours or spray. Do not get in eyes, on skin or on clothing.

Environmental Precautions

Prevent entry into waterways, sewers, basements or confined areas.

Steps to be Taken if Material is Released or Spilt

ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). As an immediate precautionary measure, isolate spill or leak area for at least 50 meters in all directions. Keep unauthorised personnel away. Stay upwind. Keep out of low areas. Do not get water inside container.

D. Storage and Handling

General Handling

Handle and open container with care. Use only with adequate ventilation. Keep away from heat. Use caution when combining with water. DO NOT add water to corrosive liquid; ALWAYS add corrosive liquid to water while stirring to prevent the release of heat, steam and fumes. Wear appropriate personal protective equipment, and avoid direct contact. Do not breath mist, vapours or spray. Do not get in eyes, on skin or on clothing. Do not ingest. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco.

Storage

Keep contain tightly closed. Store in a cool, dry, well-ventilated place. Keep away from incompatible materials. Keep from direct sunlight. Separate from alkalis. Do not store above 49°C/120°F.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

The workplace exposure standard for hydrochloric acid in Australia is 5 ppm (7.5 mg/m^3 as a peak limitation, with a sensitisation notation). A peak limitation is defined by Safe Work Australia as a

maximum or peak airborne concentration of a substance determined over the shortest analytically practicable period of time that does not exceed 15 minutes.

Engineering Controls

Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation or other engineering controls to maintain airborne levels below recommended exposure limits.

Personal Protection Equipment

Respiratory Protection: If workers are exposed to concentrations above the exposure limit, they must use appropriate, certified respirators. Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection is based on known or anticipated exposure levels, the hazard of the product and the safe working limits of the selected respirator.

Hand Protection: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Skin Protection: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling hydrochloric acid.

Eye Protection: Wear chemical splash goggles and face shield.

Other Precautions: Wash hands, forearms and face thoroughly after handling chemical products; before eating, smoking and using the lavatory; and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

Australian Dangerous Goods

UN 1789 (HYDROCHLORIC ACID)

Class: 8

Packing Group: II or III

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

Australian Drinking Water Guidelines [ADWG]. (2011). National Water Quality Management Strategy. Australian Drinking Water Guidelines, Section 6, Australian Government, National Health and Medical Research Council, Natural Resource Management Ministerial Council. Updated September 2022. https://www.nhmrc.gov.au/about-us/publications/australian-drinking-water-guidelines

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HYDROTREATED LIGHT PETROLEUM DISTILLATE

This dossier on hydrotreated light petroleum distillate (CAS RN [redacted] presents the most critical studies pertinent to the risk assessment of this substance in its use in coal seam or shale gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): 1,4-bis(propan-2-yl)benzene; 7,7-dimethylhexadecane; octadecane

CAS RN: [redacted]

Molecular formula: Not available (UVCB substance)

Molecular weight: Not available (UVCB substance)

Synonyms: Distillates, petroleum, hydrotreated light

SMILES: CC(C)C1=CC=C(C=C1)C(C)C.CCCCCCCCCCCCCCCCCC.CCCCCCCCCC(C)(C)CCCCCC

II. PHYSICO-CHEMICAL PROPERTIES

Hydrotreated light petroleum distillate is a UVCB substance (unknown variable composition or biological substance) containing aliphatic (linear, branched, and/or cyclic paraffins) molecules of carbon and hydrogen. Physical and chemical properties were not available for the UVCB hydrocarbon. As a result, information was obtained from a read-across substance (hydrodesulfurised kerosine). Key physical and chemical properties for the substance are shown in Table 1.

Table 1: Overview of the Physico-Chemical Properties of Hydrodesulfurised Kerosine (CAS RN [redacted]

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Liquid	2	ECHA
Melting Point	-49°C (pour point) @ 101.3 kPa.	2	ECHA
Boiling Point[1]	90 to 320°C @ 101.3 kPa	2	ECHA
Density	770 to 850 kg/m^3 @ 15°C	2	ECHA
Vapour Pressure	<1,000 to 37,000 Pa at 37.8°C	2	ECHA
Partition Coefficient (log K_{ow})	1.99 – 18.02 @ 20°C	2	ECHA
Water Solubility	0.000009 – 0.00645 g/L @ 25 °C	-	OECD
Viscosity	1.1 to 2.5 mm^2/s @ 20°C (kinematic)	2	ECHA
Auto flammability	220 - 250°C (for kerosines)	2	ECHA

[1] CAS numbers in this category indicate a boiling point range of 90-320 deg Celsius.

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Representative substances are expected to be readily biodegradable. They are highly insoluble in water and have high adsorption potential. They have a low potential to bioaccumulate.

While sediment and soil are expected to be the main targets for environmental distribution, biodegradation potential is expected to offset sorption. In fact, fugacity modelling suggests that accumulation in sediment is expected to be several orders of magnitude less than 1%, relative to soil, water and air compartments.

B. Partitioning

Based on Henry's Law Constant values > 4.76 x 10^4 Pa-m^3/mol @25 ^oC, members of this group have the potential to volatilise from water or moist soil surfaces. These chemicals are unlikely to degrade by hydrolysis as they lack a functional group that is hydrolytically reactive. However, in the air, category members have the potential to rapidly degrade through indirect photolytic processes (OECD, 2012).

C. Biodegradation

Kerosine's are readily to inherently biodegradable. In the supporting OECD 301 study, naphtha solvents were readily biodegraded in 28 days but not within the 10-day window. The mean of three samples was 61% theoretical biological oxygen demand on Day 28. In a valid OECD 301F supporting study Kerosine Mid-Blend was not considered readily biodegradable in 28 days, with less than 60% degradation on day 28 (58.6%). However, according to USEPA guidance for biodegradability, it is considered inherently biodegradable because significant degradation occurred). Based on this and the known properties of hydrocarbons in the range C9 to C16, kerosines are often considered not readily biodegradable; but as they can be degraded by microorganisms, they are regarded as being inherently biodegradable.

If a chemical is found to be inherently or readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

D. Environmental Distribution

Standard adsorption/desorption studies are not applicable to petroleum UVCB substances. Mackay Level III modelling indicates that category member constituents partition mostly to the sediment and soil compartments rather than air compartment when an equal emission rate (1000 kg/hr) to the air, water, and soil compartment is assumed. When release occurs only to either the air, or soil compartment, constituents are indicated in the modelling to partition largely to the compartment to which they are released. When released to the water compartment, constituents are indicated by the model to partition to either water or sediment (HPVIS). However, based on the member category low solubility, partitioning to sediment would be expected.

E. Bioaccumulation

No experimental studies are available on the substance. Using BCFBAF in EPISuite™, the estimated BCF of a representative substance is 0.893 L/kg based on the Arnot-Gobas model that includes biotransformation and upper trophic. Thus, bioaccumulation is not expected (ECHA). [Kl. score = 2]

IV. HUMAN HEALTH HAZARD ASSESSMENT

The information presented within this Section was derived in part from read-across substances: hydrodesulfurised kerosine (CAS RN [redacted] and undiluted JP-8 jet fuel (CAS No. [redacted]

A. Summary

The substance has low acute toxicity by the oral and dermal route. It is not irritating to the skin and eyes, but it is a skin sensitiser. Aside from minor changes in body weight, no adverse effects were seen in animals given repeated doses by the oral route. The substance is not genotoxic when tested in both *in vitro* and *in vivo* assays. There is no indication that this substance will cause malformations or have an adverse effect on reproduction and development. This information was derived in part from products of similar structure or composition.

B. Toxicokinetics

The studies of the pharmacokinetics (i.e., absorption, distribution, metabolism and excretion) of kerosine are scarce. There are some *in vitro* and *in vivo* studies available on jet fuels. However, because jet fuel is a complex mixture, these studies use certain constituents of jet fuels as marker compounds to describe the total jet fuel's pharmacokinetics. There are more data available for a number of kerosine constituents, and these can be used as a basis for understanding the pharmacokinetics of kerosine as a whole. There are three ways in which humans are exposed to kerosine: by inhalation; ingestion; and dermal contact. Due to the relatively low volatility of kerosine and jet fuels, dermal exposure can be a more important route of exposure than exposure via inhalation. During many operations involving aircraft fuel tanks there is a significant potential for dermal exposure. Ingestion occurs primarily as a consequence of incidental ingestion.

Groups of five male C3H mice were dosed with a single dermal application of 15 or 60 µL kerosine (30% straight-run hydrotreated and 70% hydrocracked kerosine) spiked with radiolabelled naphthalene or tetradecane, and sacrificed after 96 h exposure (Mobil, 1994). Another group of five male C3H mice were exposed by air to the same compounds and doses in a metabolism cage to determine passive inhalation. The results of the dermal exposure show that 5% of the labelled tetradecane and 15% of the labelled naphthalene were absorbed over 96 h. The inhalation experiments showed that 2.8% of the labelled naphthalene was bioavailable. Comparison of these data with a similar dataset obtained with a 25% concentration of the test compounds diluted in mineral oil, revealed that dilution did not affect the absorption of the test compound.

Four groups of eight male Sprague-Dawley rats were exposed to 1, 4, 8, or 16 mL kerosine through the abdominal skin for 2 h at a skin area of 4, 8, 16 or 64 cm2, respectively (Tsujino et al., 2003). Before, during and after the experiment, blood samples were taken and analysed for trimethylbenzenes and aliphatic hydrocarbons. Trimethylbenzenes were detectable in blood within 5-20 min and showed a dose dependent absorption. High concentrations of aliphatic hydrocarbons were detected in the exposed skin as compared to the blood concentration. The aliphatic hydrocarbon levels were dependent on the amount of kerosine exposed per unit area.

The systemic distribution of kerosine components in the blood and tissues of rats following *in vitro* dermal exposures was investigated, using trimethylbenzenes and aliphatic hydrocarbons (C9-C16) as biomarkers (Tsujinoet al., 2002). The trimethylbenzenes were absorbed through the skin and detected in blood and tissues to a greater extent as compared to the aliphatics. The data indicate that kerosine components are absorbed percutaneously and distributed to the various organs via the blood circulation. Distribution of trimethylbenzenes in blood and tissues following dermal exposure

is (at decreasing concentrations): kidney > blood > liver > adipose > brain > spleen > lung = muscle. Distribution of aliphatics in blood and tissues following dermal exposure is (at decreasing concentrations): blood > adipose > muscle > lung > liver > kidney > spleen > brain.

The inhalation studies demonstrate that the volatile kerosine constituents are well absorbed (31 – 54%) and are distributed mainly in the fat tissue. Aromatics were metabolised at a higher rate than naphthenes, n-alkanes, isoalkanes and 1-alkenes. Dermal application of kerosine or jet fuel generally shows that the aromatics and aliphatics are well absorbed into the skin. Subsequently, the aromatics penetrate the skin at a higher rate than the alkanes. SKINPERM calculations indicate that although skin permeation rates of alkanes, naphthenes and aromatics are more or less comparable, the latency times of alkanes are longer than the latency times of naphthenes and aromatics. After absorption, the kerosine constituents are distributed via the blood circulation to the fat tissue and various organs. Studies with oral exposure to kerosine indicate that gastrointestinal absorption of kerosine is slow and incomplete, resulting in low bioavailability.

C. Acute Toxicity

Kerosines are of low acute toxicity, with an oral LD50 greater than 5,000 mg/kg (rat), a dermal LD50 greater than 2,000 mg/kg (rabbit), and an inhalation LC50 greater than 5.28 mg/L (rat). The most important effects in animals following very high oral doses were slight irritation of the stomach and the gastrointestinal tract. The only adverse effects observed in acute inhalation studies were decreased activity and breathing frequency at very high doses. Dermal application of kerosine did not lead to acute toxic systemic effects. Clinical effects observed were related to dermal irritation rather than to systemic toxicity. The acute toxicity of kerosine is not classified by EU CLP Regulation (EC No. 1272/2008).

<u>Oral</u>

In the key acute oral toxicity study (Klimisch score=1; ARCO, 1992a), groups of fasted (5 per sex), young adult, Sprague Dawley rats were given a single oral dose of undiluted thermocracked kerosine at a dose of 5,000 mg/kg bw and observed for 14 days. There were no treatment related mortalities. All of the study animals exhibited one or more of the following clinical signs: nasal discharge, ocular discharge, abnormal stools, lethargy, stained coat, and alopecia. All animals gained weight during study period. At necropsy, one of the ten animals exhibited visual lesions, the remaining nine showed signs of alopecia in the inguinal and/or perineal regions. The oral LD50 was determined to be greater than 5000 mg/kg in males and females.

In supporting studies conducted on kerosine substances, rats were administered single oral gavage doses of the test substance. The results supported an oral LD50 of > 5,000 mg/kg in males and females.

<u>Inhalation</u>

In the key acute inhalation toxicity study (Klimisch score = 1; API, 1987a), groups of Sprague-Dawley rats, five males and five females, were exposed by inhalation route to straight-run kerosine for 4 hours to their whole body at a single dose of 5.28 mg/L (vapour, analytical). All except one animal had normal growth rates throughout the study. The one exception on day 8 had a body weight less than its starting body weight but by the end of the study normal growth had resumed. All animals exhibited decreased activity during the exposure. Otherwise, there were no treatment-related clinical signs of toxicity. No macroscopic lesions were observed in any animal at post-mortem and no microscopic changes were observed in any lung section examined. The LC50 was greater than 5.28 mg/L.

In supporting studies conducted on kerosine substances, rats were administered single doses of the test substance via inhalation. The LC50s as measured based on mortality and systemic effects do not indicate classification of kerosine as an acute inhalation toxicant. One supporting study on deodorised kerosine showed a lack of systemic effects after repeated exposure to rats (6 hours each day for 4 days) and resulted in an LC50 of > 7.5 mg/L (Carpenter et al., 1976). Another supporting study on deodorised kerosine showed a lack of systemic effects after a single 6-hour exposure to cats and resulted in an LC50 of > 6.4 mg/L (Carpenter et al., 1976).

Dermal

In the key acute dermal toxicity study (Klimisch score=1; ARCO, 1992g), groups of young adult New Zealand White rabbits, five males and five females, were dermally exposed to undiluted thermocracked kerosine for 24 hours to 10% of their body surface area at a dose of 2,000 mg/kg. Animals were then observed for 14 days. There were no mortalities and all animals gained weight during the study. All of the animals exhibited one or more of the following clinical signs during the observation period: dermal irritation (erythema, oedema, eschar, fissuring and/or dried skin) and/or abnormal stools. Apart from skin irritation, there were no other abnormalities noted at necropsy. The dermal LD50 was determined to be greater than 2,000 mg/kg in both males and females.

In supporting studies conducted on kerosine substances, rabbits were administered single dermal doses of the test substance, and results supported a dermal LD50 of > 2,000 mg/kg in males and females.

D. Irritation

Skin

In the key study, young adult rabbits (6 females) were dermally exposed (occlusive coverage) to 0.5 mL of undiluted kerosine/heating oil for 24 hours on both intact and abraded skin sites. Each of the test sites was evaluated for skin responses for 9 days post-exposure and was scored using the Draize scale. The mean erythema score from 24 to 72 hours was 3.46/4 while the mean oedema score from 24 to 72 hours was 2.33/4. While this protocol deviates from current guidelines that state exposure should be semi-occlusive over 4 hours, and to intact skin only, this study is included as key to show the irritating nature of kerosine products.

In another guideline study conducted according to GLP and in accordance with current guidelines, young adult New Zealand White rabbits (3 per sex) were dermally exposed (semi-occlusive coverage) to 0.5 mL of undiluted odourless kerosine, for 4 hours. Animals were observed for seven days after exposure. Irritation was scored based on the Draize method (1959). The mean erythema score from 24 to 72 hours was 0.17/4 while the mean oedema score from 24 to 72 hours was 0/4.

Additional supporting studies are provided on straight run kerosine, odourless kerosine, hydrocracked kerosine, hydrodesulfurised kerosine, Jet Fuel A, Jet Fuel A1, JP-5, and Cherry Point Jet Fuel A. Most of the studies are valid in their methodology, but they differ from the current OECD guidelines in that animals were exposed under occluded conditions for 24 hours instead of semi-occluded conditions for 4 hours. Considering the conditions of the test, results must be interpreted carefully for the purposes of classification and labelling. The mean scores for erythema and oedema have been assessed against the deviations and provided the test would be conducted under standard conditions, the overall weight of evidence indicates that kerosines are irritating to skin. Kerosines are classified as irritating to the skin according to criteria in EU CLP Regulation (EC No. 1272/2008).

Effects on skin irritation/corrosion: irritating

Eyes

Several well-controlled (GLP) animal experiments performed on a variety of kerosines indicate that none of the kerosines and jet fuels tested were more than slightly irritating to the eyes. In addition, a number of short reports on eye irritation studies on JP-5 and JP-8 show no eye irritation whatsoever in rabbits (6 unwashed eyes; 3 washed eyes): all scores 0.0 for up to 7 days (end of the study). None of the hazard assessments of kerosine and jet fuel constituents have resulted in classification for eye irritation.

In the key study selected for primary eye irritation, 0.1mL of undiluted thermocracked kerosine was instilled into the conjunctival sac of the right eye of three female young adult New Zealand White rabbits and observed through 72 hours. Irritation was scored according to the Draize method (1959). There was no evidence of damage to the cornea or iris for all animals over all scoring periods. Mild conjunctivae indicators such as redness, chemosis, and discharge were evident at the one-hour scoring interval, but not at any of the other scoring intervals. Fluorescein staining scores were zero for all study animals over all scoring periods.

The average irritation score was 0.0 for the cornea, iris and conjunctivae.

Based on the evidence, kerosine is not an eye irritant.

E. Sensitisation

In animal assays for skin sensitisation such as the Magnusson-Kligman GPMT and the Buehler assay, kerosines and jet fuels did not trigger a positive response.

In the key dermal sensitisation study (Klimisch score=1; ARCO, 1992q), thermocracked kerosine in mineral oil was tested on male young adult Pig/Hartley guinea pigs using a modified Buehler technique. During the challenge phase, a second exposure of a 1:4 dilution of thermocracked kerosine to induced test animals did not yield higher response grades, severity, or incidence than those associated with the naive challenge control group exposed to thermocracked kerosine. During the challenge phase, exposure of 0.2% DNCB to induction positive control animals elicited significantly higher response grades, severity indices, and incidence over the naive DNCB challenge control group. The vehicle irritation control group was free of dermal irritation during the challenge phase. Therefore, under the conditions of this study, thermocracked kerosine is not considered a delayed contact sensitiser while DNCB induced an appropriate positive response.

Based on test data, there was no evidence of skin sensitisation; therefore, kerosine is not classified for skin sensitisation according to EU CLP Regulation (EC No. 1272/2008)

F. Repeated Dose Toxicity

Oral

In the key oral subchronic study (Klimisch score=1; Mattie et al., 2000), male rats were treated for 70 to 90 days with 0 (1mL of distilled water), 750, 1,500, or 3,000 mg/kg/day of undiluted JP-8 jet fuel, then mated to untreated females (one female at a time). Males were gavaged throughout the cohabitation period and were returned to their individual cage after successful mating. In the second part of the study, female rats were administered the test compound at doses of 0 (1mL of distilled water), 375, 750, or 1,500 mg/kg/day undiluted JP-8 jet fuel for 90-day prior to mating, through

mating, gestation, delivery, and lactation for a total of 21 week. During mating, they were housed with untreated males.

There were no effects on clinical signs or mortality in either sex. Haematology, clinical chemistry, and urinalysis were measured only in females without any effects noted. Body weights in male rats were decreased in a dose-dependent manner and was likely related to nephropathy, which is specific in male rats treated with hydrocarbons, and not relevant for human exposure. In females, body weight was only significantly reduced in the high-dose group. Absolute and relative liver weights were increased in mid- and high-dose females but were not likely biologically significant due to the lack of changes in clinical chemistry or histopathology in the liver. The test compound caused perianal dermatitis (high-dose only) and stomach hyperplasia (mid- and high-dose) in the female rats. There was a dose-related decrease in pup weight that was significant in the 750 mg/kg/day group on postnatal day 4 only and in the 1,500 mg/kg/day group from postnatal day 4 through postnatal day 21 but had recovered by postnatal day 90. There were no treatment-related effects on reproduction or sperm parameters in males. There were no effects on reproduction, gestation, or litter size in females.

The study low observed adverse effect level (LOAEL) for systemic effects is 1,500 mg/kg/day and the no observed adverse effects level (NOAEL) for systemic effects is 750 mg/kg/day, based on reduced body weight in dams and in pups. The LOAEL for adult male rats exposed to JP-8 orally was 750 mg/kg/day due to changes in clinical pathology, body weight, organ weights and the same irritation seen in female rats. The decrease in male rat bodyweight is very likely due to the male rat-specific nephropathy and is therefore not considered for the derivation of the oral NOAEL. The reproduction NOAEL was 3,000 and 1,500 mg/kg/day in males and females, respectively.

<u>Inhalation</u>

In a key subchronic inhalation toxicity study (Klimisch score=1; Mattie et al., 1991), JP-8 jet fuel was administered to 95 male Fisher 344 rats, 75 female Fischer 344 rats, and 100 male and female C57BL/6 mice by dynamic whole body vapour exposure at concentrations of 0, 500 or 1,000 mg/m3(0, 0.5, or 1.0 mg/L) as a vapour for 24 hours per day, 7 days/week for a total of 90 days. The male rats developed hydrocarbon-induced nephropathy at both treatment concentrations. Male rats had decreased body weight and decreased absolute and relative kidney weight at both treatment concentrations. Female rats were unaffected by treatment. In mice, no significant clinical signs of toxicity were noted that differentiated the groups that were treatment-related. The no observed adverse effect concentration (NOAEC) for male rats is difficult to establish, since potential adverse effects may be masked by male rat specific hydrocarbon nephropathy. However, based on the hydrocarbon-induced nephropathy and reduced body weights and increased kidney weights, the lowest observed adverse effects concentration (LOAEC) in male rats is 500 mg/m^3. The LOEC for male mice is also 500 mg/m^3, but it was not treatment related. The NOAEC for female rats and mice is greater than or equal to 1,000 mg/m3. This was the highest dose tested in the study.

In a subacute inhalation toxicity study (Klimisch score = 1; API, 1986), hydrodesulfurised kerosine vapour was administered to 20 Sprague-Dawley rats/sex/concentration by dynamic whole-body exposure at a concentration of 24 mg/m^3 (0.024 mg/L) for 6 hours per day, 5 days/week for 4 weeks. There were no compound related effects in mortality, clinical signs, body weight, haematology, clinical chemistry, organ weights, or gross and histologic pathology. Therefore, the NOAEC is greater than or equal to 24 mg/m^3. This was the highest dose tested in the study.

Dermal

In a key sub-chronic dermal study hydrodesulfurised kerosine was applied at concentrations of 20, 40 or 60% (v/v) at a rate of 1 ml/kg/day to the shorn intrascapular region of groups of 12 individually housed male and female, Sprague-Dawley rats (aged 7-9 weeks). This was equivalent to doses of test material of 165, 330 or 495 mg/kg/day. Dosing was continued for five days a week for 13 weeks. In addition, a group of 12 male and 12 female rats of similar age were administered mineral oil at a dose rate of 1 ml/kg/day; these animals served as vehicle controls. 12 rats/sex/group each in the vehicle controls and high dose group were maintained for a 4-week recovery period. Ingestion of the test material was prevented by using a collar and removal of any residual test or control material from the skin. Animals were observed for clinical signs prior to dosing and 1, 6 and 24 hours after the first dose. Subsequently, observations were made prior to each dose being applied.

Prior to the administration of each dose, the treated skin site was evaluated for dermal irritation using the Draize scoring method. Body weights were recorded prior to the first dose and weekly thereafter. An ophthalmic examination was conducted on each rat prior to application of the first dose and again prior to sacrifice at the end of the study. During the week prior to the first dose, each rat was subjected to a functional observation battery (FOB). The FOB was conducted again 1, 6 and 24 hours after the first dose and at 7 and 14 days. During the study, the FOB, motor activity and startle response testing was conducted on all rats at weeks 4, 8 and 12. At week 14 blood samples were collected from 12 animals/sex/group. Full necropsies were performed at week 14 on 6 rats/sex/group and at week 18 on the recovery rats (vehicle and high dose groups). Each full necropsy included an examination of the external surface of the body and its contents. The remaining six rats of each group were anesthetized with an intraperitoneal injection of Pentothal and transcardially perfused in-situ using 10% neutral-buffered formalin and given a limited necropsy. For these rats, no organs were weighed, and specific tissues were also collected for subsequent microscopic testing.

There was a generally dose-related increase in the incidence and severity of various skin conditions at the treated site. Males seemed to be more sensitive than females as they were affected at all doses, however, the effects indicated very little irritation. Recovery group animals revealed complete recovery in the females and minimal hyperkeratosis in the high dose group males. At necropsy no substance-related observations were made for males in any group. In the females there was a suggestion of a possible treatment-related effect which occurred in 7 rats across all groups and consisted of skin crusts or ulceration at the site of application of test material. Haematological and serum clinical parameters were unaffected by treatment.

All animals survived until scheduled termination. There were no test substance-related effects on survival, clinical observations (apart from skin irritation), neurobehavioral signs or ophthalmological findings. The NOEL for systemic toxicity was >495 mg/kg/day. The LOEL for slight dermal irritation was 165 mg/kg/day, equivalent to ~ 1 mg/cm^2.

G. Genotoxicity

In vitro Gene Mutation in Mammalian Cells

Key in vitro gene mutation studies in mammalian cells were identified. In a study by the American Petroleum Institute (API, 1984b), cultures of mouse lymphoma cells were exposed to hydrodesulfurised kerosine with or without metabolic activation by Aroclor 1254-induced rat liver S9 fraction. Under non-activation conditions the test material induced a good range of toxicities for evaluation (relative growths ranged from 2.8% to 65.3%). None of the assays induced a mutant

frequency that exceeded the minimum criterion (40.8 x 10-6). The test material was not mutagenic under non-activation conditions. In the presence of metabolic activation, a wide range of toxicities was induced (6.1 to 107.9% relative growths). The minimum criterion mutant frequency of 69.0 x 10-6 was not exceeded. The test material was therefore considered non mutagenic under activation conditions. In a study by API (1977) (Klimisch score = 1), mouse lymphoma L5178Y cells were exposed to straight-run kerosine in acetone vehicle at concentrations ranging from 0.04 to 0.065 µL/mL (with metabolic activation) or 0.006 to 0.13 µL/mL (without activation). There was no evidence that straight-run kerosine induced mutant colonies over background levels.

In vitro Cytogenicity in Mammalian Cells

Hydrodesulfurised kerosine was tested in the sister chromatid exchange assay using Chinese hamster ovary cells (API, 1988a). The assay was conducted with Aroclor-induced rat liver S-9 activation system. A small but statistically significant increase in the frequency of sister chromatid exchanges was observed at the high and low concentrations with metabolic activation. These increases appeared to be random and of no biological significance. There were no significant increases observed at any concentration in the absence of metabolic activation. Under the conditions of the study, hydrodesulfurised kerosine is negative in the sister chromatid exchange assay with Chinese hamster ovary cells.

In vivo Cytogenicity

Based on weight of evidence kerosine substances were found to be non-mutagenic through cytogenic investigations.

In six in vivo bone marrow cytogenetic studies in the rat, there were no indications of chromosomal aberrations. Although an in vivo Sister Chromatid Exchange study in the mouse gave positive findings in the male group (but not in the females) the positive findings in the males were associated with signs of toxicity (lethargy and weight loss) at the very high-top dose used in the study (4,000 mg/kg), both on the day of the administration of the kerosine and the day after (when they were sacrificed).

In a rat bone marrow micronucleus assay (API, 1985c, Klimisch score = 1), straight run kerosine (CAS RN [redacted] was administered to Sprague Dawley rats. Straight run kerosine was not considered to induce chromosomal aberrations in bone marrow cells of rats. In another bone marrow micronucleus assay (API, 1984b, Klimisch score = 1), hydrodesulfurised kerosine (CAS RN [redacted] was administered to rats. No clinical signs of toxicity were exhibited by the rats, and there was no significant increase in frequency of micronucleated polychromatic erythrocytes in bone marrow as compared to control. In a study by API (1977) (Klimisch score = 1), straight-run kerosine (CAS RN [redacted] was administered to 45 male rats. No significant increase in the frequency of micronucleated polychromatic erythrocytes was observed.

In vivo Gene Mutation

Key in vivo gene mutation studies were identified. In a sperm cell dominant lethal mutation assay (API, 1980b, Klimisch score = 1), Jet Fuel A was administered via inhalation route to male mice at concentrations of 100 or 400 ppm for a 6-hour exposure period, 5 days per week for 8 weeks. Males were mated with females, and the uteri of pregnant females were examined for living and dead implants. Jet Fuel A did not increase the incidence of post-implantation deaths. In another study by API (1973) (Klimisch score = 1), deodorised kerosine was administered subcutaneously to 10 male Swiss-Webster mice in corn oil vehicle or intraperitoneally to 10 Long-Evans rats undiluted at a dose of 1.0 mL/kg. Males were mated with females, and no pattern of decreased pregnancy rate or increased embryo loss was observed in the females.

H. Carcinogenicity

Kerosine is not carcinogenic when animals are exposed via the oral or inhalation route (ECHA).

Male mice were administered dermally 37.5µL of jet fuel A to the shaved backs of 50 mice per dose, twice a week for 2 years or intermittently so that application of the jet fuel was suspended when dermal irritation was noted in 20% of the group and was resumed when irritation resolved in all but 20% of the affected animals. There was a significant increase in tumours at the application site with continuous treatment compared to the control (0% versus 44%), but not with intermittent treatment (0% versus 2%). With continuous treatment, there was a treatment-related increase in dermal tumour incidence compared to controls. However, stopping treatment during dermal irritation nearly eliminated the carcinogenic effect (ECHA) [Kl. Score = 1].

Male and female mice were administered dermally 25 mg of petroleum-derived jet fuel A to the shaved backs of 25 mice, three times a week for 105 weeks. Due to high mortality, jet fuel A application was discontinued during week 62, but surviving animals were observed until study termination. There was a significant increase in tumours at the application site (0%, 26%, and 26% in the controls, JP-4, and jet A groups). The majority of the tumours were squamous cell carcinomas or fibrosarcomas. At the doses tested, there was a treatment-related increase in dermal tumour incidence when compared to controls. The results of the study indicate that there was a treatment-related increase in dermal tumour incidence when compared to controls, therefore it can be concluded that Jet fuel A has a carcinogenic effect on mice at 25 mg dosage (ECHA) [Kl. Score = 1].

Straight-run kerosine (CAS RN [redacted] and hydrodesulfurised kerosine (CAS RN [redacted] were tested in standard 2-year bioassays in mice. The animals, 50 per group, were treated twice weekly with 50 µl straight-run kerosine or with hydrodesulfurised kerosine. It was concluded that both straight-run and hydrodesulfurised kerosine were moderate skin carcinogens (ECHA) [Kl. Score = 2].

In the key carcinogenicity study from NTP, JP-5 navy fuel in acetone was administered to 50 mice dermally at dose levels of 0 (vehicle control), 250, or 500 mg/kg bw/day for up to 103 weeks. There was a significant decrease in survival in females at both treatment doses. Remaining high-dose females were sacrificed at week 90. There was no treatment-related effect on survival in male mice. The LOAEL is 250 mg/kg/day, based on dermatitis and decreased survival in females. No NOAEL can be determined. At the doses tested, there was not a treatment-related increase in tumour incidence when compared to controls (ECHA) [Kl. Score = 1].

The potential influence of skin irritation on tumour development in long-term mouse skin painting studies was investigated as part of the CONCAWE middle distillates programme. The study included straight run hydrotreated kerosine (MD3). The test material was applied to the shorn skin of three groups of 50 male mice for 104 weeks. For the straight run hydrotreated kerosine, skin tumours only developed in the group of animals in which substantial skin irritation occurred during the study. Since no polycyclic aromatic compounds were detected in the straight run kerosine it is concluded that the occurrence of tumours is likely to have been caused by a non-genotoxic mechanism. This conclusion is consistent with reports by others that lighter middle distillates are tumour promotors but not initiators and furthermore that skin irritation plays an important role in skin tumour development. These tumours are probably the consequence of a continuous cycle of cell damage and repair caused by chronic skin irritation. The conclusions gained from this study can be applied to other carcinogenicity studies on kerosines, and they show that tumours are noted in the presence of repeated dermal irritation, and that kerosines lack a genotoxic mechanism of carcinogenicity (ECHA) [Kl. Score = 1].

I. Reproductive Toxicity

There are no specific reproductive toxicity data for the substance but there are data available with ECHA as migrated information which is read-across based on grouping of substances (category approach).

An OECD Guideline 415 One-Generation Reproduction Toxicity study was conducted. This was a reproductive study performed in two parts. In the first part, males were treated for 70 to 90 days with 0 (1mL of distilled water), 750, 1,500, or 3,000 mg/kg/day of undiluted JP-8 jet fuel, then mated to untreated females (one female at a time). In the second part of the study, female rats were administered the test compound at doses of 0 (1mL of distilled water), 375, 750, or 1,500 mg/kg/day undiluted JP-8 jet fuel for 90 -day prior to mating, through mating, gestation, delivery, and lactation for a total of 21 weeks.

There were no changes in clinical signs or mortality in parental animals. Body weights in male rats were decreased in a dose-dependent manner. Terminal body weights were approximately 545 grams, 520 grams, 475 grams, and 315 grams in the control, 750, 1,500, and 3,000 mg/kg/day, respectively. In females, body weight was only significantly reduced in the high-dose group, but the differences were not significant at terminal sacrifice. The body weight in females at 20 weeks (1 week before sacrifice) was approximately 400 grams, 385 grams, 382 grams, and 335 grams in the control, 375, 750, and 1,500 mg/kg/day, respectively. Hematology was not measured in the males and no effects were noted in the females. Clinical chemistry was not measured in the males and no effects were noted in the females. Urinalysis was not measured in the males and no effects were noted in the females. Absolute and relative liver weights were increased in mid- and high-dose females but were not accompanied by any histological findings. The test compound caused perianal dermatitis (high-dose only) and stomach hyperplasia (mid- and high-dose) in the female rats.

There were no treatment-related effects on reproduction or sperm parameters in males. There were no effects on reproduction, gestation, or litter size in females. The lowest NOAEL based on parental body weight was determined to be 750 mg/kg/day.

The F1 generation was not examined for clinical signs though no mention would suggest no significant signs were noted. No mortality was observed. There were no effects on offspring viability. However, there was a dose-related decrease in pup weight that was significant in the 750 mg/kg/day group on postnatal day 4 only and in the 1,500 mg/kg/day group from postnatal day 4 through postnatal day 21. The 1,500 mg/kg/day group recovered by postnatal day 90. The NOAEL based on offspring body weight was determined to be 750 mg/kg/day.

J. Reproductive Toxicity/Developmental Toxicity

In a developmental toxicity study, undiluted JP-8 jet fuel was administered to 30 Sprague-Dawley (Crl:CD) rats/dose by gavage at various volumes to achieve dose levels of 0 (sterile water), 500, 1,000, 1,500, or 2,000 mg/kg bw/day from days 6 through 15 of gestation.

There was a significant decrease in maternal weight gain with doses of 1,000 mg/kg/day or greater. Maternal necropsy weight was significantly different than the control in the 1,500 and 2,000 mg/kg/day groups. There were no apparent clinical signs of toxicity. Reproductive endpoints were not assessed in this study because females were pregnant prior to treatment and did not deliver, so only developmental endpoints can be assessed. Thirteen females (one 1,000 mg/kg/day; three 1,500 mg/kg/day, and nine 2,000 mg/kg/day) were found dead. Although there appears to be a dose-dependent increase in the mortality, necropsy found the cause of death to be related to the

presence of the test compound in the lungs indicating dosing into the lungs instead of the gastrointestinal tract. The maternal LOAEL is 1,000 mg/kg/day, based on reduced body weight gain. The maternal NOAEL is 500 mg/kg/day.

There was a significant decrease in foetal weight in both male and female foetuses dosed with 1,500 and 2,000 mg/kg/day. The test compound did not significantly increase the incidence of malformations or variations compared to the control nor was the sex ratio altered. The developmental LOAEL is 1,500 mg/kg/day, based on reduced foetal weight. The developmental NOAEL is 1,000 mg/kg/day. It can be concluded that the test substance is not toxic to development.

This study received a Klimisch score of 1 and is classified as reliable without restrictions because it was carried out in a method equivalent/similar to OECD TG 414.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for the substance follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

Non-Cancer

The NOAEL for reduced maternal body weight is 500 mg/kg/day, based on reduced body weight in dams and in pups treated under a repeat dose regimen. The NOAEL from this study will be used for determining the oral Reference dose (RfD) and the drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / (UF_A x UF_H x UF_L x UF_{Sub} x UF_D)

Where:
UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 10
UF_D (database uncertainty) = 1

Oral RfD = 500 /(10 x 10 x 1 x 10 x 1) = 500/1,000 = 0.5 mg/kg-day

Drinking water guidance value

Drinking water guidance value = (animal dose) x (human weight) x (proportion of intake from water) / (volume of water consumed) x (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) x (human weight) x (proportion of water consumed) / (volume of water consumed)

where:
Human weight = 70 kg (ADWG, 2011)

Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)

Drinking water guidance value = (0.500 x 70 x 0.1)/2 = 1.8 mg/L

Cancer

There are no carcinogenicity studies on the substance or related hydrocarbons. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

The substance does not exhibit the following physico-chemical properties:

- Explosivity
- Oxidising potential

The substance is classified as a "Flammable Liquid Category 3"

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

The substance is of low acute concern to aquatic organisms.

B. Aquatic Toxicity

Acute Studies

Table 2 lists the results of acute aquatic toxicity studies on hydrotreated light petroleum distillate surrogates.

Table 2: Acute Aquatic Toxicity Studies on Hydrotreated Light Petroleum Distillate Surrogate[2]

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Oncorhynchus mykiss	96-hour LL_{50}	2-5	1	ECHA
Daphnia magna	48-hour EL_{50}	1.4	1	ECHA
Raphidocelis subcapitata	72-hour EC_{50}	<1-3 (average of 2)	1	ECHA
Selenastrum capricornutum	72-hour EC_{50}	3.7	2	ECHA

Chronic Studies

There are no long-term toxicity studies on fish. A single long-term study on invertebrates is discussed below.

In a 21-day semi-static chronic reproductive toxicity test (OECD 211; KS = 1) on *Daphnia magna*, hydrodesulfurised kerosine was evaluated using water accommodated fraction methodology. The

[2] Hydrodesulfurised Kerosine (CAS RN [redacted]

actual loading rates were 0 (control), 0.08, 0.19, 0.48, 1.2 and 3.0 mg/L. Under the conditions of this test, the 21-day chronic reproductive NOEL for kerosine is 0.48 mg/L. The LOEL is 1.2 mg/L. The EL_{50} based on reproduction is 0.89 mg/L (ECHA).

C. Terrestrial Toxicity

There are no terrestrial toxicity studies for this substance.

D. Calculation of PNEC

The PNEC calculations for hydrotreated light petroleum distillate follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available from acute tests on three trophic levels. There is one long term study on a single trophic level organism, *D. magna*.

On the basis that the data consists of short-term studies from three trophic levels and a long-term study from one trophic level, an assessment factor of 100 is applied to the 21-day chronic reproductive NOEL for kerosine of 0.48 mg/L. The $PNEC_{aquatic}$ is 0.005 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 0.36 mg/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (93.4/1280) \times 1000 \times 0.005$
$= 0.36$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3) [calculated]
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]

$K_{sed\text{-}water} = 0.8 + [0.2 \times Kp_{sed}/1000 \times BD_{solid}]$
$= 0.8 + [0.2 \times 193/1000 \times 2400]$
$= 93.4\ m^3/m^3$

And:
Kp_{sed} = solid-water partition coefficient (L/kg).[calculated]
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]

$Kp_{sed} = K_{oc} \times f_{oc}$
$= 4818 \times 0.04$
$= 193$ L/kg

Where:
K_{oc} = organic carbon normalized distribution coefficient (L/kg). The K_{oc} for hydrodesulfurised kerosine calculated from EPISUITE™ using the MCI is 4818 L/kg.
F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There are no experimental toxicity testing results available for the substance or its noted surrogates. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 0.32 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (96.4/1500) \times 1000 \times 0.005$
$= 0.32$ mg/kg

Where:
Kp_{soil} = soil-water partition coefficient (m3/m3)
BD_{soil} = bulk density of soil (kg/m3) = 1,500 [default]

$Kp_{soil} = K_{oc} \times f_{oc}$
$= 4818 \times 0.02$
$= 96.4\ m^3/m^3$

And:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for hydrodesulfurised kerosine calculated from EPISUITE™ using the MCI is 4818 L/kg.
F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (DEWHA, 2009; ECHA, 2017).

The substance or similar compounds are readily biodegradable; thus they do not meet the screening criteria for persistence.

Based on the estimated BCF values, derived from EPISuite estimates (BCF = 3.162 L/kg wet-weight) the substance does not meet the screening criteria for bioaccumulation.

The NOEC values from acute and chronic aquatic toxicity studies on the substance indicate it does not meet the screening criteria for toxicity.

Therefore, hydrotreated light petroleum distillates are not PBT substances.

IX. CLASSIFICATION AND LABELLING

A. Classification

Asp. Tox. 1

B. Labelling

Danger

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Eye Contact

Rinse immediately with plenty of running water. If easy to do, remove contact lenses. Get medical attention if symptoms persist.

Skin Contact

Wash with soap and water. Get medical attention if symptoms occur.

Inhalation

Treat symptomatically. Move to fresh air. Get medical attention if symptoms persist.

Ingestion

In case of ingestion, always assume that aspiration has occurred. Do not induce vomiting. Rinse mouth with water and then drink plenty of water. Never give anything by mouth to an unconscious person. Seek medical attention.

B. Fire Fighting Information

Extinguishing Media

Foam (Specifically trained personnel only)- Water fog (Specifically trained personnel only)- Dry chemical powder- Carbon dioxide- Other inert gases (subject to regulations)- Sand or earth

Specific Exposure Hazards

None known.

Special Protective Equipment for Firefighters

Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

C. Accidental Release Measures

Personal Precautions

Wear appropriate personal protective equipment.

Environmental Precautions

Do not release to open drains or surface water. Not regarded as dangerous to the environment.

Steps to be Taken if Material is Released or Spilled

Collect free product with suitable means. Transfer collected product and other contaminated materials to suitable containers for recycle, recovery or safe disposal. Absorb spill with inert absorbent material, then place in a container for chemical waste.

D. Storage and Handling

General Handling

Ensure that all relevant regulations regarding explosive atmospheres, and handling and storage facilities of flammable products, are followed.

Other Handling Precautions

Wash hands thoroughly after handling.

Storage

Keep containers tightly closed and properly labelled. Protect from the sunlight5.3. Light hydrocarbon vapours can build up in the headspace of containers. These can cause flammability / explosion hazard.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for the substance.

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection:
Respiratory protection is not required.

Hand Protection:
Minimize skin contact.

Skin Protection:
Body protection must be chosen depending on activity and possible exposure.

Eye protection:
Minimize eye contact.

Other Precautions:
Handle in accordance with good industrial hygiene and safety practice. Eyewash fountains and safety showers must be easily accessible.

F. Transport Information

The substance retains UN 1223 transport code is listed as such within the Australian Dangerous Goods (AUS 2018)

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state, and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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METHANOL

This dossier on methanol presents the most critical studies pertinent to the risk assessment of methanol in its use in coal seam or shale gas extraction activities. It does not represent an exhaustive or critical review of all available data. The information presented in this dossier was obtained primarily from the OECD-SIDS documents on methanol (OECD, 2004a,b), and the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

NICNAS has assessed methanol in an IMAP Tier 1 assessment and concluded that it poses no unreasonable risk to the environment

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Methanol

CAS RN: [redacted]

Molecular formula: CH_4O

Molecular weight: 32.04 g/mol

Synonyms: Methyl alcohol, carbinol, wood spirits, wood alcohol, methylol, wood, columbian spirits, colonial spirit, columbian spirit, methyl hydroxide, monohydroxymethane, pyroxylic spirit, wood naphtha.

SMILES: CO

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Physico-Chemical Properties of Methanol

Property	Value	Klimisch score	Reference
Physical state at 20°C and 101.3 kPa	Colourless liquid	2	ECHA
Melting Point	-97.8°C @ 101.3 kPa	2	ECHA
Boiling Point	64.7°C @ 101.3 kPa	2	ECHA
Density	790 kg/m^3@ 20 °C	2	ECHA
Vapour Pressure	16927 Pa @ 25 °C	2	ECHA
Partition Coefficient (log P_{ow})	-0.77	2	ECHA
Water Solubility	>1,000 g/L [miscible]	2	ECHA
Flash Point	9.7°C	2	ECHA
Auto flammability	455°C @ 101.3 kPa	2	ECHA
Viscosity	0.544 – 0.59 mPa s (dynamic)	2	ECHA
Henry's Law Constant	0.461 Pa m^3/mol @ 20 °C	2	ECHA

Methanol is a highly flammable liquid.

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Methanol is readily biodegradable. It has a low adsorptive capacity to soils and is unlikely to bioaccumulate.

B. Biodegradation

Methanol is readily biodegradable. In a closed bottle test using seawater, there was 84% and 95% degradation after 10 and 20 days, respectively (Price et al., 1974; ECHA). [Kl. score = 2]

In a soil test using [^{14}C]-methanol, there was 53.4% degradation under aerobic conditions after 5 days, as measured by CO_2 evolution; and 46.3% degradation under anaerobic conditions after 5 days, as measured by CO_2 evolution (Scheunert et al., 1987; ECHA). [Kl. score = 2]

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

The adsorption of methanol was investigated in three different soil types at 6°C (Lokke, 1984; ECHA). There was slight adsorption with the sandy soils tested (percentage organic matter of 0.09% and 0.1% in the samples) and with the clay soil (percentage organic matter was 0.22%). Methanol solutions of concentrations of 0.1, 1.0, 9 and 90 mg/L were used in one-hour exposure adsorption studies; the K_{oc} values were between 0.13 and 0.61 for all soil types and at all concentrations.

Based upon these K_{oc} values, if released to soil, methanol is expected to have very high mobility. If released into water, due to its high water solubility and low K_{oc}, methanol is not expected to adsorb to suspended solids and sediment in water.

D. Bioaccumulation

The BCF of methanol in *Cyprinus carpio* was determined to be 1.0 (Gluth et al. 1985); in *Leuciscus idus*, the BCF was < 10 (Hansch and Leo, 1985; Freitag et al. 1985). Therefore, the potential for bioaccumulation is low.

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Methanol has low acute oral, dermal and inhalation toxicity in experimental animals but moderate to high acute oral and dermal toxicity in humans. Methanol is metabolised to formate, which is considered to be the ultimate toxicant in acute methanol intoxication in humans. Acute methanol toxicity in humans is characterised by CNS depression, followed by acidosis and ocular injury. Methanol is not irritating to the skin, but it is slightly irritating to the eyes. It is not a skin sensitiser. Repeated exposures by the oral and inhalation routes have not resulted in any systemic toxicity to rodents. In primates, adverse health effects on brain, kidney and heart were observed in chronic inhalation studies. Methanol is not genotoxic or carcinogenic. Conflicting results have been obtained concerning the effect of methanol on reproductive and developmental toxicity in experimental animals. However, it is not considered to have reproductive or developmental toxicity in humans.

B. Toxicokinetics and Metabolism

Several reviews on the metabolism and pharmacokinetics of methanol are available (Kavet and Nauss, 1990; Liesivuori and Savolainen, 1991; Tephly, 1991; IPCS, 1997; OECD, 2004a, b). Methanol is first oxidised to formaldehyde. This initial metabolic step involves different enzymes in rats than in primates and humans, although the rates are similar. A catalase–peroxidase system is primarily responsible for the initial step in rats, whereas alcohol dehydrogenase plays a major role in humans and monkeys. Methanol oxidation can also occur via hepatic microsomal oxidation involving the cytochrome P450 system.

Formaldehyde is converted to formic acid, which is converted to formate and a hydrogen ion. Conversion to formic acid is a two-step process, the second step is irreversible. In the first reaction, formaldehyde combines with reduced glutathione (GSH) to form S-formylglutathione. This is mediated by an NAD-dependent formaldehyde dehydrogenase. In the second reaction, thiolase catalyses the hydrolysis of S-formylglutathione to form formic acid and GSH. A folate-dependent pathway in the liver is responsible for formate metabolism in both rats and primates. Formate first forms a complex with tetrahydrofolate (THF) that is sequentially converted to 10-formyl-THF (by formyl-THF synthetase) and then to CO_2 (by formyl-THF dehydrogenase). THF is derived from folic acid in the diet and is also regenerated in the folate pathway. Although the folate pathway metabolises formate in both rats and monkeys, rats use the pathway more efficiently.

The dermal uptake rate of liquid methanol applied to the forearm of human volunteers was 11.5 $mg/cm^2/hr$ (Dutkiewicz et al., 1980). The dermal flux for methanol in human skin (epidermis) *in vitro* is 8.29 $mg/cm^2/hr$ (Schueplein and Blank, 1971). When 12 human volunteers immersed one hand into a vessel containing neat methanol for up to 16 minutes, the maximum methanol concentration in blood reached 1.9 ± 1.0 hr after exposure. Delivery rates from the skin into blood lagged exposure by 0.5 hours, and methanol continued to enter the blood for 4 hours following exposure. The average derived dermal absorption rate absorption rate was 8.1 ± 3.7 $mg/cm^2/hr$. The authors calculated that the maximum concentration of methanol in blood following immersion of one hand in methanol for approximately 20 minutes is comparable to that reached following inhalation exposures to 200 ppm methanol (Batterman and Franzblau, 1997).

C. Acute Toxicity

The acute oral LD_{50} for rats range from 6,200 to 13,000 mg/kg (Kimura et al., 1971; Welch and Slocum, 1943; Deichman and Mergard, 1948; Smyth et al., 1941). The acute dermal LD_{50} for rabbits was reported to be 20 mL/kg (Rowe and McCollister, 1982). The inhalation 4- and 6-hour LC_{50} values in rats are 128.2 and 87.5 mg/L, respectively (BASF, 1980a,b). Sublethal doses, however, produce CNS effects and ocular injury that may result in blindness. This effect has been seen in primates, but not in rodents, and has been attributed to the differences in blood levels of the metabolite, formic acid.

Methanol is metabolised to formate, which is considered to be the ultimate toxicant in acute methanol intoxication in humans. Acute methanol toxicity in humans is characterised by CNS depression, followed by acidosis and ocular injury. Generally, transient CNS effects appear above methanol levels of 200 mg/L and serious ocular symptoms appear above 500 mg/L (OECD, 2004a). This blood concentration can transiently be achieved in an adult person (70 kg) by ingestion of 0.4 mL methanol/kg (approximately 0.32 mg/kg). The minimal acute methanol dose to humans that can result in death is considered to be 300 to 1,000 mg/kg by ingestion, and fatalities have occurred in untreated patients with initial methanol blood levels in the range of 1,500-2,000 mg/L (OECD,

2004a). However, such high blood methanol levels able to cause death are not likely to be achieved through inhalation exposure.

D. Irritation

Methanol is not irritating to the skin of rabbits (BASF, 1975), but it is slightly irritating to the eyes of rabbits (BASF, 1975).

E. Sensitisation

Methanol was not considered a skin sensitiser to guinea pigs (BASF, 1979).

F. Repeated Dose Toxicity

Oral

Male and female Sprague–Dawley rats were dosed by oral gavage with 0, 100, 500 or 2,500 mg/kg of methanol for 90 days. There were no differences in body weight gain and food consumption between treated and control animals. Brain weights were decreased in both sexes in the 2,500 mg/kg dose group. Elevated serum glutamic pyruvate transaminase and alkaline phosphatase were noted in the 2,500 mg/kg dose group, but there were no adverse treatment-related effects in the gross pathology and histopathological evaluation. The NOAEL is 500 mg/kg/day (USEPA, 1986).

Sprague-Dawley rats were given in their drinking water 0, 500, 5,000 or 20,000 ppm methanol for 104 weeks, and then the animals were maintained until natural death. The study was conducted by the Ramazzini Foundation which uses its testing guideline for carcinogenicity studies and not an internationally accepted guideline. Treatment with methanol did not decrease survival. However, there was considerable early mortality; by 18 months, 30% of the male controls had died. In females, there were no differences in survival between controls and treated groups. There was still more early mortality in the females than expected, but it was less pronounced than the males. There was no obvious effect of methanol exposure on water consumption. The 20,000 ppm males and females weighed more than the controls (up to 14% and 7%, respectively) throughout the study. The 5,000 ppm females also weighed more (4%) than the controls at 24 months, but not at earlier time points. There were no body weight differences between the remaining treatment groups and the controls. The calculated methanol doses based on water intake were: 0, 55, 542 and 1,840 mg/kg/day for males; and 0, 67, 630 and 2,250 mg/kg/day for females. Nearly all rats in all dose groups had some pathology in the lung. The finding of lung pathology was consistent regardless of the age at death (not an old age response). The lung pathology included inflammation, dysplasia or tumours. Lung pathology was present in 70-100% of the first 10% of deaths in each group, including controls (70, 80, 80, 100% in males; and 90, 90, 100, 100% in females at 0, 500, 5,000 and 20,000 ppm, respectively). The degree of inflammation in the lungs is difficult to assess because no other lung information was recorded for the rats when a neoplasm in the lung was recorded (Soffritti et al., 2002; Cruzan, 2009; USEPA, 2013a) [Kl. score = 3].

Inhalation

Cynomolgus monkeys or Sprague–Dawley rats were exposed by inhalation to 0, 500, 2,000 or 5,000 ppm (0, 660, 2,620 or 6,552 mg/m^3) methanol for 6 h/day, 5 days/week for 4 weeks. There was no mortality and no clinical signs of toxicity among the monkeys, but there were a few signs of eye and nose irritation in the rats. No differences were seen between treated and control groups in body weight gain and organ weights, with the exception being decreased absolute adrenal weight in the 5,000 ppm female monkeys and increased relative spleen weights in the 2,000 ppm female rats.

These changes were not considered by the authors to be of biological significance. There were no treatment-related effects on the ophthalmoscopy, gross pathology or histopathology. The NOAEL for this study is 5,000 ppm (6,552 mg/m^3) (Andrews et al., 1987) [Kl. score = 4].

Groups of four male rats were exposed by inhalation to 0, 200, 2,000 or 10,000 ppm (0, 262, 2,621 or 13,104 mg/m^3) methanol for 6 hours/day, 5 days/week for 1, 2, 4 or 6 weeks. Additional groups of animals were exposed for 6 weeks followed by a 6-week recovery period. Evaluation of a number of parameters including lung weights, surfactant levels and enzyme activities did not reveal any adverse effects on the lung. No histopathological examinations were performed (White et al. 1983) [Kl score = 2].

Male and female F344 rats were exposed by inhalation to 0, 10, 100 or 1,000 ppm methanol 19.5 hours/day, 7 days/week for 104 weeks. The average methanol doses were: 0, 3.7, 37 and 369 mg/kg/day in males; and 0, 5.9, 60 and 599 mg/kg/day for females. There were no treatment-related clinical signs and no effect on survival or food consumption. Lower body weights were seen in the 1,000 ppm females beginning around Day 259, but after Day 574, there was no difference from controls. Body weights in males were similar across all groups. There were no treatment-related effects on urinalysis, hematology or clinical biochemistry. Nor were there any treatment-related effects on organ weights or gross lesions. Histopathologic examination showed no statistically significant differences between treated and control animals (NEDO, 1985a) [Kl score = 2].

Male and female B6C3F1 mice were exposed by inhalation to 0, 10, 100 or 1,000 ppm methanol 19.5 hours/day, 7 days/week for 78 weeks. The average methanol doses were: 0, 9.8, 95 and 947 mg/kg/day in males; and 0, 8.1, 106 and 1,071 mg/kg/day for females. There were no treatment-related clinical signs and no effect on survival or body weight. Food consumption was decreased slightly between months 7 and 12 in the 1,000 ppm females. Urinalysis, hematology and clinical biochemistry were similar across all groups. No differences were seen in organ weights, gross lesions or histopathology between treated and control mice (NEDO, 1985b) [Kl score = 2].

Dermal

No studies were identified.

G. Genotoxicity

In Vitro Studies

Methanol was not mutagenic to *Salmonella* strains TA97, TA98, TA100, TA1535, TA1537 and TA1538 in *in vitro* bacterial mutation assays with or without metabolic activation (De Flora et al., 1984a,b; Florin et al., 1980; Gocke et al.,1981). Equivocal results were obtained with *Salmonella* strain TA102 in the presence of metabolic activation (De Flora et al., 1984b). Methanol was not mutagenic in a DNA-repair test using various strains of *Escherichia coli* WP2 (De Flora et al., 1984a) and in a forward mutation assay using *Schizosaccharomyces pombe* (Abbondandolo et al., 1980).

Methanol did not induce micronuclei in Chinese hamster lung V79 cells in vitro (Lasne et al., 1984). Methanol was mutagenic in the mouse lymphoma assay in the presence of metabolic activation (McGregor et al., 1985), but it was not mutagenic in a Basc test or in a Drosophila, sex-linked, recessive lethal mutation assay (Gocke et al., 1981). Treatment of primary cultures of Syrian golden hamster embryo cells with methanol did not lead to cell transformation (Heidelberger et al., 1983).

In Vivo Studies

Male C57BL/6J mice were exposed by inhalation to 0, 800 or 4,000 ppm methanol, 6 hours/day for five days. There were no increased frequencies of micronuclei in blood cells; sister chromatid exchanges, chromosomal aberrations, or micronuclei in lung cells; or synaptosomal complex damage in spermatocytes (Campbell et al., 1991).

Normal or folate-deficient mice were given four daily intraperitoneal injections of up to 2,500 mg/kg of methanol. There was no increase in micronucleated erythrocytes in the treated mice compared to the controls (O'Loughlin et al., 1992).

Male and female NMRI mice were given a single intraperitoneal injection of 0, 1,920, 3,200 or 4,480 mg/kg methanol. There was no increase in micronuclei observed in the bone marrow at any dose level (Gocke et al., 1981).

H. Carcinogenicity

The carcinogenicity studies conducted on methanol were reviewed by Cruzan (2009) and by the USEPA (2013a).

Oral

Male and female SD rats were given in their drinking water 0, 500, 5,000 or 20,000 ppm methanol for 104 weeks. This study was conducted by the Ramazzini Foundation, which uses a unique methodology and not the standardised international testing guidelines. There was excessive early mortality, and lung pathology (inflammation, dysplasia, or tumours) was present in 87 to 94% of those dying anytime during the study. An increase in lympho-immunoblastic lymphomas was reported (Soffritti et al., 2002; Cruzan, 2009; USEPA, 2013a) [Kl score = 3].

Inhalation

Male and female F344 rats were exposed by inhalation to 0, 10, 100 or 1,000 ppm methanol 19.5 hours/day, 7 days/week for 104 weeks. The average methanol doses were: 0, 3.7, 37 and 369 mg/kg/day in males; and 0, 5.9, 60 and 599 mg/kg/day for females. There was no increase in tumours in the methanol-exposed rats and mice (NEDO, 1985a) [Kl score = 2].

Male and female B6C3F1 mice were exposed by inhalation to 0, 10, 100 or 1,000 ppm methanol 19.5 hours/day, 7 days/week for 78 weeks. The average methanol doses were: 0, 9.8, 95 and 947 mg/kg/day in males; and 0, 8.1, 106 and 1,071 mg/kg/day for females. There was no increase in tumours in the methanol-exposed mice (NEDO, 1985b) [Kl score = 2].

I. Reproductive and Developmental Toxicity

Based on the data available, methanol is not considered to have reproductive or developmental toxicity in humans (NICNAS, 2013).

The reproductive and developmental toxicity studies were reviewed by the NTP Centre for Evaluation of Risks to Human Reproduction (NTP-CERHR, 2003). Conflicting results have been obtained concerning the effect of methanol on testicular hormones in rats; nevertheless, methanol does not appear to be a male reproductive toxicant. The primate data indicates that methanol is unlikely to be a reproductive hazard in females. Methanol causes developmental effects at very high

exposure levels in both rats (≥ 10,000 ppm) and mice (≥ 2,000 ppm); there is also some evidence that it is a developmental neurotoxicant in rodents, but not in primates.

Blood methanol concentrations associated with serious teratogenic effects and reproductive toxicity are in the range associated with formate accumulation, which is likely to result in metabolic acidosis, and visual and clinical effects in humans (NTP-CERHR, 2003). Other effects (such as subtle, not yet definitive neurological effects observed in primates) may be exhibited at lower inhalation doses and lower methanol blood levels (OECD, 2004).

The limited data available in humans do not show an association of reproductive and developmental toxicity with methanol (NTP-CERHR, 2003). Based on the studies reviewed by the NTP (2003), it concluded that there is evidence to suggest that women with low folate levels may be more susceptible to the adverse developmental effects of methanol, but more information is necessary to clarify this issue (NICNAS, 2013).

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for methanol follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2021).

A. Non-Cancer

<u>Oral</u>

USEPA has derived an oral reference dose (RfD) by using exposure-response data from candidate principal inhalation studies of mice (Rogers et al., 1993) and rats (NEDO, 1987) and route-to-route extrapolation with the aid of the USEPA physiologically based pharmacokinetic (PBPK) model. The decision to use inhalation rather than oral study data is due to limitations in the database of oral studies, including the limited reporting of noncancer findings in the subchronic and chronic oral studies of rats, the determination that developmental effects are the most sensitive effects of methanol exposure. The RfD of 2 mg/kg/day was estimated from the Rogers et al. (1993) study for extra cervical rib incidence in mice (USEPA, 2013a). This RfD will be used for determining the drinking water guidance value.

Drinking water guidance value

Drinking water guidance value = (animal dose) x (human weight) x (proportion of intake from water) / (volume of water consumed) x (safety factor)

Using the oral RfD: Drinking water guidance value = (oral RfD) x (human weight) x (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2021)
Proportion of water consumed = 10% (ADWG, 2021)
Volume of water consumed = 2 L (ADWG, 2021)
Drinking water guidance value = (2 x 70 x 0.1)/2 = <u>7 mg/L</u>

B. Cancer

Methanol was not carcinogenic to rats or mice in chronic inhalation studies. Increased tumours from methanol in drinking water were reported by Soffritti et al. (2002); however, there are methodological problems with this study and questions have been raised about the validity of the results. No cancer reference value was derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Methanol is a highly flammable liquid.

Methanol does not exhibit the following physico-chemical properties:

- Explosivity
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Methanol exhibits a low toxicity concern for aquatic organisms, terrestrial invertebrates and plants.

B. Aquatic Toxicity

Acute Studies

Table 2 lists the results of acute aquatic toxicity studies conducted on methanol.

Table 2: Acute Aquatic Toxicity Studies on Methanol

Test Species	Endpoint	Results (mg/L)	Klimisch score	Reference
Bluegill	96-hour LC_{50}	15,400	1	Poirer et al. 1986
Salmo gairdneri	96-hour LC_{50}	20,100	1	Call et al., 1983
Pimphales promelas	96-hour LC_{50}	28,100	1	Call et al., 1983
Daphnia magna	96-hour EC_{50}	18,260	2	Dom et al., 2012; ECHA
Daphnia magna	48-hour EC_{50}	>10,000	2	Kuehn et al., 1989
Selenastrum capricornutum	96-hour EC_{50}	~22,000	2	Cho et al., 2008; ECHA
Chlorella pyrenoidosa	10 to 14-day EC_{50}	28,400	2	Stratton and Smith, 1988

Chronic Studies

No adequate chronic studies were identified. Reported studies were either invalid or their reliability was questionable. Methanol belongs to the category of organic chemicals exerting toxicity for aquatic organisms with a non-specific mode of action. The acute and chronic toxicity may be estimated for such kind of chemicals using QSAR methods. The ECOSAR model (version 1.11, US EPA, July 2012) predicts for methanol a chronic toxicity value of about 450 mg/L (equivalent to a NOEC) for *Pimephales promelas* and a value of 208 mg/L for *Daphnia magna* (REACH) [Kl. score = 1].

C. Terrestrial Toxicity

The terrestrial toxicity studies on methanol are listed in **Table 3**.

Table 3: Terrestrial Toxicity Studies on Methanol

Test Species (Method)	Endpoint	Results (mg/kg soil dw)	Klimisch score	Reference
Earthworm *Eisenia fetida* (OECD 222)	35-day EC_{50} 63-day EC_{50}	17,199 26,646	2	ECHA
Folsomia candida (OECD 232)	28-day EC_{25} 28-day NOEC* (reproduction)	2,842 1,000	1	ECHA
Hordeum vulgare (OECD 208)	14-day EC_{50} 14-day NOEC* (seedling emergence)	15,492 12,000	1	ECHA
	14-day EC_{25} 14-day NOEC* (shoot dry mass)	2,538 1,555		
	14-day EC_{25} 14-day NOEC* (root dry mass)	2,823 2,592		
	14-day EC_{25} 14-day NOEC* (shoot length)	4,885 2,592		
	14-day EC_{25} 14-day NOEC* (root length)	5,752 4,320		

* Since only EC_{25} values were available from the test results, NOECs were derived graphically from the representing treatment means.

D. Calculation of PNEC

The PNEC calculations for methanol follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels. Acute $E(L)C_{50}$ values are available for fish (15,400 mg/L), *Daphnia* (> 10,000 mg/L) and algae (22,000 mg/L). There are no well-conducted long-term studies on methanol. Therefore, an assessment of 1,000 has been applied to the lowest reported effect concentration of 10,000 mg/L for *Daphnia*. The $PNEC_{water}$ is 10 mg/L.

PNEC Sediment

There are no adequate toxicity studies on sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 6.3 mg/kg wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (0.81/1280) \times 1000 \times 10$
$= 6.3$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [0.2 \times Kp_{sed}/1000 \times BD_{soilid}]$
$= 0.8 + [0.2 \times 0.02/1000 \times 2400]$
$= 0.81\ m^3/m^3$

Where:
Kp_{sed} = solid-water partition coefficient (L/kg).
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 0.61 \times 0.04$
$= 0.02$ L/kg

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for methanol is 0.61 L/kg.
f_{oc} = fraction of organic carbon suspended sediment = 0.04 [default].

PNEC Soil

Experimental results from chronic studies are available for three trophic levels. The lowest NOEC is 1,000 mg/kg soil dry weight for the arthropod *Folsomia candida*. On the basis that the data consists of long-term results from three trophic levels, an assessment factor of 10 has been applied to the lowest reported long-term NOEC of 1,000 mg/kg soil dry weight. The $PNEC_{soil}$ is 100 mg/kg soil dry weight.

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (DEWHA, 2009 and ECHA, 2008).

Methanol is readily biodegradable and thus it does not meet the screening criteria for persistence.

Based on an experimental BCF of < 10 in fish, methanol does not meet the criteria for bioaccumulation.

There are no adequate chronic toxicity studies on methanol. Predicted toxicity based on QSAR methods indicates chronic values > 0.1 mg/L for fish and invertebrates. The acute EC_{50} values of methanol in fish, invertebrates and algae is >1 mg/L; thus, it does not meet the screening criteria for toxicity.

The overall conclusion is that methanol is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

Flammable Liquid Category 2

Acute Toxicity Category 3 [Oral]

Acute Toxicity Category 3 [dermal]

Acute Toxicity Category 3 [inhalation]

STOT SE Category 1 [optic nerve, central nervous system]

In the EU, there are concentration limits for the STOT SE classification of methanol. This may or may not apply to GHS classifications for Australian SDS.

Concentration range (%):

>10	STOT SE Category 1
>3 and <10	STOT SE Category 2

B. Labelling

Danger

C. Pictograms

The health hazard pictogram is omitted if the STOT SE classification for methanol does not apply (i.e., concentration of methanol is below the concentration limits).

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

Note: Methanol is used in the drilling mud product ALDACIDE® G ANTIMICROBIAL at a concentration of 0.1% to 1%. The safety and handling of methanol at this concentration in ALDACIDE® G ANTIMICROBIAL will be provided in the dossier on glutaraldehyde, the major constituent of ALDACIDE® G ANTIMICROBIAL.

A. Occupational Exposure Standards

The workplace exposure standard for methanol in Australia is 200 ppm (262 mg/m^3) as an 8-hour TWA and 250 ppm (328 mg/m^3) as a 15-minute STEL. There is also a skin notation indicating that absorption through the skin may be a significant source of exposure.

B. Transport Information

Methanol is used in drilling mud product ALDACIDE® G ANTIMICROBIAL at a concentration of 0.1 to 1%. The transportation information for ALDACIDE® G ANTIMICROBIAL will be provided in the dossier on glutaraldehyde, the major constituent of ALDACIDE® G ANTIMICROBIAL.

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

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POLYETHYLENE GLYCOL

This dossier on polyethylene glycol presents the most critical studies pertinent to the risk assessment polyethylene glycol in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

NICNAS has assessed polyethylene glycol in an IMAP Tier 1 assessment and concluded that it poses no unreasonable risk to human health.[1]

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Poly(oxy-1,2-ethanediyl),α-hydro-ω-hydroxy- Ethane-1,2-diol, ethoxylated

CAS RN: [redacted]

Molecular formula: $C_{2n}H_{4n+2}O_{n+1}$

Molecular weight: variable (polymer)

Synonyms: Polyethylene glycol; poly(oxyethylene); polyethylene oxide

Polyethylene glycols (PEGs) are water-soluble linear polymers formed by the addition reaction of ethylene oxide to an ethylene glycol equivalent. The general formula for polyethylene glycol is: H-$(OCH_2CH_2)_n$-OH where "n" is the average number of repeating oxyethylene groups.

SMILES: **O{-}CC(n+}** (curly SMILES notation)

II. PHYSICO-CHEMICAL PROPERTIES

Key physical and chemical properties for the substance are shown in Table 1.

Table 1: Overview of the physico-chemical properties of polyethylene glycol

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Pale yellow organic liquid	1	ECHA
Melting Point	No freezing down to -14.08°C @ 97.4 kPa	1	ECHA
Boiling Point	205.7°C @97.8 kPa	1	ECHA
Density	1,116 kg/m^3@ 20°C and 97.6 kPa	1	ECHA
Vapour Pressure	10 Pa @ 20°C	1	ECHA
Partition Coefficient (log K_{ow})	-0.698 @ 30°C and pH of 6.44	1	ECHA

[1] https://www.industrialchemicals.gov.au/chemical-information/search-assessments?assessmentcasnumber=[redacted]

Property	Value	Klimisch Score	Reference
Water Solubility	256 g/L at 25°C	1	ECHA
Viscosity	289.87 mPa s @ 20°C (dynamic)	1	ECHA

Polyethylene glycols are water-soluble linear polymers formed by the addition reaction of ethylene oxide to an ethylene glycol equivalent. The general formula for polyethylene glycol is: $H-(OCH_2CH_2)_n-OH$ where "n" is the average number of repeating oxyethylene groups.

All of the lower molecular weight polyethylene glycols are liquid at room temperature; polyethylene glycols with higher molecular weights (defined as > 600 g/mol) exist as solids at room temperature.

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Polyethylene glycol is readily biodegradable, and it is not expected to bioaccumulate. Polyethylene glycol has low potential to adsorb to soil and sediment.

B. Biodegradation

Polyethylene glycol is readily biodegradable. In an OECD 301D test, there was 75% degradation after 28 days, as determined by oxygen consumption (ECHA) [Kl.score=1]. If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

Experimental data are available for polyethylene glycol. In the key study, the soil organic carbon partition coefficient (K_{oc}) in soil and in sewage sludge of test chemical was determined by the Reverse Phase High Performance Liquid Chromatographic method according to OECD Guideline No. 121 for testing of Chemicals. The Log K_{oc} value of test chemical was determined to be 1.8568 dimensionless at 25°C (ECHA) [Kl.score=1].

Using KOCWIN in EPISUITE™ (USEPA, 2019), the estimated soil organic carbon partition coefficient (K_{oc}) value from the molecular connectivity index (MCI) and K_{ow} method are 10 and 0.02935 L/kg, respectively (ECHA) [Kl.score=2].

Based upon these K_{oc} values, if released to soil, polyethylene glycol is expected to have low potential for adsorption and a high potential for mobility. If released to water, based on its K_{oc} and high water solubility values, polyethylene glycol is likely to remain in water and not adsorb to sediment. From the water surface, the substance will not evaporate into the atmosphere (ECHA).

D. Bioaccumulation

Using BCFBAF in EPISUITE™, the estimated the estimated BCF for polyethylene glycol is 3.162 L/Kg (ECHA). [Kl.score=2]. Based on this BCF value, the substance is not expected to bioaccumulate.

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Polyethylene glycol is partially absorbed from the small intestine, can undergo metabolism in the body, and both polyethylene glycol and its metabolites are excreted mainly in the urine. Polyethylene glycol has low acute oral, inhalation, and dermal toxicity. It is not irritating to the skin or eyes. Polyethylene glycol is not a skin sensitiser. Polyethylene glycol is not likely to be genotoxic *in vitro* although it did induce chromosome aberrations at doses of 2mM. This substance has low oral and inhalation repeated dose toxicity. There are no available dermal repeated dose toxicity studies available. There are no *in vivo* genotoxicity studies and there are no carcinogenicity studies available. Polyethylene glycol is not considered a reproductive toxicant. However, polyethylene glycol exposure has been shown to have negative teratogenic effects such as foetal body weight, foetal loss and malformation.

B. Toxicokinetics and Metabolism

Low molecular weight polyethylene glycol is partially absorbed in the proximal small intestine following oral administration. About 50-65% of PEG 400 was shown to be absorbed in humans (Shaffer et al., 1950).

Metabolism of polyethylene glycol to acidic metabolites may occur following absorption. PEG and its acidic metabolites appear to be excreted in the urine and bile, with the biliary route playing a major role for the higher molecular weight PEGs (Herold et al., 1982).

C. Acute Toxicity

<u>Oral</u>

The lethal concentration LD_{50} value for acute oral toxicity test was considered to be >2000 mg/kg bw,when female wistar rats were treated with polyethylene glycol via oral gavage according to OECD Guideline 423 (Acute Oral toxicity - Acute Toxic Class Method) (ECHA) [KI.score =1].

<u>Inhalation</u>

No deaths were reported in rats exposed to an aerosol of 2,516 mg/m3 PEG 200 for 6 hours (OECD, 2004).

<u>Dermal</u>

The LD_{50} value was considered to be >2000 mg/kg bw when male and female wistar rats were treated with polyethylene glycol by dermal application (semiocclusive) following 14 days of observation period according to OECD Guideline 402 (Acute Dermal Toxicity) (ECHA) [KI.score=1].

D. Irritation

<u>Skin</u>

An acute dermal Irritation/corrosion study (OECD guideline 404) of polyethylene glycol was conducted using New Zealand White rabbits. The individual mean score at 24, 48 and 72 hours for the test animals were 0.33, 0.33, 0.33 and 0.00, 0.00, 0.00, for erythema and oedema formation, respectively. Hence, polyethylene glycol was regarded as non-irritating to the skin of female New

Zealand White rabbits under the experimental conditions tested and is thus not considered a skin irritant (ECHA) [KI.score=1].

Eye

An acute eye irritation/corrosion study (OECD guideline 405) of polyethylene glycol was conducted using female New Zealand white rabbits. Under the experimental conditions tested, eye irritation and reversibility of effects on the eyes was observed till 72 hours which were recovered on day 7. Hence, polyethylene glycol is not irritating to New Zealand White female rabbit eyes and is thus not considered an eye irritant (ECHA) [KI.score=1].

E. Sensitisation

Polyethylene glycol was considered to be not sensitising on skin of guinea pigs in a guinea pig maximisation test described by Magnusson and Kligman (ECHA) [KI.score=2].

F. Repeated Dose Toxicity

Oral

A 90-day sub chronic oral toxicity study was conducted using male and female Wistar rats exposed to 0, 2000, 4000, 8000, 16000, or 24000 mg/kg bw/day polyethylene glycol via dietary feed. Polyethylene glycol exposure showed no effect upon male and female rats when it was present in the diet at a dose level up to 8000 mg/kg/day (8% concentration) during a 90-day study period. But at 16000 mg/kg/day, the test chemical showed effects on organ weight (liver and kidney heavier than that of control rats);and a decrease in weight gain was observed. Thus, the NOAELs (no observed adverse effect level) for repeated dose oral toxicity was 8000 mg/kg/day whereas the LOAELs (low observed adverse effect level) for subacute repeated dose was 16000 mg/kg/day. (ECHA) [KI.score=2].

Inhalation

A sub-chronic inhalation toxicity study was conducted using male and female Fischer 344 rats exposed to 0, 100, 1000 mg/m^3 polyethylene glycol via whole body inhalation for 13 weeks (6 hours per day for 5 days a week). No pattern of significance could be related to polyethylene glycol exposure for the 13-week or the 30-day postexposure periods. The polyethylene glycol exposure did not product any adverse physiological effects on the rats exposed to the 100 and 1000 mg/m^3 concentrations for the various exposure periods. There were no consistently 'significant changes in rat blood chemistry at the end of the 6- or 13-week exposures or the 30-day postexposure period. It appears that polyethylene glycol produced no positive effects in the rodents at the 100 and 1000 mg/m3 test chemical concentrations over the 13 weeks of exposure used in this study. Thus, it is concluded that the no observed adverse effect concentration (NOAEC) of polyethylene glycol in rats was observed at dose level of 1000 mg/m3 (ECHA) [KI.score =2].

Dermal

No studies were located on polyethylene glycol.

G. Genotoxicity

In Vitro Studies

The *in vitro* genotoxicity studies on polyethylene glycol are presented in Table 2.

Table 2: *In vitro* genotoxicity studies on polyethylene glycol

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
In vitro gene mutation study in bacteria (Salmonella typhimurium strains TA100, TA1535, TA1537, and TA98)	-	-	2	ECHA
In vitro cytogenicity/chromosome aberration study in mammalian cells (mammalian cell line/CHEL cells)* did not induce chromosome aberrations at dose level of 2mM	+	+	2	ECHA
In vitro Mammalian cell gene mutation assay (OECD 476) Chinese hamster ovary (CHO) cells	-	-	1	ECHA

*+, positive; -, negative

In Vivo Studies

There are no studies available.

H. Carcinogenicity

No studies were located.

I. Reproductive Toxicity

A reproduction/developmental toxicity screening test (OECD 421) study was conducted using male and female Fischer 344 rats exposed to 0, 5000, 25000, 50000 ppm polyethylene glycol via their drinking water. Reproductive parameters, including number of fertile males and number of gravid females with viable implants, were not affected by test chemical treatment. There were no significant preimplantation losses or dominant lethal effects observed. Based on all the observation, and all the results it was concluded that the NOAEL for polyethylene glycol was found to be 5699 ± 1341 mg/kg (ECHA) [KI.score=4].

A two-year (three-generation reproductive toxicity) study was conducted using male and female Wistar rats exposed to 15, 59, 270, or 1690 mg/kg bw/day polyethylene glycol via their drinking water. The oral administration of polyethylene glycol to rats by drinking water, resulted in no injury to the test animals when administered in the drinking water over a two-year period. The 'No Observed Adverse Effect Level' (NOAEL) for reproductive toxicity was therefore considered to be 1690 mg/kg for the test chemicals (ECHA) [KI.score=2].

A multigeneration reproductive toxicity study was conducted using male and female ICR Swiss mice exposed to 0 and 1% (0 or 1667 mg/kg bw/day) polyethylene glycol via their drinking water. No significant changes in reproductive performance were observed in any of the matings. No adverse

effects were observed when fetuses were analysed for mean litter size, postnatal body weight and pup survival indices. The only significant change observed in both the dominant lethal and teratology screenings was an increase in the ratio of dead fetuses to live fetuses. Thus, based on all the observations and results, NOAEL for the Swiss ICF mice was 1% (1667 mg/kg bw) of the test chemical for the parental generation and the offspring generation (ECHA) [KI.score=2].

J. Developmental Toxicity

Oral

A prenatal developmental toxicity study (OECD Guideline 414) was conducted using Sprague-Dawley rats exposed to polyethylene glycol via an unspecified oral exposure for 20 days. Female rats were orally dosed on gestational days 6-14 or 11-16 with 1.5 -5 ml/animal/day (equivalent to 1500 -5000 ng/kg bw/d). Polyethylene glycol exposure was shown to have negative teratogenic effects as foetal body weight, foetal loss and malformation at dose levels of 1.5 - 5 ml/animal/day (equivalent to 1500 -5000 mg/kg bw/d) in 6-14 or 11-16 days of gestation period. Thus, the LOAEL was reported as 1.5 -5 ml/animal/day (equivalent to 1500 -5000 mg/kg bw), it is regarded that there is no teratogenic effects in the fetuses at concentrations 1.5 -5ml/animal/day (equivalent to 1500 -5000 mg/kg bw/d) when administered orally (ECHA) [KI.score=2].

In a developmental toxicity test, the teratogenic effects of oral polyethylene glycol exposure to female mice were assessed in a one generation in an overall estimation of 6-17 days of gestation. The teratogenic effects on external, visceral and skeletal malformations and body weight of fetuses by polyethylene glycol was observed at dose concentration 0.5 mg/animal/day (equivalent to 500 mg/kg bw/d) in 6-17 days gestation period. The dosage of the test chemical was given orally to mice on a daily basis and resulted in skeletal anomalies and external malformations. Thus, the LOAEL for teratogenicity study is considered to be 500 mg/kg/day (ECHA) [KI.score=2].

Inhalation

No studies were located.

Dermal

No studies were located.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for lower molecular PEGs follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

A two-year (three-generation reproductive toxicity) study was conducted using oral administration of polyethylene glycol to rats by drinking water. This exposure resulted in no injury to the test animals when administered in the drinking water over a two-year period. The NOAEL for reproductive toxicity was therefore considered to be 1690 mg/kg for the test chemicals. This value will be used to determine the oral reference dose (RfD) and the drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 1690/(10 × 10 × 1 × 1 × 1) = 1690/100 = <u>16.9 mg/kg/day</u>

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (16.9 × 70 × 0.1)/2 = <u>59.15 mg/L</u>

B. Cancer

There are no carcinogenicity studies on the low molecular weight PEGs. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

The low molecular weight PEGs does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Polyethylene glycol is of low toxicity concern to aquatic organisms.

B. Aquatic Toxicity

<u>Acute Studies</u>

Table 3 lists the results of acute aquatic toxicity studies conducted on polyethylene glycol.

Table 3: Acute aquatic toxicity studies on polyethylene glycol

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Poecilia reticulata	96-hr LC_{50}	>100	2	ECHA
Daphnia magna	48-hr EC_{50}	>100	1	ECHA
Scenedesmus subspicatus	96-hour EC_{50}	>100	2	ECHA

Chronic Studies

Based on the EPISUITE™ ECOSAR version 1.11 predicted model, in 28 days long term fish toxicity (NOEC value) was estimated to be 13,671.586 mg/L on fish for on the basis of mortality effects (ECHA). [Kl.score=2].

The calculated value was further supported by 7-day freshwater study conducted on *Poecilia reticulata* (guppy fish) in semi-static conditions. The median lethal concentration of the test chemical (LC_{50}) was determined as 1150 mg/L (ECHA) [Kl.score=2].

Based on the EPISUITE™ ECOSAR version 1.10 predicted model, in 21 days long term aquatic invertebrate toxicity (NOEC value) was estimated to be 17,475.27 mg/L to Daphnid on the basis of reproductive effects (ECHA) [Kl.score=2].

Data for algae was available for read-across substance diethylene glycol mono-butyl ether (CAS No. [redacted] The effect of the test chemical to algae *Scenedesmus quadricauda* was performed for a period of 8 days. Based on the results obtained, the 8-day EC_{50} value was determined to be 1,000 mg/L (ECHA) [Kl.score=2].

C. Terrestrial Toxicity

No studies were located. These studies don't need to be conducted because direct and indirect exposure of the soil compartment is less as considering its use as binding agents and emulsion stabilizers and even if PEGs are accidentally exposed to the soil compartment, there is likely to be little or no adsorption of chemical in soil compartment as the chemical is not persistent in soil (ECHA).

D. Calculation of PNEC

The PNEC calculations for polyethylene glycol follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels for polyethylene glycol. Acute $E(L)C_{50}$ values are available for fish (>100 mg/L), invertebrates (>100 mg/L), and algae (>100 mg/L). Chronic toxicity data are available fish (1,150 mg/L) and invertebrates (17,475 mg/L) and in algae (1,000 mg/L) based on a read-across substance. On the basis that the data consists of short-term results from three trophic levels and long-term results of three trophic levels, an assessment factor of 10 has been applied to the lowest chronic NOEC of 1,000 mg/L for algae. The $PNEC_{water}$ is 100 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 770 mg/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (0.99/1280) \times 1000 \times 100$
$= 770$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 0.4/1000 \times 2400]$
$= 0.99\ m^3/m^3$

Where:
Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 10 \times 0.04$
$= 0.4$ L/kg

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for polyethylene glycol calculated from EPISUITE™ using the MCI is 10 L/kg.
F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 13 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (0.2/1500) \times 1000 \times 100$
$= 13$ mg/kg

Where:
Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]
$Kp_{soil} = K_{oc} \times f_{oc}$
$= 10 \times 0.02$
$= 0.2\ m^3/m^3$

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for polyethylene glycol calculated from EPISUITE™ using the MCI is 10 L/kg.

f_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Polyethylene glycol has been shown to be readily biodegradable; thus, it does not meet the screening criteria for persistence.

The calculated BCF is 3.162 L/kg. Thus, polyethylene glycol does not meet the screening criteria for bioaccumulation.

The NOECs from the chronic aquatic toxicity studies on polyethylene glycol are >0.1 mg/L. The acute $E(L)C_{50}$ values from the acute aquatic toxicity studies on polyethylene glycol are >1 mg/L. Thus, polyethylene glycol does not meet the criteria for toxicity.

Therefore, polyethylene glycol is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

Not classified

B. Labelling

No signal word.

C. Pictogram

None.

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

<u>Eye Contact</u>

In the case of contact, immediately flush eyes with plenty of water for at least 15 minutes. If symptoms persist, seek medical advice.

<u>Skin Contact</u>

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air.

Ingestion

Rinse mouth with water and then drink plenty of water. Do not induce vomiting. Never give anything by mouth to an unconscious person. Seek medical attention.

B. Firefighting Information

Extinguishing Media

Water spray or fog, carbon dioxide, dry powder.

Specific Exposure Hazards

Burning produces harmful and toxic fumes.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus.

C. Accidental Release Measures

Personal Precautions

No special precautions are necessary. Ensure adequate ventilation.

Environmental Precautions

For large amounts: dike spillage and pump off the product. For residues: pick up with suitable absorbent material. Dispose of contaminated material as prescribed.

Steps to be Taken if Material is Released or Spilled

For large amounts: dike spillage and pump off product. For residues: pick up with suitable absorbent material. Dispose of contaminated material as prescribed.

D. Storage and Handling

General Handling

Handle in accordance with good industrial hygiene and safety practice.

Other Handling Precautions

Protect against fire and explosion: prevent electrostatic charge; sources of ignition should be kept well clear, and fire extinguishers should be kept handy.

Storage

Keep container tightly closed and dry. Protect against heat. Store below 25°C.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Occupational exposure standards for the low molecular weight PEGs have not been established.

Engineering Controls

Provide local exhaust ventilation to control vapours and mists.

Personal Protection Equipment

Respiratory Protection: Respiratory protection in case of vapours/aerosol release. Wear a certified organic vapour/particulate respirator.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye protection: Safety glasses with side-shields.

Other Precautions: Wash hands, forearms, and face thoroughly after handling chemical products, before eating, smoking, and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

The low molecular weight PEGs are not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

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POLYPROPYLENE GLYCOL

This dossier on polypropylene glycol (PPG) presents the most critical studies pertinent to the risk assessment of PPG in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA) and on a Cosmetics Ingredient Review (CIR) on PPG (Andersen, 1994). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

NICNAS has assessed PPG in an Inventory Multi-tiered Assessment and Prioritisation (IMAP) Tier 1 assessment and concluded that it poses no unreasonable risk to human health.[1]

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): 2-(2-hydroxypropoxy)propan-1-ol

CAS RN: [redacted]

Molecular formula: $C_6H_{14}O_3$

Molecular weight: 134.17 g/mol

Synonyms: Propane-1,2-diol propoxylated; polyoxypropylene; oxirane, methyl-, homopolymer; propylene oxide homopolymer; propylene oxide, propylene glycol polymer; poly[oxy(methyl-1,2-ethanediyl)], alpha.-hydro-.omega.-hydroxy-; alpha-hydro-omega-hydroxypoly(oxy(methyl-1,2-ethanediyl)); alpha-hydro-omega-hydroxypoly(oxypropylene)

PPG is a polymer of propylene oxide, with a minimal of three propylene oxide units.

SMILES: CC(CO)OCC(C)O

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the physico-chemical properties of polypropylene glycol

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Clear, colourless, viscous, organic, liquid	1	ECHA
Melting Point*	< -150°C @ 101.3 kPa	1	ECHA
Boiling Point*	287.6°C @ 101.3 kPa	1	ECHA
Density*	1012 kg/m^3@ 20°C	1	ECHA
Vapour Pressure**	8.39×10^{-2} Pa @ 20°C 1.35×10^{-1} Pa @ 25°C	1	ECHA

[1] https://www.industrialchemicals.gov.au/chemical-information/search-assessments?assessmentcasnumber=[redacted]2C+

Property	Value	Klimisch Score	Reference
Partition Coefficient (log K_{ow})***	<0.3 to 0.9 (measured) @ 23°C	1	ECHA
Water Solubility*	Miscible 47 g/L @ 22°C	1	ECHA
Flash Point*	151°C	1	ECHA
Auto flammability*	305°C	1	ECHA
Viscosity**	78.34 mPa s @ 20°C 27.37 mPa s @ 20°C	1	ECHA
Henry's Law Constant	-	-	-

*Polypropylene glycol (MW 260)

**Polypropylene glycol (MW 250)

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

PPG is an organic substance that biodegrades readily, is not expected to bioaccumulate and has a low potential to adsorb to soil.

B. Biodegradation

PPG has been determined to be readily biodegradable via an OECD Guideline 301 F test. After 28 days, 86.6% of the test substance had been degraded in a manometric respirometry test (ECHA) [Kl.score=2]. If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

No experimental adsorption/desorption data are available for PPG. However, the estimated soil organic carbon partition coefficient (K_{oc}) values for homologous components of this UVCB substance range from 1 to 10 L/kg for the lowest (least sorptive) and highest (most sorptive) molecular weight homologues. The components of this UVCB substance can be regarded as having low affinity for adsorption to soils and activated sludge biosolids (ECHA).

D. Bioaccumulation

Based on a log K_{ow} of <=3 and relatively high water solubility, PPG is not expected to bioaccumulate.

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

The acute oral toxicity of PPG varies from moderately to non-toxic, depending on the molecular (toxicity decreases with increasing molecular weight). These substances are non-toxic by the dermal route. PPG is not a skin and eye irritant, nor is it a skin sensitisers. Repeated dose toxicity studies showed minimal systemic toxicity in rats given oral doses or rabbits given dermal applications of PPG. This substance is not genotoxic. In a screening study, no reproductive or developmental effects were seen in rats dosed orally with a substance that is structurally related PPG.

B. Acute Toxicity

Acute oral toxicity studies on PPG of various molecular weights (300 to 3,900) have indicated LD_{50} values in rats ranging from 500 to >40,000 mg/kg (Andersen, 1994).

In acute dermal toxicity studies, doses of PPG 1025 (20 mL/kg) and PPG 2025 (20 mL/kg) did not cause death to rabbits. Two of five rabbits dosed with 20 mL/kg PPG 425 and one of five dosed with 10 mL/kg PPG 425 died (Andersen, 1994).

No acute inhalation studies on PPG were identified

C. Irritation

Skin irritation was not noted after PPG 425, PPG 1025 or PPG 2025 was applied once to the skin of rabbits or when applied a total of eight times to the same area within 4 hours (Andersen, 1994).

PPGs 425, 1025 and 2025 were classified as harmless agents in rabbits in another ocular irritation study; PPG 1200 induced slight, transient ocular irritation in an albino rabbit (Andersen, 1994).

D. Sensitisation

PPG (MW 260) was considered a non-sensitiser in a mouse local lymph node assay (LLNA) (ECHA) [Kl.score=1]. Neither skin irritation nor sensitisation reactions were observed in 300 human subjects who received continuous and repeated dermal applications of undiluted PPG 2000 (Andersen, 1994).

E. Repeated Dose Toxicity

<u>Oral</u>

PPG 2000 was administered to rats over a period of 100 days. Concentrations of 0.1, 0.3, 1.0 and 3.0% were administered in oral doses of 50 to 1,500 mg/kg-day. There were no adverse effects noted at concentrations of 0.1 to 1.0%. Slight decreases in growth were observed after the administration of 3% PPG 2000. The NOAEL is 1% (500 mg/kg-day) in the diet (Andersen, 1994).

In a 90-day study, PPG 2000 was administered orally to rats in doses ranging from 275 to 501 mg/kg-day. There was no evidence of adverse histopathologic, hematologic or clinical chemistry effects in any of the animals tested. Body weight effects (not specified) were noted at the highest dose tested. The NOAEL is ~500 mg/kg-day (Andersen, 1994).

PPG 750 was administered to rats over a period of 100 days. Concentrations of 0.1 and 1% were administered at doses of 50 and 500 mg/kg-day. PPG 750 (0.1%) did not induce any adverse effects. However, in the group dosed with 1% PPG 750, there was a slight increase in liver and kidney weights; there were no histological changes. Neither of the doses resulted in a central nervous system stimulatory effect. The NOAEL is 500 mg/kg-day (Andersen, 1994).

A rat 28-day oral gavage study was conducted on triethanolamine, propoxylated (CAS No. [redacted] a structurally related substance to PPG. Male and female Wistar rats were dosed with 0, 100, 300 or 1,000 mg/kg-day. There were no treatment-related deaths and no clinical signs of toxicity. Haematological and clinical chemistry parameters measured in the study were similar across all groups. There were no gross necropsy or histopathological changes that were considered to be treatment-related. The NOAEL for this study is 1,000 mg/kg-day (ECHA) [Kl.score=1].

Inhalation

No studies are available.

Dermal

PPG-2000, at doses of 1, 5 or 10 ml/kg, was applied to the skin of rabbits 24 hours/day, 5 days/week for three months. It was reported that there was a slight reduction in growth in the 5 and 10 ml/kg groups; no effects were seen at 1 mL/kg (Andersen, 1994).

F. Genotoxicity

In Vitro Studies

Polypropylene glycol (MW 260) was not mutagenic to *S. typhimurium* strains TA1535, TA1537, TA102, TA98 and TA100 in the absence or presence of metabolic activation (ECHA).

The *in vitro* genotoxicity studies on PPG are presented in Table 2.

Table 2: In vitro genotoxicity studies on polypropylene glycol

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
In vitro mammalian chromosome aberration test: human lymphocytes	-	-	1	ECHA
OECD Guideline 473 (In Vitro Mammalian Chromosome Aberration Test): human lymphocytes	-	-	1	ECHA
Mammalian cell gene mutation assay: Chinese hamster lung fibroblasts V79	-	-	1	ECHA
OECD Guideline 471 (Bacterial Reverse Mutation Assay): Salmonella typhimurium strains TA1535, TA 1537, TA102, TA98, TA100	-	-	1	ECHA

*+, positive; -, negative

In Vivo Studies

No studies are available.

G. Carcinogenicity

Oral

There are no studies available

Inhalation

There are no studies available

Dermal

There are no studies available

H. Reproductive Toxicity

No studies are available on PPG.

A reproductive and developmental screening toxicity study (OECD 421) was conducted on triethanolamine, propoxylated (CAS No. [redacted] a structurally related substance to PPG. Male and female Wistar rats were dosed by oral gavage with doses of 0, 100, 300 or 1,000 mg/kg-day. Transient salivation was noted in the high-dose parental animals. There were marginal body weight gains in females in all dose groups during the pre-mating period, and a slight body weight loss in the high-dose females during lactation. There were no reproductive or developmental effects that were considered treatment-related. The NOAEL for reproductive and developmental toxicity is ≥1,000 mg/kg-day (ECHA) [Kl.score=1].

I. Developmental Toxicity

PPG is not classifiable as hazardous in respect to its reproductive toxicity. There is sufficient information from a qualitative and quantitative understanding of the toxicological properties of the core substance, the repeating unit and screening studies on the most bioavailable members of the category, such that testing for developmental toxicity is not necessary (ECHA).

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for PPG follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Several rat subchronic toxicity studies conducted on PPG showed an NOAEL of 1% PPG in diet (500 mg/kg-day). In one study, it was reported that there was a slight increase in liver and kidney weights, but no data were provided to determine if the change in organ weights were statistically significant. Nevertheless, these organ weight changes may not be considered adverse since there were no accompanying histopathologic changes. No adverse effects were seen in rats given oral doses of up to 1,000 mg/kg-day for four weeks of a substance that is structurally similar to PPG.

The NOAEL of 500 mg/kg-day from the PPG studies will be used for determining the oral Reference dose (RfD) and the drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

- UF_A (interspecies variability) = 10
- UF_H (intraspecies variability) = 10
- UF_L (LOAEL to NOAEL) = 1
- UF_{Sub} (subchronic to chronic) = 10

UF_D (database uncertainty) = 1
Oral RfD = 500/(10 × 10 × 1 × 10 × 1) = 500/1,000 = 0.5 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:
Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (0.5 × 70 × 0.1)/2 = 2 mg/L

B. Cancer

No carcinogenicity studies are available on PPG. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

PPG does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

PPG is low toxicity concern to aquatic organisms.

B. Aquatic Toxicity

Acute Studies

Table 3 lists the results of acute aquatic toxicity studies conducted on PPG.

Table 3: Acute aquatic toxicity studies on polypropylene glycol

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Danio rerio	96-h LC_{50}	>100	1	ECHA
Daphnia magna	48-h EC_{50}	105.8	1	ECHA
Desmodesmus subspicatus	72-h EC_{50}	>100	1	ECHA

Chronic Studies

No studies on PPG are available. Chronic toxicity to invertebrates of the structurally related substance D-Glucitol (Sorbitol), propoxylated (CAS RN [redacted] has been investigated in a reproduction test with *Daphnia magna f*ollowing the OECD guideline 211 using semi-static exposure. No effects were observed at the maximum concentration test (10 mg/l) and the NOEC are reported at 10 mg/l (nominal) for reproduction and mortality (ECHA) [Kl.score=1].

C. Terrestrial Toxicity

No studies are available.

D. Calculation of PNEC

The PNEC calculations for PPG follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels. Acute $E(L)C_{50}$ values are available for fish (>100 mg/L), *Daphnia* (105.8 mg/L), and algae (>100 mg/L). A chronic *Daphnia* study has been conducted on D-Glucitol (Sorbitol)(CAS No. [redacted] a structurally similar substance to PPG, with a NOEC of 10 mg/L On the basis of the short-term results from three trophic levels and long-term results from one trophic levels, an assessment factor of 100 has been applied to the lowest reported NOEC value of 10 mg/L for invertebrates. The $PNEC_{water}$ is 0.1 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 0.07 mg/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (0.896/1280) \times 1000 \times 0.1$
$= 0.07$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 0.2/1000 \times 2400]$
$= 0.896\ m^3/m^3$

Where:
Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 5 \times 0.04$
$= 0.2$ L/kg

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for PPG estimated as the mid-point from a range of values is 5 L/kg.

F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 0.0067 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$

$= (0.1/1500) \times 1000 \times 0.1$

$= 0.0067$ mg/kg

Where:

Kp_{soil} = soil-water partition coefficient (m^3/m^3)

BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]

$Kp_{soil} = K_{oc} \times f_{oc}$

$= 5 \times 0.02$

$= 0.1\ m^3/m^3$

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for PPG estimated as the mid-point from a range of values is 5 L/kg..

F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

PPG is readily biodegradable; thus, it does not meet the screening criteria for persistence.

No data are available on bioaccumulation. However, based on the low log K_{ow}, and rapid degradation rate, and significant water solubility, bioaccumulation is not expected.

There are no chronic toxicity studies on PPG. The NOEC values for a structurally related substance [D-Glucitol (Sorbitol), propoxylated (CAS# [redacted] are >0.1 mg/L for invertebrates. The acute $E(L)C_{50}$ values of PPG are >1 mg/L for fish, invertebrates and algae. Thus, PPG does not meet the criteria for toxicity.

The overall conclusion is that PPG is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

Not classified.

B. Labelling

No signal word.

C. Pictogram

None.

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

Eye Contact

In case of contact, immediately flush eyes with plenty of water for at least 5 minutes. Remove contacts, if possible. If symptoms persist, seek medical attention.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion

If swallowed, seek medical attention. Do not induce vomiting. Never give anything by mouth to an unconscious person.

B. Firefighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Burning produces harmful and toxic fumes. Combustion products may include carbon monoxide, carbon dioxide.

Special Protective Equipment for Firefighters

Wear a self-contained breathing apparatus and protective clothing.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Spilled material may cause a slipping hazard.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

D. Storage And Handling

General Handling

Do not swallow. Wash thoroughly after handling.

Storage

Keep container closed when not in use. Store in a dry place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure limit for propylene glycol.

Engineering Controls

Use in a well-ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal Protection Equipment

Respiratory Protection: Not normally needed. But if significant exposures are possible then the following respirator is recommended: organic vapour respirator with a dust/mist filter.

Hand Protection: Chemical protective gloves.

Skin Protection: Normal work coveralls.

Eye protection: Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Eyewash fountains and safety showers must be easily accessible.

F. Transport Information

PPG is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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SODIUM BICARBONATE

This dossier on sodium bicarbonate presents the most critical studies pertinent to the risk assessment of sodium bicarbonate in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

NICNAS has assessed sodium bicarbonate in an IMAP Tier 1 assessment and concluded that it poses no unreasonable risk to human health or the environment.[1] In addition, based on an assessment of environmental hazards, NICNAS also identified sodium bicarbonate as a chemical of low concern to the environment (DoEE, 2017). Chemicals of low concern are unlikely to have adverse environmental effects if they are released to the environment from coal seam gas operations.

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Sodium hydrogen carbonate

CAS RN: [redacted]

Molecular formula: $CH_2O_3.Na$

Molecular weight: 84.01 g/mol

Synonyms: Sodium bicarbonate; sodium hydrogen carbonate; baking soda; carbonic acid monosodium salt; sodium hydrogencarbonate; carbonic acid sodium (1:1)

SMILES [Na+].OC([O-])=O

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the physico-chemical properties of sodium bicarbonate

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	White, crystalline, odourless solid	1	ECHA
Melting Point	Decomposes above 50°C (pressure not provided)	1	ECHA
Boiling Point	Not applicable	-	-
Density	2,100-2230 kg/m^3 @ 20°	1	ECHA
Vapor Pressure	Negligible, ionisable inorganic compound	-	ECHA

[1] https://www.industrialchemicals.gov.au/chemical-information/search-assessments?assessmentcasnumber=[redacted]

Property	Value	Klimisch Score	Reference
Partition Coefficient (log K_{ow})	Not applicable	-	-
Water Solubility	93.4 g/L @ 20°C (pH 8.4)	1	ECHA
Flash Point	Not applicable	-	-
Autoflammability	Not applicable	-	-
Viscosity	Not applicable	-	-
Dissociation constant (pKa)	6.3 (temperature not indicated)	-	NCBI, 2024

III. ENVIRONMENTAL FATE PROPERTIES

Due to its high-water solubility and low vapor pressure, sodium bicarbonate will be found predominantly in the aquatic environment where it dissociates completely to sodium (Na^+) and bicarbonate (HCO_3^-) ions. Both ions are ubiquitous in the environment (UNEP, 1995).

When bicarbonate is dissolved in water, a re-equilibration takes place according to the following equations:

$HCO_3^- \leftrightarrow CO_3^{2-} + H^+$ pKa = 10.33

$CO_2 + H_2O \leftrightarrow HCO_3^- + H^+$ pKa = 6.35

Only a small fraction of the dissolved CO_2 is present as H_2CO_3 (carbonic acid); the major part is present as CO_2. The amount of CO_2 in water is in equilibrium with the partial pressure of CO_2 in the atmosphere. The CO_2/ HCO_3^-/ CO_3^{2-} equilibria are the major buffer of the pH of freshwater.

Based on the above equations, CO_2 is the predominant species at a pH smaller than 6.35, while HCO_3^- is the predominant species at a pH in the range of 6.35-10.33 and CO_3^{2-} is the predominant species at a pH higher than 10.33.

Geochemical and biological processes dictate the natural concentration of CO_2/ HCO_3^-/ CO_3^2 in freshwater. For instance, a continuous source of carbonate in freshwater is from the deposition of carbonate ions from the dissolution of minerals. Carbon dioxide comes from the decay of organic matter in aquatic ecosystems. On the other hand, carbon dioxide dissolved in freshwater is utilised by plants in photosynthesis.

The addition of sodium bicarbonate to the aquatic environment could potentially increase the sodium and bicarbonate concentration. However, unlike sodium carbonate, sodium bicarbonate does not increase the pH of the water to high and/or lethal levels. Addition of bicarbonate to water will move the pH towards 8.34 (the mean of the two pKa values from the two above equations) (OECD, 2002).

Na^+ and HCO_3^- ions will not adsorb on particulate matter or surfaces and will not accumulate in living tissues.

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Sodium bicarbonate is not expected to be systemically available in the body. Sodium bicarbonate is not acutely toxic by the oral and inhalation routes. Sodium bicarbonate is slightly irritating to the skin and eyes. There are no adequate repeated dose toxicity studies available in animals exposed to sodium bicarbonate. However, it is not expected to be systemically available in the body from oral exposure due to its dissociation in bodily fluids and the neutralisation of the bicarbonate ion in the stomach to CO_2. Sodium bicarbonate was not mutagenic or carcinogenic and is not considered to be genotoxic. There are no reproductive toxicity studies available to evaluate the effects of sodium bicarbonate on mammalian reproduction. However, based on the normal physiological role of sodium and bicarbonate no toxicity on mammalian reproduction is expected. It is not a developmental toxicant.

B. Toxicokinetics/Metabolism

Sodium bicarbonate will dissociate in bodily fluids to sodium (Na^+) and bicarbonate (CO_3^-) ions. The oral uptake of sodium bicarbonate would lead to neutralisation of bicarbonate in the stomach by the gastric acids, resulting in carbon dioxide (CO_2) formation (see equation below). It is unlikely that an oral uptake of sodium bicarbonate would disrupt the acid-base balance of the body because CO_2 formation in the stomach would alleviate the high amounts of bicarbonate that would be present in the stomach from an acute exposure. The equation that describes this reaction is:

$$HCO_3^- + H^+ \leftrightarrow H_2CO_3 \leftrightarrow CO_2 + H_2O$$

The bicarbonate is the principal extracellular buffer in the blood and interstitial fluids (Ganong, 1995; ECHA).

C. Acute Toxicity

<u>Oral</u>

An acute oral toxicity study was conducted using male and female Crl:CD BR rats exposed to 3,000, 3,500, 4,000 and 4,500 mg/kg bw/day of sodium bicarbonate via oral gavage. The LD_{50} was reported to be >4,000 mg/kg bw/day in males and 3,000 mg/kg bw/day in females (ECHA) [KI.score=1].

An acute oral toxicity study was conducted using male and female Sprague-Dawley rats exposed to sodium bicarbonate. The acute oral LD_{50} was reported to be 4,220–8,290 mg/kg bw/day (ECHA) [KI.score=2].

The LD_{50} studies presented indicate low acute oral toxicity in rats, with LD_{50} values varying from >4,000 mg/kg bw/day up to 7,334 mg/kg bw/day (ECHA; OECD SIDS 2002).

In humans, acute oral ingestion of sodium bicarbonate may result in a ruptured stomach due to excessive gas development. Acute or chronic excessive oral ingestion may cause metabolic alkalosis, cyanosis and hypernatremia. These conditions are reversible and will not cause adverse effects (OECD, 2002).

Inhalation

A whole-body acute inhalation toxicity study was conducted using male and female Sprague-Dawley rats exposed to 4.74 mg/L of sodium bicarbonate for 4.5 hours. The inhalation 4.5-hour LC_{50} in rats was reported to be >4,740 mg/m^3 mg/L air. There was no mortality, and the mass median aerodynamic diameter (MMAD) was 2.8 µm (ECHA) [Kl.score=1].

Dermal

There are no studies available.

D. Irritation

Skin

Skin-irritating properties of sodium bicarbonate have been studied in two GLP-compliant studies, performed according to OECD Guideline 404 and EPA Guideline OTS 798.4470. In the first study, 0.3 g of the test substance (0.5 ml bump volume) was applied to the shaved skins of three male rabbits for 4 hours under semi-occlusive conditions. One rabbit had a slight erythema (score 1) 1 hour after the test patch removal, which was resolved at 24 hours examination. Another had slight erythema (score 1) observed 24 hours after the test patch removal, which was resolved at 48 hours examination. The mean erythema score was reported to be 0.1, and the mean oedema score was reported to be 0. All of these effects were found to be fully reversible within 48 hours (ECHA) [KI.score=1].

In the second study, 0.5 g of the sodium bicarbonate, moistened with distilled water prior to application, was applied under semi-occlusive conditions to clipped skins of three male and three female New Zealand white rabbits. The Primary Dermal Irritation Index was reported to be 0.3. The mean of the 24-, 48-, and 72-hour scores for erythema and oedema were 0.06 and 0.00, respectively. In this study, sodium bicarbonate was reported to be slightly irritating to the skin of rabbits (ECHA) [Kl.score=1].

Eye

Eye-irritating potential of sodium bicarbonate has been studied in two GLP-compliant studies, performed according to OECD Guideline 405 (Henkel, 1991b) and EPA Guideline EPA OTS 798.4500. In the first study, 0.05–0.07 ml (bump volume) of the test substance were instilled into the eyes of three rabbits, the untreated eyes serving as negative controls. Twenty-four hours post-instillation, the eyes were rinsed thoroughly with tepid water, and the reactions were scored using the Draize system. All rabbits had a slight to moderate conjunctival erythema (scores 1–2) 1 hour after the instillation, which was resolved at 48 hours observation. Two out of three animals also exhibited mild chemosis (score 1), which was resolved at 24 hours observation (ECHA) [KI.score=1].

In the second study, 0.1 g of the test substance was instilled in the eyes of nine rabbits. The treated eyes of three rabbits were irrigated with 30 ml of physiological saline approximately 20–30 seconds after installation of the test substance. The eyes of the remaining six rabbits were not irrigated. The rabbits were observed for four days. No corneal opacity was noted during the study. One washed and one unwashed eye exhibited iritis one hour after installation only. All treated eyes had conjunctivitis. The incidence and severity of irritation decreased with time. All ocular irritation cleared from the washed and unwashed eyes by days 3 and 4, respectively. Based on these results, sodium bicarbonate is considered to be non-irritating to rabbit eye (ECHA) [KI.score=1].

E. Sensitisation

There are no studies available. However, the weight of evidence suggests that sodium bicarbonate does not have sensitising properties based on the physiological role of both its constituent ions. In addition to this, the sensitising effects of sodium bicarbonate have never been reported despite the long-term historical and wide dispersive (e.g., human food, pharmaceutical, cosmetics, and detergents) (ECHA).

F. Repeated Dose Toxicity

There are no acceptable repeat dose studies available. However, in humans, there is a long history of sodium bicarbonate use as an antacid in doses up to 4 grams without adverse effects of long-term use, although it is recommended not to use high doses of pure sodium bicarbonate instead of antacids (Gosselin, 1976; McEvoy, 1994; as cited in ECHA).

Sodium bicarbonate is recognised as 'GRAS' in food with no other limitation than current good manufacturing practice (FDA, 1983). In addition, sodium bicarbonate is an important extracellular buffer in vertebrates and is therefore readily regulated in the body. Therefore, additional testing for repeated dose toxicity is not deemed necessary (ECHA).

G. Genotoxicity

In Vitro Studies

The results of the *in vitro* genotoxicity studies on sodium bicarbonate are presented below in Table 2.

Table 2: *In vitro* genotoxicity studies on sodium bicarbonate

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Bacterial reverse mutation (*S. typhimurium* strains)	-	-	2	Ishidate et al., 1984; OECD, 2002
Bacterial reverse mutation (*S. typhimurium* and *E. coli* strains)	-	-	2	De Flora et al., 1984; OECD, 2002
Chromosomal aberration (Chinese hamster fibroblasts)	-	-	2	Ishidate et al., 1984; OECD, 2002
Bacterial reverse mutation assay (Ames test)	-	-	2	ECHA
In vitro mammalian chromosomal aberration test	-	-	2	ECHA
In vitro gene mutation study in bacteria (Ames) (E. coli WP2, WP67, CM871)	-	-	2	ECHA
Bacterial reverse mutation assay (Salmonella typhimurium TA 92, TA 94, TA98, TA100, TA1535, TA1537)	NA	-	2	ECHA

*+, positive; -, negative
** NA, not applicable

In Vivo Studies

There are no studies available.

H. Carcinogenicity

Male F344 rats were administered sodium bicarbonate in combination with o-phenylphenol (OPP-Na) (only one group received 0.64% sodium bicarbonate alone) in their feed for 104 weeks. The survival rate was 84% and 73% for the treated and control animals, respectively. There was no significant difference in the incidence of bladder tumours between the treated and control groups. No carcinogenic effects were found in this study when sodium bicarbonate only. A NOAEL was not established for this study (OECD, 2002; ECHA) [Kl.score= 2].

I. Reproductive Toxicity

There are no studies are available. However, based on the normal physiological role of sodium and bicarbonate no toxicity on mammalian reproduction is expected (ECHA).

J. Developmental Toxicity

Pregnant female Wistar rats were given by oral gavage 0, 3.4, 15.8, 73.3 or 340 mg/kg sodium bicarbonate on gestational days 6 to 15. There was no maternal or developmental toxicity, with the NOAEL being 340 mg/kg-day, the highest dose tested (ECHA) [Kl.score=2].

Pregnant female CD-1 mice were given by oral gavage 0, 5.8, 27, 125 or 580 mg/kg sodium bicarbonate on gestational days 6 to 15. There was no maternal or developmental toxicity, with the NOAEL being ≥580 mg/kg-day, the highest dose tested (ECHA) [Kl.score=2].

Pregnant female Dutch rabbits were given by oral gavage 0, 3.3, 15.3, 71.2 or 330 mg/kg sodium bicarbonate on gestational days 6 to 18. There was no maternal or developmental toxicity, with the NOAEL being ≥330 mg/kg-day, the highest dose tested (ECHA) [Kl.score=2].

Sodium bicarbonate will usually not reach the foetus when the exposure to sodium bicarbonate is sufficiently low, as it does not become systemically available (ECHA).

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

There are no adequate repeated dose toxicity studies conducted on sodium bicarbonate by any route of exposure. A limited carcinogenicity study showed no increase in bladder tumours in rats given sodium bicarbonate in their diet. Developmental toxicity studies conducted by the oral route in three animals species showed no developmental effects at the highest doses tested. Sodium bicarbonate dissociates to sodium and bicarbonate ions in bodily fluids, and significant amount of these ions are already ingested in foods. Furthermore, both ions are present in the body and are highly regulated by homeostatic mechanisms.

Sodium bicarbonate is used in many countries (e.g., U.S. and EU) as a food additive. It is regarded as a ‘Generally Recognised as Safe’ (GRAS) substance in food with no limitation other than current good manufacturing practice (OECD, 2002).

Thus, a toxicological reference value was not derived for sodium bicarbonate.

The Australian drinking water guideline values for sodium (180 mg/L, aesthetic) and pH of 6.5 to 8.5 may be applicable (ADWG, 2011).

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Sodium bicarbonate does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Sodium bicarbonate is of low toxicity concern to aquatic organisms.

B. Aquatic Toxicity

Acute Studies

Table 3 lists the results of acute aquatic toxicity studies on sodium bicarbonate.

Table 3: Acute aquatic toxicity studies on sodium bicarbonate

Test Species	Endpoint	Results (g/L)	Klimisch Score	Reference
Oncorhynchus mykiss	96-hour LC_{50}	7,700	2	OECD, 2002
Lepomis macrochirus	96-hour LC_{50}	7,100	1	OECD, 2002; ECHA
Daphnia magna	48-hour EC_{50}	4,100	1	OECD, 2002; ECHA
Daphnia magna	48-hour EC_{50}	>1,000	2	OECD, 2002
Ceriodaphnia dubia	48-hour EC_{50}	1,020	2	OECD, 2002

Chronic Studies

Table 4 lists the results of chronic aquatic toxicity studies conducted on sodium bicarbonate.

Table 4: Chronic aquatic toxicity studies on sodium bicarbonate

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Pimephales promelas	30-day NOEC	400	2	ECHA
Daphnia magna	21-day NOEC	>576	2	ECHA

C. Terrestrial Toxicity

The 48-hour LC_{50} and NOEC from an acute honeybee test on sodium bicarbonate was >24 and 24 µg/bee, respectively (OECD, 2002).

D. Calculation of PNEC

The acute $E(L)C_{50}$ values are available for fish (7100 mg/L) and invertebrates (1000 mg/L). NOECs from chronic studies are available for fish (400 mg/L) and invertebrates (>576 mg/L). Both sodium and bicarbonate ions are ubiquitous in the environment. UNEP (1995) reported that the 10th and 90th percentiles of bicarbonate ion present in 77 rivers were 20 and 195 mg/L, respectively; for sodium, the 10th and 90th percentiles in 75 rivers were 1.5 and 68 mg/L, respectively.

OECD (2002) concluded:

> Because the natural pH, bicarbonate and also the sodium concentration (and their fluctuations in time) varies significantly between aquatic ecosystems, it is not considered useful to derive a generic PNEC. To assess the potential environmental effect of a sodium bicarbonate discharge, the increase in sodium, bicarbonate and pH should be compared with the natural values and their fluctuations and based on this comparison it should be assessed if the anthropogenic addition is acceptable.

Based on the information above, PNEC values for water, sediment, and soil were not derived for sodium bicarbonate.

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU Reach Criteria methodology (IChEMS, 2022; ECHA, 2023).

Sodium bicarbonate is an inorganic salt that dissociates completely to sodium and bicarbonate ions in aqueous solutions. Biodegradation is not applicable to these inorganic ions; both sodium and bicarbonate ions are also ubiquitous and are present in most water, soil and sediment. For the purposes of this PBT assessment, the persistent criteria is not considered applicable to this inorganic salt.

Sodium and bicarbonate ions are essential to all living organisms and their intracellular and extracellular concentrations are actively regulated. Therefore, sodium bicarbonate is not expected to bioaccumulate, and it does not meet the screening criteria for bioaccumulation.

The NOEC for sodium bicarbonate from a chronic *Daphnia* study is >0.1 mg/L. The acute $E(L)C_{50}$ values for sodium bicarbonate are >1 mg/L in fish and invertebrates. Thus, sodium bicarbonate does not meet the screening criteria for toxicity.

The overall conclusion is that sodium bicarbonate is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

Not classified.

B. Labelling

No signal word.

C. Pictogram

None.

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Eye Contact

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Contact

Wash with soap and water. Get medical attention if irritation persists.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion

Do not induce vomiting. Slowly dilute with one to two glasses of water or milk and seek medical attention. Never give anything by mouth to an unconscious person.

B. Firefighting Information

Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Decomposition in fire may produce toxic gases. Combustion products include carbon dioxide and carbon monoxide.

Special Protective Equipment for Firefighters

Full protective clothing and approved self-contained breathing apparatus required for firefighting personnel.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

Scoop up and remove.

D. Storage and Handling

General Handling

Avoid contact with eyes, skin or clothing. Avoid creating or inhaling dust.

Storage

Store away from acids. Store in a cool, dry location. Product has a shelf life of 36 months.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia does not have an occupational exposure standard for sodium bicarbonate.

Engineering Controls

Use in a well-ventilated area. Localised ventilation should be used to control dust levels.

Personal Protection Equipment

If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection: Dust/mist respirator. (N95, P2/P3)

Hand Protection: Normal work gloves.

Skin Protection: Normal work coveralls.

Eye protection: Dust proof coveralls.

Other Precautions: Eyewash fountains and safety showers must be easily accessible.

F. Transport Information

Sodium bicarbonate is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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SODIUM DIACETATE

This dossier on sodium diacetate presents the most critical studies pertinent to the risk assessment of sodium diacetate in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Sodium hydrogen di(acetate)

CAS RN: [redacted]

Molecular formula: $C_4H_7NaO_4$

Molecular weight: 142.09 g/mol

Synonyms: Sodium diacetate; sodium hydrogen di(acetate); sodium hydrogen diacetate; acetic acid, sodium salt (2:1); sodium acid acetate; sodium acetate, acid; sodium hydrogen acetate; sodium acetate (1:2); acetic acid, dimer, sodium salt

SMILES: CC(=O)O.CC(=O)[O-].[Na+]

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the physico-chemical properties of sodium diacetate

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	White crystalline powder with the odour of acetic acid	2	ECHA
Melting Point	>150°C @ 101.3 kPa (decomposes)	2	ECHA
Boiling Point	Not applicable		ECHA
Density	1405 kg/m^3@ 20°C	1	ECHA
Vapour Pressure	7.16×10^{-7}Pa @ 25°C (calculated)	2	ECHA
Partition Coefficient (log K_{ow})	-3.72 (temperature not provided) C	2	EPA, 2019
Water Solubility	1,000 g/L (temperature not provided)	2	ECHA
Flash Point	Study not applicable for solids		ECHA
Auto flammability	Study not applicable for solids		ECHA
Viscosity	Study not applicable for solids		ECHA
Henry's Law Constant	Not available		

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Sodium diacetate is readily biodegradable, and it is not expected to bioaccumulate.

B. Biodegradation

No studies are available on sodium diacetate.

Read-across substance sodium acetate (CAS RN [redacted] is readily biodegradable. In a Dissolved Organic Carbon (DOC) Die-Away test, degradation for sodium acetate was 86% after 7 days and 99% after 28 days (ECHA) [Kl.score=1].

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

No experimental data are available for sodium diacetate. Using KOCWIN in EPISUITE™ (EPA, 2019), the estimated K_{oc} values from log K_{ow} of -3.72 is 0.0125 L/kg (acetic acid). The estimated K_{oc} value from the molecular connectivity index (MCI) is 1.0 L/kg (acetic acid).

D. Bioaccumulation

There are no bioaccumulation studies on sodium diacetate. Bioaccumulation of sodium diacetate is not expected to occur because the substance dissociates completely in aqueous media to acetate and its sodium ion. Both ions are ubiquitous in the environment. Acetate is naturally found in eukaryotic and prokaryotic cells and is involved in their biochemical pathways. Sodium diacetate is not expected to bioaccumulate based on a log K_{ow} of -3.72 (ECHA).

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

The substance is of low oral, inhalation, and dermal acute toxicity. It is not irritating to the skin but displays severe eye irritation. It is not expected to be a skin sensitiser, it is not genotoxic or carcinogenic. It has low oral repeat dose toxicity. It is not a reproductive or developmental toxicant.

B. Acute Toxicity

<u>Oral</u>

The oral LD_{50} in rats is 5,600 mg/kg (ECHA) [Kl.score=2].

<u>Inhalation</u>

No acute inhalation studies are available on sodium diacetate. However, the calculated LC_{50} for sodium diacetate was reported as 18929 mg/L based on read across of analogues with similar molecular weights (ECHA) [Kl.score=2].

Dermal

The dermal LD_{50} in rats is >2,000 mg/kg (ECHA) [Kl.score=2].

C. Irritation

Skin

Application of 0.5 g sodium diacetate to the skin of rabbits for 4 hours under unspecified conditions was non-irritating (ECHA) [Kl.score=1].

Eye

Instillation of 0.1 g sodium diacetate into the eyes of rabbits was severely irritating. Conjunctival redness was not fully reversible after 21 days (ECHA) [Kl.score=1].

D. Sensitisation

No studies are available for sodium diacetate. However, read across approaches were employed using citric acid (CAS RN [redacted] as a surrogate chemical. Based on read across approaches, sodium acetate is not considered as a skin sensitiser for human skin (ECHA) [Kl.score=2].

E. Repeated Dose Toxicity

No data are available on repeat dose toxicity studies for this substance. However, the analogue citric acid, sodium salt which shares the same functional group with sodium diacetate, also has comparable values for the relevant molecular properties for the repeated dose toxicity endpoint. Therefore, read across approaches were employed to calculate a NOAEL for sodium acetate. An oral repeated dose toxicity study was conducted using rats exposed to citric acid via their feed for one year. No additional study details were provided. The NOAEL for sodium acetate was calculated to be ≥ 50 mg/kg bw/day (ECHA) [Kl.score=2].

F. Genotoxicity

In Vitro Studies

No studies are available on sodium diacetate. The *in vitro* genotoxicity studies on sodium acetate are presented in Table 2.

Table 2: *In vitro* Genotoxicity Studies on Sodium Acetate

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Bacterial reverse mutation (*S. typhimurium* strains TA92, TA1535, TA 100, TA 1537, TA 94, TA98)	NC	-	2	ECHA
Chromosomal aberration (Chinese hamster fibroblast CHL cells)	-	NC	2	ECHA

*+, positive; -, negative; NC, not conducted.

In Vivo Studies

No studies are available on sodium diacetate or sodium acetate. However, sodium diacetate was not considered mutagenic to male mice based on read across from an *in vivo* study evaluating DNA-replication in male mice treated with sodium acetate. Sodium acetate exposure did not produce an inhibitory effect on DNA-replication in male mice. No further study details were provided. Thus, sodium diacetate is not considered to be mutagenic (ECHA) [Kl.score=2].

A bone marrow micronucleus study has been conducted on acetic anhydride (which hydrolyses to acetic acid). Male and female SD rats were exposed by inhalation to 0, 1, 5, or 20 ppm acetic anhydride, 6 hours/day, 5 days/week for 13 weeks. The incidence of micronucleated immature erythrocytes was not increased at any exposure concentration (ECHA) [Kl.score=1].

G. Carcinogenicity

No studies are available.

H. Reproductive Toxicity

No studies are available on sodium diacetate. Based on the experimental results obtained with the analogue citric acid on rats daily treated by feed for several months (NOAEL for reproductive effects = 600 mg/kg bw/day; LOAEL > 600 mg/kg bw/day for the same effects), and the molecular weights, the read-across approach was applied and the NOAEL with the substance sodium diacetate is calculated to be 665.5 mg/kg bw/day, and LOAEL higher than 665.5 mg/kg bw/day for reproductive effects. Read across from experimental results on rats and mice treated with citric acid and citric acid, sodium salt. No toxicity to reproduction was observed in any case (ECHA) [Kl.score=2].

I. Developmental Toxicity

Oral

Pregnant female Wistar rats were dosed by oral gavage with 0 or various concentrations up to 1,600 mg/kg apple cider vinegar (5% acetic acid) on gestational days 6 to 15. There were no maternal or developmental toxicity at any dose level. The NOAEL for maternal and developmental toxicity is 1,600 mg/kg-day (ECHA) [Kl.score=2].

Pregnant female CD-1 mice were dosed by oral gavage with 0, 16, 74.3, 345, or 1,600 mg/kg apple cider vinegar (5% acetic acid) on gestational days 6 to 15. There were no treatment-related effects on maternal or fetal survival, or on soft or skeletal tissues. There was no effect on the fetal development in the presence of slight maternal toxicity (reduced body weight gain) at 345 mg/kg. At 1,600 mg/kg, there was an increase in the number of litters containing a dead fetus and some reductions in ossification. The NOAELs for maternal and developmental toxicity are 74.3 and 345 mg/kg-day, respectively (ECHA) [Kl.score=2].

Pregnant female Dutch-belted rabbits were dosed by oral gavage with 0, 16, 74.3, 345, or 1,600 mg/kg apple cider vinegar (5% acetic acid) on gestational days 6 to 18. There were no treatment-related effects on maternal or fetal survival, or on soft or skeletal tissues. There was a reduction in the pregnancy rate in the high-dose group; and a dose-dependent decrease in maternal body weights at ≥74.3 mg/kg. Some deaths or abortions occurred in all treated groups and some litter losses were reported at ≥345 mg/kg. Maternal effects were much more noticeable than the effects on fetal development. These findings have been considered a consequence of the bactericidal properties of orally administered acetic acid within the gastrointestinal tract of female rabbits, and

not a direct effect on embryonic implantation and development of acetic acid (EU, 2008). It is likely that this accounts for the apparent increased sensitivity of this species to oral administration of acetic acid. The NOAEL for developmental toxicity is 1,600 mg/kg-day; a NOAEL for maternal toxicity was not identified (ECHA) [Kl.score=2].

Inhalation

No studies are available.

Dermal

No studies are available.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for sodium diacetate follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

An oral reference dose was not derived for sodium diacetate.

The Joint FAO/WHO Expert Committee on Food Additives (JECFA) has maintained a group acceptable daily intake (ADI) of “not limited” for related substance acetic acid and its potassium and sodium salts (JECFA).

The Australian drinking water guidance value for sodium (180 mg/L [aesthetics]) and pH (6.5 to 8.5) may be applicable (ADWG, 2011).

B. Cancer

No carcinogenicity studies are available. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Sodium diacetate does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Acute aquatic toxicity studies on analogs of sodium diacetate suggest a relatively low level of toxicity. Data on these studies are shown below.

B. Aquatic Toxicity

Acute Studies

There are no studies on sodium diacetate. Table 3 lists the results of acute aquatic toxicity studies read-across from sodium acetate and potassium acetate. Read-across is justified since all three substances dissociate to the acetate anion and their respective cations (Na^+ or K^+). The toxicity of these substances is expected to be driven by the acetate ion, with the cations having a minor role.

Table 3 lists the results of acute aquatic toxicity studies conducted on sodium acetate and potassium acetate.

Table 3: Acute aquatic toxicity studies on sodium acetate and potassium acetate

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Brachydanio rerio	96-hr LC_{50}	>100 173*	1	ECHA
Daphnia magna	48-hr EC_{50}	>1,000 1,730*	2	ECHA
Daphnia magna	48-hr EC_{50}	>459.5 665*	2	ECHA
Skeletonema costatum	72-hr EC_{50}	>500 724*	2	ECHA

*Values converted to sodium diacetate using the molecular weights of sodium acetate (82.03 g/mol), potassium acetate (98.15 g/mol), and sodium diacetate (142.09 g/mol).

Chronic Studies

No studies are available.

C. Terrestrial Toxicity

No studies are available.

D. Calculation of PNEC

The PNEC calculations for sodium diacetate follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels. Acute $E(L)C_{50}$ values are available for fish (173 mg/L), invertebrates (665 mg/L), and algae (724 mg/L). On the basis that the data consists of short-term studies for three trophic levels, an assessment factor of 100 has been applied to the lowest reported $E(L)C_{50}$ value of 173 mg/L for fish. The $PNEC_{water}$ is 1.7 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. This is considered a conservative estimate since the substance dissociates completely in water. The $PNEC_{sed}$ is 1.1 mg/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (0.82/1280) \times 1000 \times 1.7$
$= 1.1$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 0.04/1000 \times 2400]$
$= 0.82\ m^3/m^3$

Where:
Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 1.0 \times 0.04$
$= 0.04$ L/kg

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for sodium diacetate calculated from EPISUITE™ using the MCI is 1.0 L/kg.
F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

<u>PNEC Soil</u>

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. This is considered a conservative estimate since the substance is ionizable (ECHA). The $PNEC_{soil}$ is <u>0.02 mg/kg soil dry weight</u>.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (0.02/1500) \times 1000 \times 1.7$
$= 0.02$ mg/kg

Where:
Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]
$Kp_{soil} = K_{oc} \times f_{oc}$
$= 1.0 \times 0.02$
$= 0.02\ m^3/m^3$

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for sodium diacetate calculated from EPISUITE™ using the MCI is 1.0 L/kg.
F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Sodium diacetate is readily biodegradable; thus, it does not meet the screening criteria for persistence.

Bioaccumulation of sodium diacetate is not expected to occur because the substance dissociates completely in aqueous media to acetate and its sodium ion. Both ions are ubiquitous in the environment. Acetate is naturally found in eukaryotic and prokaryotic cells and is involved in their biochemical pathways. Based on a measured log K_{ow} of -3.72, sodium diacetate does not meet the screening criteria for bioaccumulation.

There are no chronic aquatic chronic toxicity data for sodium diacetate (or its surrogates). The acute $E(L)C_{50}$ values for sodium acetate and potassium acetate (read-across to sodium diacetate) are >1 mg/L. Thus, sodium diacetate does not meet the screening criteria for toxicity.

The overall conclusion is that sodium diacetate is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

H318 Eye damage Category 1

B. Labelling

Danger

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

<u>Eye Contact</u>

In the case of contact, immediately flush eyes with plenty of water for at least 15 minutes. If symptoms persist, seek medical advice.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air.

Ingestion

Rinse mouth with water and then drink plenty of water. Do not induce vomiting. Never give anything by mouth to an unconscious person. Seek medical attention.

B. Firefighting Information

Extinguishing Media

Water spray or fog, carbon dioxide, dry powder.

Specific Exposure Hazards

Burning may produce harmful and toxic fumes.

Special Protective Equipment for Firefighters

Wear a self-contained breathing apparatus if exposed to vapours, fumes or combustion products.

C. Accidental Release Measures

Personal Precautions

No special precautions are necessary. Ensure adequate ventilation.

Environmental Precautions

Do not discharge into drains, sewers, or waterways.

Steps to be Taken if Material is Released or Spilled

For large amounts: dike spillage and pump off the product. For residues: pick up with suitable absorbent material. Dispose of contaminated material as prescribed.

D. Storage and Handling

General Handling

Handle in accordance with good industrial hygiene and safety practice.

Other Handling Precautions

Protect against fire and explosion: prevent electrostatic charge; sources of ignition should be kept well clear, and fire extinguishers should be kept handy

Storage

Keep container tightly closed and dry. Protect against heat. The most favourable course of action is to use an alternative chemical product with less inherent propensity for occupational exposure or environmental contamination. Recycle any unused portion of the material for its approved use or return it to the manufacturer or supplier. Ultimate disposal of the chemical must consider: the material's impact on air quality; potential migration in soil or water; effects on animal, aquatic, and plant life; and conformance with environmental and public health regulations.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for sodium diacetate.

Engineering Controls

Provide local exhaust ventilation to control vapours and mists.

Personal Protection Equipment

Respiratory Protection: Respiratory protection in case of vapours/aerosol release. Wear a certified organic vapour/particulate respirator.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Safety glasses with side-shields.

Other Precautions: Wash hands, forearms, and face thoroughly after handling chemical products, before eating, smoking, and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

Sodium diacetate is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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SODIUM HYDROXIDE

This dossier on sodium hydroxide presents the most critical studies pertinent to the risk assessment of sodium hydroxide in its use in coal seam and shale gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The information presented in this dossier was obtained from the OECD-SIDS documents on sodium hydroxide (OECD, 2002a,b) and the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Sodium hydroxide

CAS RN: [redacted]

Molecular formula: HNaO

Molecular weight: 40 g/mol

Synonyms: Caustic soda, soda lye, NaOH

SMILES: O[Na]

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the Physico-Chemical Properties of Sodium Hydroxide

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Solid	2	Lide, 2009; ECHA
Melting Point	318°C (solid, 100%); 52°C (60% solution)	2	ECHA
Boiling Point	1,388°C @ 101.3 kPa	2	Lide, 2009; ECHA
Density	2130 kg/m^3, 20°C (100%) 1430 kg/m^3, 20°C (40%)	2	Lide, 2009; ECHA
Vapour Pressure	1 Pa @ 513°C	2	Lide, 2009; ECHA
Partition Coefficient (log K_{ow})	Not applicable	-	-
Water Solubility	Very soluble (>10 g/L @ 25°C)	2	Lide, 2009; ECHA
Dissociation Constant (pKa)	14.8 @ 25°C	2	Lide, 2009; ECHA
pH of 5% NaOH solution	14	2	O'Neil, 2006

Sodium hydroxide (NaOH) is a strong alkaline substance that dissociates completely in water to sodium (Na^+) and hydroxyl (OH^-) ions.

III. ENVIRONMENTAL FATE PROPERTIES

Due to its high-water solubility and low vapour pressure, sodium hydroxide will be found predominantly in the aquatic environment where it dissociates completely to sodium (Na^+) and hydroxyl (OH^-) ions. Both ions are ubiquitous in the environment (UNEP, 1995).

The addition of sodium hydroxide to an aquatic ecosystem may increase the pH depending on the buffer capacity of the receiving water. In general, the buffer capacity is regulated by the equilibria between CO_2, HCO_3^- and CO_3^{2-}:

$CO_2 + H_2O \leftrightarrow HCO_3^- + H^+$ ($pKa_1 = 6.35$)

$HCO_3^- \leftrightarrow CO_3^{2-} + H^+$ ($pKa_2 = 10.33$)

A release of sodium hydroxide into the aquatic environment from the use of NaOH could potentially increase the sodium concentration and the pH in the aquatic environment. Table 2 shows the concentration of sodium hydroxide needed to increase the pH to values of 9.0, 10.0, 11.0, and 12.0.

Table 2: Sodium Hydroxide Concentration (mg/L) Needed to Increase pH

Buffer Capacity*	Final pH			
	9.0	10.0	11.0	12.0
0 mg/L HCO_3 (distilled water)	0.4	4.0	40	400
20 mg/L HCO_3 (10th percentile of 77 rivers)	1.0	8.2	51	413
106 mg/L HCO_3^- (mean value of 77 rivers)	3.5	26	97	468
195 mg/L HCO_3^- (90th percentile of 77 rivers)	6.1	45	145	525

*The initial pH of a bicarbonate solution with a concentration of 20-195 mg/L was 8.25 to 8.35.
Source: DeGroot et al., 2002; taken from OECD, 2002b

Na^+ and OH^- ions will not adsorb on the particulate matter or surfaces and will not accumulate in living tissues (OECD, 2002b).

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Limited toxicity data exist for sodium hydroxide (NaOH). Depending on the concentration, solutions of NaOH are corrosive, irritating, or non-irritating. These solutions cause direct effects to the skin, eyes, respiratory tract, and gastrointestinal tract. Vapours from aqueous solutions of KOH can cause respiratory irritation. NaOH is not a skin sensitiser. There are no repeated dose, reproductive and developmental toxicity studies on sodium hydroxide.

B. Toxicokinetics/Metabolism

Sodium hydroxide dissociates completely in aqueous solutions to sodium (Na^+) and hydroxyl (OH^-) ions. Sodium is an essential nutrient involved in fluid and electrolyte balance and is required for normal cellular function (Ganong, 1995). Sodium is the major extracellular cation in the body; the total body content is tightly regulated (Ganong, 1995).

C. Acute Toxicity

There are no oral toxicity guideline studies on sodium hydroxide. An oral LD_{50} of a 1 to 10% solution of NaOH in rabbits was reported to be 325 mg/kg (expressed as 100% NaOH) (OECD, 2002a,b). Mortality was also observed when a 1% NaOH solution was dosed, but in this case, the applied volume was relatively high (24 mL per kg body weight) (OECD, 2002a,b).

Acute toxicity studies were not identified for the inhalation and dermal route.

D. Irritation

Animal studies have shown that an 8% NaOH solution is corrosive to the skin. In humans, 0.5 to 4% NaOH concentrations produced skin irritation; and, based on the results of two different human patch tests, a NaOH solution that is slightly less than 0.5% would be non-irritating to human skin (OECD, 2002a,b).

Results from animal eye irritation studies indicate that a 0.2-1.0% NaOH solution would be non-irritating, while 1.2 or > 2% NaOH solutions would be corrosive (OECD, 2002a,b).

E. Sensitisation

Male volunteers were exposed on the skin of their back to solutions of 0.063 to 1.0% NaOH in the induction phase of a human patch test. After 7 days the volunteers were challenged to a concentration of 0.125% NaOH. The irritant response correlated well with the concentration of NaOH, but an increased response was not observed when the previously patch tested sites were re-challenged. Based on this study, sodium hydroxide is not a skin sensitiser (OECD, 2002a,b; ECHA) [Kl. score = 2].

F. Repeated Dose Toxicity

No studies were identified for the oral and dermal route. An inhalation study was conducted in rats exposed to aerosols of solutions of NaOH ranging from 5% to 40%. Exposures were twice weekly (hours/day and total exposure days unspecified). All animals in the 40% solution group died within a month mostly from bronchopneumonia. At the lower concentrations, respiratory tract lesions were observed; an NOAEL was not identified (NIOSH, 1975).

G. Genotoxicity

In Vitro Studies

Several *in vitro* studies have been conducted on NaOH (OECD, 2002a,b; ECHA). Although these studies reported negative results, they are considered unreliable (Kl. score = 3) due to methodological or reporting deficiencies.

In Vivo Studies

Several *in vivo* studies have been conducted on NaOH (OECD, 2002a,b; ECHA). Although these studies reported negative results, they are considered unreliable (Kl. score = 3) due to methodological or reporting deficiencies.

H. Carcinogenicity

No studies were identified.

I. Reproductive Toxicity

No valid studies were identified regarding toxicity to reproduction in animals after oral, dermal or inhalation exposure to NaOH.

J. Developmental Toxicity

No valid studies were identified regarding developmental toxicity in animals after oral, dermal or inhalation exposure to NaOH (OECD, 2002a,b; ECHA).

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

Oral and dermal repeated dose, reproductive, and developmental toxicity studies have not been conducted on NaOH. A repeated dose toxicity study was conducted by the inhalation route, but the methodology and documentation preclude its use for deriving a toxicological reference value. These toxicity studies would have questionable usefulness because of the corrosive/irritating nature of NaOH, which would limit the amount absorbed. NaOH dissociates to sodium and hydroxyl ions in bodily fluids, and a significant amount of these ions are already ingested in foods. Furthermore, both ions are present in the body and are highly regulated by homeostatic mechanisms. Thus, a toxicological reference value was not derived for NaOH.

The Australian drinking water guideline values for sodium (180 mg/L, aesthetic) and pH may be applicable (ADWG, 2021).

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Sodium hydroxide does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Sodium hydroxide has low acute toxicity to aquatic organisms.

B. Aquatic Toxicity

The OECD-SIDS SIAR on NaOH states that while the toxicity of the NaOH has been assumed to be related to the hydroxyl anion, in general a pH change could influence the speciation of other chemicals and therefore increase and/or decrease toxicity of the substance.

There are no guideline studies on NaOH; the studies summarised below have Klimisch scores of 3 or 4.

Acute Fish

The 24-hour LC_{50} to *Carassius auratus* (goldfish) is 160 mg/L. At 100 mg/L, which was equivalent to a pH of 9.8, no mortality was observed. The 48-hour LC_{50} to *Leuciscus idus melanotus* is 189 mg/L. The 96-hour LC_{50} of *Gambusia affinis* (mosquitofish) is 125 mg/L. At 84 mg/L, no effects on the fish were observed. The pH was 9 at 100 mg/L.

Acute Invertebrate

The 48-hour LC_{50} is 40 mg/L for *Ceriodaphnia cf. dubia*. The toxicity threshold concentration of NaOH for *Daphnia magna* was reported to range from 40 to 240 mg/L.

Acute Algae

No studies were identified.

C. Terrestrial Toxicity

No studies were identified.

D. Calculation of PNEC

The OECD-SIDS SIAR on NaOH states the following regarding the aquatic toxicity studies on NaOH (OECD, 2002b):

> *"In many cases pH, buffer capacity and/or medium composition were not discussed in the publications, although this is essential information for toxicity tests with NaOH. This is the most important reason why most of the studies, mentioned above were considered invalid. Although valid acute ecotoxicity tests and chronic ecotoxicity tests with NaOH are not available, there is no need for additional testing with NaOH. A significant number of acute toxicity tests are available, and the results of the tests are more or less consistent. Altogether they give a sufficient indication of acute toxicity levels of sodium hydroxide."*
>
> *"Furthermore, acute toxicity data cannot be used to derive a PNEC or a PNEC added for sodium hydroxide. Aquatic ecosystems are characterised by an alkalinity/pH, and the organisms of the ecosystem are adapted to these specific natural conditions. Based on the natural alkalinity of waters, organisms will have different optimum pH conditions, ranging from poorly buffered waters with a pH of 6 or less to very hard waters with pH values up to 9. A lot of information is available about the relationship between pH and ecosystem structure and also natural variations in pH of aquatic ecosystems have been quantified and reported extensively in ecological publications and handbooks."*
>
> *"Normally a PNEC or a PNEC added has to be derived from the available ecotoxicity data. A PNEC added is a PNEC which is based on added concentrations of a chemical (added risk approach). Based on the available data it is not considered useful to derive a PNEC or a PNEC added for NaOH because:*
>
> - *The natural pH of aquatic ecosystems can vary significantly between aquatic ecosystems,*

- *Also, the sensitivity of the aquatic ecosystems to a change of the pH can vary significantly between aquatic ecosystems and*
- *The change in pH due to an anthropogenic NaOH addition is influenced significantly by the buffer capacity of the receiving water."*

"Although a PNEC or a PNEC added was not calculated for NaOH, there is a need to assess the environmental effect of a NaOH (alkaline) discharge. Based on the pH and buffer capacity of effluent and receiving water and the dilution factor of the effluent, the pH of the receiving water after the discharge can be calculated. Of course, the pH change can also be measured very easily via a laboratory experiment or by conducting field measurements. The change in pH should be compared with the natural variation in pH of the receiving water and based on this comparison it should be assessed if the pH change is acceptable."

Based on the information above, PNEC values for freshwater, sediment, and soil were not derived for sodium hydroxide.

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (DEWHA, 2009; ECHA, 2017).

Sodium hydroxide is an inorganic salt that dissociates completely to sodium and hydroxide ions in aqueous solutions. Biodegradation is not applicable to these inorganic ions; both sodium and hydroxide ions are also ubiquitous and are present in most water, soil and sediment. For the purposes of this PBT assessment, the persistent criteria are not considered applicable to this inorganic salt.

Sodium and hydroxide ions are essential to all living organisms, and their intracellular and extracellular concentrations are actively regulated. Thus, sodium hydroxide is not expected to bioaccumulate and does not meet the screening criteria for bioaccumulation.

No chronic toxicity data exist on sodium hydroxide; however, the acute EC_{50} values are > 1 mg/L in fish, invertebrates, and algae. Thus, sodium hydroxide does not meet the screening criteria for toxicity.

The overall conclusion is that sodium hydroxide is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

Metal Corrosive Category 1

Skin Corrosive, Category 1A

Eye Damage, Category 1

EU Concentration Limits:
- ≥ 5%: Skin Corrosive 1A
- ≥ 2 to <5%: Skin Corrosive 1B

≥ 0.5%to <2%: Skin Irritant Category 2
≥ 0.5% to <2%: Eye Irritant Category 2

In addition to the hazard statements corresponding the GHS classification for corrosive, the following non-GHS hazard statement is to be added to the SDS: AUH071: Corrosive to the Respiratory Tract.

B. Labelling

Danger

C. Pictograms

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Eye Contact

Flush with plenty of fresh water for 15 minutes holding eyelids open, lifting eyelids occasionally to ensure complete removal of the product. Remove contacts, if present and easy to do. DO NOT allow rubbing of eyes or keeping eyes closed. Seek medical attention.

Skin Contact

Rinse with soap and plenty of water for several minutes. Remove contaminated clothing. Seek medical attention immediately.

Inhalation

Remove person to fresh air. Apply artificial respiration if not breathing. Seek medical attention.

Ingestion

Rinse mouth with water (only if the person is conscious), but do not administer fluids. Do NOT induce vomiting. Seek medical attention immediately.

B. Fire Fighting Information

Extinguishing Media

Carbon dioxide, water spray, foam, dry chemical.

Specific Exposure Hazards

Containers may explode when heated. May form explosive mixtures with strong acids. Hazardous combustion products may include the following materials: halogenated compounds, metal oxides/oxides, sodium monoxide.

Special Protective Equipment for Firefighters

Full protective clothing and approved self-contained breathing apparatus required for firefighting personnel.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment and avoid direct contact. Do not touch damaged containers or spilt material unless wearing appropriate protective clothing. Ventilate the area before entry.

Environmental Precautions

Prevent spills from entering storm drains or sewers and contact with soil.

Steps to be Taken if Material is Released or Spilt

Use an absorbent material to recover as much product as possible, then rinse the affected area with water to dilute the residue. Disposal of leftover product and used containers should be carried out in accordance with all local, state, and federal regulations.

D. Storage and Handling

General Handling

Wear appropriate personal protective equipment. Avoid contact with eyes, skin, or clothing. Avoid breathing mist, vapours, or spray. Use only with adequate ventilation. Wash hands after use. Launder contaminated clothing.

Storage

Store away from acids. Keep container closed when not in use. Store in a cool well-ventilated area.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

The workplace exposure standard for sodium hydroxide in Australia is 2 mg/m^3 as a peak limitation, with a sensitisation notation. A peak limitation is defined by Safe Work Australia as a maximum or peak airborne concentration of a substance determined over the shortest analytically practicable period of time which does not exceed 15 minutes.

Engineering Controls

Good general ventilation should be used. If applicable, use process enclosures, local exhaust ventilation or other engineering controls to maintain airborne levels below recommended exposure limits.

Personal Protection Equipment

Respiratory Protection: Use a mask or approved air-purifying respirator with appropriate cartridge or canister in spray applications or in confined spaces.

Hand Protection: Wear impervious gloves to prevent skin contact and absorption of this material. Rubber or Neoprene gloves may afford adequate skin protection.

Skin Protection: Wear appropriate clothes (i.e., coveralls). Use non-slip footwear.

Eye Protection: Wear eye protection in situations where splash or thick mists are possible.

Other Precautions: Avoid contact with skin, eyes and clothing. When using, do not eat or drink. Wash hands thoroughly with soap and water before eating or drinking. Remove contaminated clothing and launder before reuse.

F. Transport Information

For sodium hydroxide solutions of > 5%:
Australian Dangerous Goods
UN1824, Corrosive liquid, (Sodium hydroxide solution)
Class 8
Packing Group: II

Lower concentrations of sodium hydroxide may require a different packing group or may not require any hazard code if the concentration of NaOH is low enough not to be considered a corrosive material.

XI. DISPOSAL MANAGEMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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SODIUM IODIDE

This dossier on sodium iodide presents the most critical studies pertinent to the risk assessment of sodium iodide in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Sodium iodide

CAS RN: [redacted]

Molecular formula: NaI

Molecular weight: 149.89 g/mol

Synonyms: Ioduril, Sodium iodide (NaI), sodiumiodide, Sodium monoiodide, Soiodin, Iodure de sodium, Natriumjodid, Natriumiodid

SMILES: [Na+].[I-]

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the physico-chemical properties of sodium iodide

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	White colourless odorless crystalline inorganic solid	1	ECHA
Melting Point	651°C @ 97.5 kPa	1	ECHA
Boiling Point	1,304°C @ 96.57 kPa	2	ECHA
Density	3,700 kg/m^3@ 25°C	1	ECHA
Vapour Pressure	133.32 Pa @ 767°C	2	ECHA
Partition Coefficient (log K_{ow})	-1.301 @ 25°C	1	ECHA
Water Solubility	837 g/L @ 25°C	1	ECHA
Flash Point	Not applicable because the substance is a solid	-	ECHA
Auto flammability	There is no evidence of this substance self-heating. This substance is not considered auto flammable in nature	-	ECHA
Viscosity	Not applicable because this substance is a solid	-	ECHA
Henry's Law Constant	Not available	-	ECHA

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Sodium iodide dissociates in aqueous media to sodium (Na^+) and iodide (I^-) ions. Biodegradation is not applicable to inorganic compounds. There are no bioaccumulation studies on sodium iodide. The low Log K_{ow} (-1.301) suggests sodium iodide will not bioaccumulate to a substantial degree (ECHA) [Kl.score=1]. Further, both ions are essential to living. Sodium (Na^+) ions are essential to all living organisms, and its intracellular and extracellular concentrations are actively regulated (Ganong, 1995). Iodine is essential for thyroid hormone synthesis in vertebrate species. Ingested iodine is converted to iodide (I^-) and absorbed. The minimum daily iodine intake that will maintain normal thyroid function is 150 mg in adult humans (Ganong, 1995).

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Sodium iodide is not considered acutely toxic by any route of exposure, but any potential toxicity would be limited to the oral route as the size of iodide crystals precludes inhalation or dermal exposure. Likewise, it is not considered irritating to skin or eyes and has a history of therapeutic use that has not found evidence of sensitivity except in certain hypersensitive individuals. Iodide is not a sensitizing agent. Although evidence exists for toxicity via repeated doses that can disrupt thyroid hormones, iodine is an essential nutrient and lack of intake is associated with sub-clinical hypothyroidism. Iodide is not genotoxic, mutagenic or carcinogenic. Iodide is not toxic to reproductive endpoints or embryonically toxic, but developmental toxicity was showed under concentration of 0.1% in diet. However, this value is much higher than the temporary most tolerated dose of 1.0 mg iodine/day, set by the FAO/WHO Joint Expert Meeting on Food Additives.

The following sections detail the available and relevant literature on the toxicity of iodide. The information described below was obtained from NICNAS IMAP if available and the ECHA database. Please refer to those information sources for the studies referenced therein.

B. Acute Toxicity

Sodium iodide is not considered acutely toxic by any route of exposure. The potential acute toxicity of sodium iodide is limited to the ingestion pathway as the crystal size precludes both dermal and inhalation exposure. The most relevant study on vertebrates by oral route is a company study (Hausner et al., 1980) [Kl.score=2]. In the test, the effects of iodide were studied in male and female Wistar rats. Ten male and ten female in each dose and control groups were administrated with potassium iodide for 14 days at dose of 0 (control), 2000, 2500, 2800 3200, 3600 and 4000 mg/kg body weight mg/kg bw respectively. This study calculated a 24 hour and 7–14 days of LD50 to rats (male/female) of 3118 and 2779 mg/kg bw, respectively under test conditions.

C. Irritation

Based on existing information, iodide does not meet the skin or eyes irritation/corrosion criteria under the Regulation (EC) No. 1272/2008 nor Directive 67/548/EEC. Iodide has no effect to the human skin. Iodine has been used for dermal application in human as disinfectant (as Iodine and Povidine Iodine) for long time. The mechanism of disinfecting is oxidizing bactericide by iodine; meanwhile the iodine is reduced to iodide. It can be assumed that following application of iodine on

skin, there is iodide exposure to the epidermis. Further, in a human assay, potassium iodide in concentrations ranging from 5% to 20% in petrolatum was applied to skin with negative reactions.

There are no recent acceptable studies evaluating iodide effects on eye irritation, but iodide has been evaluated, and the results are negative for irritation. Although there is some exceptional case showing the iodide can have different degrees of impact on eyes, most reports gave negative results. Testing of potassium iodide on rabbit eyes by injection of 3% solution into the cornea has caused only slight reaction. In a report of large-scale intravenous injections given to patients with eye diseases, some individuals hypersensitive to iodide displayed watery rhinitis, lacrimation, edema of the eyelids and conjunctival hyperemia. Rarely, superimposed infection may cause more serious disturbances, and in one instance hypopyon was observed in the anterior chambers. Serious involvement of the eyes in iodism is uncommon, but in two patients severe keratoconjunctivitis was reported and in one of these there were hemorrhagic iritis and vitreous opacities. The eyes recovered when iodides were discontinued. The ordinary signs and symptoms of iodism clear up promptly when iodides are stopped.

D. Sensitisation

Based on the properties of sodium iodide, it does not meet classification criteria of skin and respiration sensitisation under Regulation (EC) No. 1272/2008 or Directive 67/548/EEC. The lack of sensitization to sodium iodide is thought to be driven by the large crystal size preventing inhalation and epidermal penetration.

E. Repeated Dose Toxicity

<u>Oral</u>

The most likely route for human exposure is via ingestion, so the dermal and inhalation route are irrelevant in the repeated toxicity assessment.

Boyages et al. (1989) compared thyroid status in groups of children 7–15 years of age who resided in two areas of China where drinking-water iodide concentrations were either 462.5 µg/l (n = 120) or 54 µg/l (n =51). Urinary iodine concentrations were 1236 µg/g creatinine in the high-iodine group and 428 µg/g creatinine in the low-iodine group. Although the subjects were all euthyroid, with normal values for serum thyroid hormones and TSH concentrations, TSH concentrations were significantly higher ($P < 0.05$) in the high-iodine group. The high-iodine group had a 65% prevalence of goiter and a 15% prevalence of Grade 2 goiter compared with 15% for goiter and 0% for Grade 2 goiter in the low-iodine group. To transform the measured urinary iodine levels into estimates of iodine intakes, steady state baseline dietary intakes of iodide were assumed to be equivalent to the reported 24-h urinary iodine excretion rates. Assuming a body weight of 40 kg and lean body mass of 85% of body weight, the urinary iodine/creatinine ratios reported by Boyages et al. (1989) can be converted to approximate equivalent intake rates of 1150 µg/day (0.029 mg/kg body weight per day) and 400 µg/day (0.01 mg/kg body weight per day) for the high- and low-iodine groups, respectively. Thus, the NOAEL for this study is 0.01 mg/kg body weight per day.

Supporting studies indicate that the NOAEL from the Boyages et al. (1989) study would be applicable for both acute and chronic-duration exposure of elderly adults, who may represent another sensitive subpopulation (Chow et al., 1991; Szabolcs et al., 1997). In the Chow et al. (1991) study, 30 healthy 60 to 75-year-old females received daily doses of 500 µg iodine per day for 14 or 28 days. Serum concentrations of free T4 were significantly decreased, and serum TSH concentrations were significantly elevated. On average, the magnitude of the changes did not produce clinically significant depression in thyroid hormone levels; however, five subjects had serum TSH

concentrations that exceeded 5 mU/l. The pre-existing dietary iodine intake was approximately 72–100 µg/day, based on urinary iodide measurements. Therefore, the total iodide intake was approximately 600 µg/day (0.0087 mg/kg body weight per day, based on a mean weight of 69 kg for women 19–64 years of age in the British National Diet and Nutrition Survey; British Nutrition Foundation, 2004). Szabolcs et al. (1997) studied elderly nursing home residents who had received long-term exposure to iodine in one of three regions where the intakes were estimated to be approximately 117, 163 or 834 µg/day (0.0017, 0.0023 or 0.012 mg/kg body weight per day for low, moderate or high intake, respectively). The prevalence of clinical hypothyroidism was 0.8%, 1.5% and 7.6% in the low-, moderate- and high-iodine groups, respectively. Serum TSH concentrations were elevated as free T4 levels were reduced (P = 0.006).

In a study by Paul et al. (1988), healthy euthyroid adults (nine males, nine females) who had no history of thyroid disease or detectable antithyroid antibodies received daily oral doses of 250, 500 or 1500 µg iodine (as sodium iodide) per day for 14 days. Based on 24-h urinary excretion of iodide prior to the iodide supplement, the background iodine intake was estimated to be approximately 200 µg/day; thus, the total iodide intake was approximately 450, 700 or 1700 µg/day (approximately 0.0064, 0.01 or 0.024 mg/kg body weight per day, assuming a 70-kg body weight). Subjects who received 1700 µg/day (0.024 mg/kg body weight per day) had significantly depressed (5–10%) serum concentrations of total T4, free T4 and total T3 compared with pretreatment levels, and serum TSH concentrations were significantly elevated (47%) compared with pretreatment values. Hormone levels were within the normal range during treatment. In this same study, nine females received daily doses of 250 or 500 µg iodine per day for 14 days (total intake was approximately 450 or 700 µg/day; 0.0064 or 0.010 mg/kg body weight per day), and there were no significant changes in serum hormone concentrations.

In a comparable quality study by Gardner et al. (1988), 10 healthy adult euthyroid males received daily oral doses of 500, 1500 or 4500 µg iodine (as sodium iodide) per day for 14 days. Based on 24-h urinary excretion of iodide of 256–319 µg/day prior to the iodide supplement, the total estimated intakes were 800, 1800 or 4800 µg/day, or approximately 0.011, 0.026 or 0.069 mg/kg body weight per day. In this study, there were no effects on serum thyroid hormone or thyroid stimulating hormone (TSH) concentrations at the 800 µg/day intake (0.011 mg/kg body weight per day); however, intakes of 1800 or 4800 µg iodine per day (0.026 or 0.069 mg/kg body weight per day) produced small (10%), but significant, transient decreases in serum thyroid hormone concentrations and an increase (48%) in serum TSH concentration, relative to the pretreatment values.

From the Boyages et al. (1989) study, supported by the studies of Gardner et al. (1988), Paul et al. (1988) and others, a TDI of 0.01 mg/kg body weight, based upon reversible subclinical hypothyroidism, can be established by dividing the NOAEL of 0.01 mg/kg body weight per day by an uncertainty factor of 1.

However, iodine is also an essential trace element for synthesis of thyroid hormones. In healthy adults, sub-clinical hypothyroidism is associated with intakes of 1.7 to 1.8 mg/day, and for children with intakes of 1.15 mg/day (EFSA 2006, FSANZ 2008). Chronic iodine intakes of approximately 1 mg/day, however, appear to be well tolerated by healthy adults. This is consistent with the provisional maximum tolerated daily intake of 1 mg/day established by the Joint FAO/WHO Expert Committee on Food Additives (JECFA 1989), and the nutrient reference value and tolerable upper intake level of 1.1 mg/day respectively recommended by the NHMRC (2006) and Food Standards Australia New Zealand (FSANZ 2008) for iodine intake by adults in Australia and New Zealand. This value has been used as the basis for calculating the drinking water guideline described in Section V.

Inhalation

There are no studies available.

Dermal

There are no studies available.

F. Genotoxicity

In Vitro Studies

The mutagenic potential for iodide (in potassium iodide) was studied using the L5178Y mouse (TK+/-) lymphoma assay (Kessler et al., 1980). The established mutagens ethylmethanesulphonate (EMS) and dimethylnitrosamine (DMN) were highly active in this assay, whereas iodide was inactive. Using the BALB/c 3T3 transformation assay well assessed the transformational capacities of these same agents and the positive mutagen N-ethyl-N-nitro-N-nitrosoguanidine. All concentrations of the iodide tested were inactive in this assay.

Another study (Poul & Sanders, 2004) on genotoxic effects of potassium iodide was conducted *in vitro* using the alkaline comet assay at concentration of 0.625, 1.25, 2.5, 5 and 10 mM. Additionally, in the test cell viability was also measured using the Trypan blue exclusion method and expressed as proportion of total cells. The test results showed that potassium iodide did not induce DNA damage or cytotoxicity in the alkaline comet assay for doses up to 10 mM.

In the same study, the chromosome damage effects of potassium iodide were evaluated *in vitro* using cytokinesis-block micronucleus test at concentration of 0.625, 1.25, 2.5, 5 and 10 mM. Additionally, in the test cytotoxicity was also measured by the binucleated (BN) cell ratio between treated and control slides. The test results showed that potassium iodide did not induce chromosome damage or cytotoxicity in the alkaline comet assay for doses up to 10 mM.

In Vivo Studies

In an *in vivo* chromosome aberration test on embryonic hepatocytes, Stable iodine of 10 mg/kg is administered to the rats 7 days after fertilization. Then the embryonic liver was homogenized and the cells in metaphase were stained and checked under metaphase. The chromosome aberration cells were counted respectively for the concentration group and control group. The chromosome aberration rate in the concentration group was compared with that in the control group. The result showed there was no significant difference between iodide dosed group with the control group.

Based on the available studies summarized above, iodide has neither genetic toxicity nor cytotoxicity to mammalian cells.

G. Carcinogenicity

Oral

There are no studies available.

Inhalation

There are no studies available.

Dermal

There are no studies available.

H. Reproductive Toxicity and Developmental Toxicity

Iodide is not considered to meet the reproductive/developmental criteria under the Regulation (EC) No. 1272/2008 nor Directive 67/548/EEC. Several studies have evaluated reproductive and developmental effects.

A study [Kl.score=2] was conducted with rats to determine the effects of intake of the test chemical. Females were bred to normal males, wherein the test chemical was added to the diet during the latter portion of gestation and the females were permitted to litter normally. The effect of the treatment on gestation period, lactation and survival of the young was observed. Gestation time for rats was not affected but prolonged parturition was observed. In fetal parameters, average mortality was slightly greater for young fed with the test chemical while the weaning weight was significantly less than that of controls. Female rats re-bred after removal of dietary intake of the test chemical gave birth and nursed litters normally. The study resulted in a LOAEL of 150 mg/kg bw.

The effect of the test chemical on the reproductive performance of female minks was investigated [Kl.score=2]. Female mink were administered with 0, 10, 100 or 1000 ppm of the test chemical, in diet for 18 days, from breeding through lactation. Gestation periods of the test chemical-treated mink were shorter than the controls. Kit birth weights were not significantly different from the controls. The average number of kits whelped per female mated in the control group was 5.0. Only 2.1 kits per female mated were whelped by the mink fed 100 ppm supplemental test chemical, and none of the females that received the 1000 ppm supplemental test chemical diet whelped. Body weights of kits whelped and nursed by the females that received the 100 ppm supplemental test chemical diet were significantly lighter at 4 weeks of age. No detrimental effects were observed on litter size or kit survival in the group fed 10 ppm supplemental test chemical, and hence the NOAEL for reproductive toxicity in female minks is determined to be 10 ppm of the test chemical in the diet.

Iodide was administered in diet to male and female Sprague-Dawley rats before and during breeding, to females only during gestation and lactation, at levels of 0, about 23, 45 and 90 mg/kg bw (0, 0.025, 0.05 or 0.1% [w/w]). Dams in a positive control group were given 4 mg/kg i.p. of the anti-mitotic/cytotoxic drug 5-azacytidine on day 17 of gestation. The LOAEL value for the test chemical in rats is found to be about 90 mg/kg/day (0.1%). At this dose level, the test chemical did not produce any significant reduction in parental body weight or food consumption, though it significantly reduced litter size and increased offspring mortality. The LOAEL value for the test chemical is found to be about 45 mg/kg/day (0.05%) for the F_1 generation based on the effect of decreased pre-weaning body weights in the offspring, delay in auditory startle and delayed olfactory orientation from the home-cage scent. Overall, the data in this experiment [Kl.score=2] support the view that the test chemical at doses of up to 0.1% in the diet of growing rats produces evidence of developmental toxicity.

In a one-generation (experiment I) and fertility (experiment II) reproductive study [Kl.score=2], pregnant female Wistar rats were given fluid orally on a regular basis at dose levels of 0.1% (w/v) or 1% (w/v) of the test chemical. Treatment with 1% (w/v) solution led to reduced body weight and fluid intake, enlarged adrenal glands and the level of implantation was reduced. No change in food or fluid intake was seen for rats treated with 0.1% (w/v) solution. In addition, the 0.1% (w/v) of the test chemical solution-treated rats showed a high rate of implantation. Since 0.1% (w/v) of the test chemical is regarded as a high value intake, and it is concluded that the test chemical has no effect

on reproductive toxicity when orally administered. Neither has it provided any further information about the possible functional significance of the test chemical endometrial concentration in female rats during early pregnancy.

In conclusion, iodide is not toxic to reproductive endpoints or embryonically toxic, but developmental toxicity was showed under concentration of 0.1% in diet. However, this value is much higher than the temporary most tolerated dose of 1.0 mg iodine/day, set by the FAO/WHO Joint Expert Meeting on Food Additives

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

An oral RfD for sodium iodide was not derived because there is an existing Australian drinking water guidance value of 0.5 mg/L for iodide (health) and 180 mg/L for sodium (aesthetics). The substance is not carcinogenic, so a cancer reference value was not developed.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Sodium iodide does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Sodium iodide is of low toxicity concern to aquatic organisms.

B. Aquatic Toxicity

The acute aquatic toxicity studies conducted on the substance suggest a wide range of toxicity that is species dependent. The results of the studies are shown below.

Acute Studies

Table 2 lists the results of acute aquatic toxicity studies conducted on sodium iodide.

Table 2: Acute aquatic toxicity studies on sodium iodide

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Danio rerio	96-hr LC_{50}	>100	2	ECHA
Oncorhynchus mykiss	96-hr LC_{50}	3780	2	ECHA
Daphnia magna	48-hr EC_{50}	0.17	2	ECHA
Pseudokirchneriella subcapitata	72-hr EC_{50}	>37.26 (growth)	1	ECHA

Chronic Studies

The 35-day NOEC in Danio rerio based on hatchability and larvae survival was found to be > 10 mg/L (ECHA) [Kl.score=1].

The 21-day NOEC in a Daphnia reproduction test is 0.153 mg/L (ECHA) [Kl.score=1].

On the basis of growth rate, the 72-hour NOEC to green algae *Pseudokirchneriella subcapitata* was also > 37.26 mg/L (ECHA) [Kl.score=1].

C. Terrestrial Toxicity

No studies are available and do not need to be conducted because direct and indirect exposure of the soil compartment is unlikely and the chemical is readily biodegradable and not persistent in soil (ECHA).

D. Calculation of PNEC

The PNEC calculations for sodium iodide follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels. Acute $E(L)C_{50}$ values are available for fish (>100 mg/L), invertebrates (0.17 mg/L) and algae (37.3 mg/L). Results from chronic studies are available for fish (>10 mg/L), invertebrates (0.153 mg/L) and algae (>37.26 mg/L). On the basis that the data consist of short-term studies for three trophic levels and long-term results studies for three trophic levels, an assessment factor of 10 has been applied to the lowest reported NOEC value of 0.153 mg/L for *Daphnia*. The $PNEC_{water}$ is 0.0153 mg/L.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. The environmental distribution of sodium iodide is dominated by its water solubility. Sorption of sodium iodide should probably be regarded as a reversible situation—i.e., the substance is not tightly nor permanently bound. K_{ow} and K_{oc} parameters do not readily apply to inorganics, such as sodium iodide. Thus, the equilibrium partitioning method cannot be used to calculate the $PNEC_{sediment}$. As a result, the assessment of this compartment will be covered by the aquatic assessment.

PNEC Soil

No reliable experimental toxicity data on terrestrial organisms are available. The environmental distribution of sodium iodide is dominated by its water solubility. Sorption of sodium iodide should probably be regarded as a reversible situation—i.e., the substance is not tightly nor permanently bound. K_{ow} and K_{oc} parameters do not readily apply to inorganics, such as sodium iodide. Thus, the equilibrium partitioning method cannot be used to calculate the $PNEC_{soil}$. As a result, the assessment of this compartment will be covered by the aquatic assessment.

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Sodium iodide dissociates completely to sodium and iodide ions in aqueous solutions. Biodegradation is not applicable to these inorganic ions. For the purposes of this PBT assessment, the persistence criteria is not considered applicable. The low Log K_{ow} (-1.301) suggests sodium iodide will not bioaccumulate to a substantial degree. In addition, sodium ions are essential to all living organisms and its intracellular and extracellular concentrations are actively regulated. The iodide ion

is essential for thyroid function in all vertebrates. Thus, sodium iodide does not meet the screening criteria for bioaccumulation. The lowest NOEC value on sodium iodide is >0.1 mg/L for fish, invertebrates and algae. Thus, sodium iodide does not meet the screening criteria for toxicity.

Therefore, sodium iodide is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

H315: Skin irritation (Category 2)

H319: Eye irritation (Category 2A)

H400: Acute aquatic toxicity (Category 1)

B. Labelling

Warning

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

<u>Eye Contact</u>

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.

<u>Skin Contact</u>

Wipe off excess material from skin then immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Inhalation

Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give Oxygen. Get medical attention.

Ingestion

Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

B. Firefighting Information

Extinguishing Media

Sodium iodide is not considered a fire hazard. Use any means suitable for extinguishing surrounding fire.

Specific Exposure Hazards

Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.

Special Protective Equipment for Firefighters

As in any fire, wear self-contained breathing apparatus and full protective gear.

C. Accidental Release Measures

Personal Precautions

Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Avoid contact with skin, eyes and clothing. Isolate hazard area. Keep unnecessary and unprotected personnel from entering.

Environmental Precautions

Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate groundwater system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

Substance may decompose upon heating to produce corrosive and/or toxic fumes. Do not allow runoff from firefighting to enter drains or water courses.

Steps to be Taken if Material is Released or Spilled

Pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust.

D. Storage and Handling

General Handling

Wear personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Avoid contact with skin, eyes and clothing. Do not breathe dust. Do not ingest. Containers of this material may be hazardous when empty since they retain product residues (dust, solids). Observe all warnings and precautions listed for the product.

Other Handling Precautions

Protect from light.

Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

None established.

Engineering Controls

Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protection Equipment

Respiratory Protection: When workers are facing exposure to dust or mist, they must use appropriate certified respirators. To protect the wearer, respiratory protective equipment must be the correct fit and be used and maintained properly.

Hand Protection: Wear protective gloves; inspect gloves before use.

Skin Protection: Wear clean body-covering clothing.

Eye protection: Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Other Precautions: None noted.

F. Transport Information

UN Number UN3077

Hazard class 9

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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SODIUM PERBORATE TETRAHYDRATE

This dossier on sodium perborate tetrahydrate presents the most critical studies pertinent to the risk assessment of sodium perborate tetrahydrate in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

NICNAS has assessed sodium perborate tetrahydrate in an IMAP Tier 1 assessment and concluded that it poses no unreasonable risk to the environment.[1] NICNAS concluded that it is a reactive substance which rapidly converts into species of low ecotoxicological concern. This chemical, and its degradant species, are not expected to pose an unreasonable risk to the environment provided that ANZECC water quality guidelines for physical and chemical stressors are not exceeded.

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): sodium perborate tetrahydrate

CAS RN: [redacted]

Molecular formula: $NaBO_3 \bullet 4H_2O$

$[NaBO_2(OH)_2 \bullet 3H_2O]_2$ (presented as the dimer)

Molecular weight: 153.9 g/mol

Synonyms: sodium peroxoborate tetrahydrate; perboric acid, sodium salt, tetrahydrate

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the physico-chemical properties of sodium perborate tetrahydrate

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	White, odorless, crystalline powder	4	EC, 2007
Melting Point	65°C @ 101.3 kPa	-	EC, 2007
Boiling Point	Decomposes	-	EC, 2007
Density	0.65–0.9 (relative density)	-	EC, 2007
Vapour Pressure	Negligible	-	-
Partition Coefficient (log K_{ow})	Not applicable, substance is inorganic	-	-
Water Solubility	23 g/L @ 20°	-	EC, 2007
Flash Point	Not available	-	-

[1] https://services.industrialchemicals.gov.au/assessment-detail/?id=d785433e-f36b-1410-8c14-0026b2c59b62

Property	Value	Klimisch Score	Reference
Auto flammability	Not available	-	-
Viscosity	Not available	-	-
Henry's Law Constant	Not available	-	-

The molecular crystalline structure of sodium perborate tetrahydrate consists of dimeric $[(HO)_2(BOO)]$-units which forms symmetric cyclic hexagonal anions with two peroxo bridges each. In its crystalline form the substances are stable under dry conditions (EC, 2007).
In aqueous solutions at room temperature, an equilibrium occurs between sodium perborate and hydrogen peroxide (H_2O_2)/sodium metaborate ($NaBO_2$):

$NaBO_2(OH)_2 \bullet 3H_2O]2 \rightarrow 2NaBO_2 + 2H_2O_2 + 6H_2O$

At low concentrations (about <2 g/L), the equilibrium is largely on the side of the hydrolysis products; at high concentrations (about >12 g/L), the un-dissociated molecule is present in aqueous solutions. The hydrogen peroxide can be removed from the equilibrium by degradation to active oxygen, leading to an irreversible shift of the equilibrium to the degradation products sodium metaborate and water. This reaction is the basis of the bleaching effect of sodium perborate in the washing process (EC, 2007).

Sodium metaborate is the salt of a strong base (sodium hydroxide) and a weak acid (boric acid). So, sodium metaborate is expected to be present in aqueous solutions at environmental temperature and pH mainly as the weakly dissociated boric acid.

$NaBO_2 + 2H_2O \rightarrow Na^+ + OH^- + H_3BO_3$

H_3BO_3 (Boric acid) $\rightarrow [B(OH)^4]^-$ (borate) $+ H^+$

Exposure to borates are often expressed in terms of boron (B) equivalents based on the fraction of boron in the source substance on a molecular weight basis. The B equivalents used are a generic designation rather than a designation of the element boron. The factor for converting sodium perborate tetrahydrate to B-equivalents is 0.07.

Sodium perborate tetrahydrate has been identified as a Substance of Very High Concern and recommended for inclusion in Annex XIV (the Authorisation List) of the REACH legislation in the European Union based on its toxicity for reproduction (Article 57c). The chemical is on the "Candidate List" and is not on the "Authorisation List". The chemical is not currently identified as being of environmental concern (NICNAS, 2019).

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Boron is almost exclusively found in the environment as boron-oxygen compounds, which are often referred to as borates. The high strength of the B-O bond relative to those between boron and other elements makes boron oxide compounds stable compared to nearly all non-oxide boron materials. Indeed, the B-O bond is among the strongest found in the chemistry of naturally occurring inorganic substances (ECHA).

In the environment, borates and compounds of boric acid will dissociate and/or hydrolyse to form the same boron species. For example, when borax dissolves in dilute solutions, it dissociates into Na^+ ions and the tetraborate anion ($B_4O_5(OH)_4^{2-}$). Boric acid ($B(OH)_3$) is formed following acid catalysed hydrolysis of the tetraborate anion. Under alkaline conditions, dilute solutions of the tetraborate anion depolymerise rapidly to the mononuclear borate anion ($B(OH)_4^-$) (NICNAS, 2019).

Boric acid is a Lewis acid that acts as a weak monoprotic acid by accepting OH^- and not as a proton donor (pKa 9.14). Therefore, at the near neutral pH of most environmental systems and at low concentrations (<0.025 mol B/L), the neutral mononuclear species ($B(OH)_3$) will dominate and only a small proportion of boron will exist as the borate monoanion, $B(OH)_4^-$. Therefore, in the environment boric acid is in equilibrium with borate anions. Both species are very stable as they do not undergo biotransformation or redox reactions under normal environmental conditions (NICNAS, 2019).

The WHO review of boron (WHO, 1998) noted that "highly water soluble materials are unlikely to bioaccumulate to any significant degree and that borate species are all present essentially as un-dissociated and highly soluble boric acid at neutral pH." A BCF of <0.1 was reported in Chinook salmon fed boron-supplemented diets for 60 to 90 days (Hamilton & Wiedmeyer, 1990).

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Sodium perborate tetrahydrate exhibits low acute toxicity by the oral and dermal routes, and slight-to-moderate acute toxicity by the inhalation route. It is not a skin irritant or sensitiser, but it is severely irritating to the eye. Toxicity studies on boric acid, borax (disodium tetraborate decahydrate), and boron oxide have been used to read-across to sodium perborate tetrahydrate. This is justified because, in aqueous media at physiological pH, all inorganic borate compounds will predominantly exist as un-dissociated boric acid. The developing foetus and the testes are the two most sensitive targets of boron toxicity in multiple species. The testicular effects include reduced organ weight and organ to body weight ratio, atrophy, degeneration of the spermatogenic epithelium, impaired spermatogenesis, reduced fertility, and sterility. The developmental effects from boron exposure include high prenatal mortality, reduced foetal body weight, and malformations and variations. Repeated inhalation exposure resulted in slight irritation to the respiratory tract, but no systemic toxicity. Based on read-across substances, sodium perborate tetrahydrate is not genotoxic nor carcinogenic.

B. Acute Toxicity

The oral LD_{50} values of sodium perborate tetrahydrate in rats are 2,567 and 2,800 mg/kg (ECHA) [Kl.score= 1 and 2, respectively].

The 4-hour inhalation LC_{50} of sodium perborate tetrahydrate (as a dust) in rats is 1.17 mg/L. The MMAD ranged from 3.3 to 4.2 µm (ECHA) [Kl.score=2].

There are no acute dermal toxicity studies on sodium perborate tetrahydrate. The dermal LD_{50} of sodium perborate monohydrate in rabbits is >2,000 mg/kg (ECHA) [Kl.score=1].

C. Irritation

Application of 0.5 g. sodium perborate tetrahydrate to the skin of rabbits for 4 hours under occlusive conditions was not irritating (ECHA) [Kl.score=2].

Instillation of 0.1 mL sodium perborate tetrahydrate to the eyes of rabbits was considered corrosive (ECHA) [Kl.score=2]. Another study showed that sodium perborate tetrahydrate was severely irritating to the eyes of rabbits (ECHA) [Kl.score=2].

D. Sensitisation

No studies are available on sodium perborate tetrahydrate. In the mouse local lymph node assay (LLNA), sodium perborate monohydrate was not considered a skin sensitizer (ECHA) [Kl.score=1].

E. Repeated Dose Toxicity

Oral

Male and female Bor:WISW (SPFCpb) rats were dosed by oral gavage with 0 or 1,000 mg/kg sodium perborate tetrahydrate for 28 days. Clinical signs in the treated rats mainly consisted of salivation. There was no mortality. The treated males showed a 15% reduction in body weight gain and up to 15% reduction in feed consumption. There was possible treatment-related reduction in total cholinesterase and protein (both sexes) and albumin (males). Relative liver weights were slightly increased in the females. Histopathologic changes were reduction of parenchyma in the spleen (males), slight acathosis and hyperkeratosis in the forestomach (both sexes), and hyperplasia of the fundic mucosa (both sexes). There were no testicular effects in the treated males. The LOAEL for this study is 1,000 mg/kg-day; a NOAEL was not established (ECHA) [Kl.score=2].

Male and female SD rats were given doses of 0, 52.5, 175, 525, 1,750 or 5,250 ppm B equivalent in their diet boric acid for 90 days. The average intake has been estimated to be approximately 0, 2.6, 8.8, 26, 87.5 or 262.5 mg B/kg-day, respectively (EPA, 2004). By week 6, all the animals in the highest dose died. Clinical signs in the top two dose levels were rapid respiration, inflamed eyes, swollen paws, and desquamated skin on the paws and tails. There was also reduced food consumption and body weight gain. The 1,750 ppm females showed reduced liver, spleen ovary, and adrenal weights; the 1,750 ppm males showed reduced liver, spleen, kidney, testes, and adrenal weights. The adrenals of 4 of the 1,750 ppm males showed minor increases in lipid content and size of the cells in the zona reticularis. Atrophied testis (complete atrophy of the spermatogenic epithelium and decreased in the size of the seminiferous tubules) was seen in all of the 1,750 ppm males. One 525 ppm male had partial testicular atrophy. The NOAEL for this study is 175 ppm boron or 8.8 mg B/kg-day (Weir and Fisher, 1972) [Kl.score=2].

Male and female SD rats were given in their diet borax at doses of 0, 52.5, 175, 525, 1,750 or 5,250 ppm B equivalent for 90 days. The average intake has been estimated to be approximately 0, 2.6, 8.8, 26, 87.5 or 262.5 mg B/kg-day, respectively (EPA, 2004). By week 6, all animals in the highest dose died. Clinical signs in the top two dose levels were rapid respiration, inflamed eyes, swollen paws, and desquamated skin on the paws and tails. There was also reduced food consumption and body weight gain. The 1,750 ppm females showed reduced liver, spleen and ovary weights; the 1,750 ppm males showed reduced liver, spleen, kidney, testes, and brain weights. The adrenals of the majority of the 1,750 ppm males and females showed slight to moderate increases in lipid content and size of the cells in the zona reticularis. Atrophied testis (complete atrophy of the spermatogenic epithelium and decreased in the size of the seminiferous tubules) was seen in all of the 1,750 ppm males. Four 525 ppm males had partial testicular atrophy. Spermatogenic arrest was found in one 525 ppm male. NOAEL for this study is 175 ppm boron or 8.8 mg B/kg-day (Weir and Fisher, 1972) [Kl.score=2].

Male and female B6CF11 mice were given in the diet 0, 1,200, 2,500, 5,000, 10,000 or 20,000 ppm boric acid for 13 weeks (control and highest dose group) or 16 weeks (remaining dose groups). These

dietary levels correspond to approximately 0, 34, 70, 141, 281 and 563 mg B/kg-day for males, respectively, and 0, 47, 97, 194, 388 and 776 mg B/kg-day for females, respectively (EPA, 2004). There was mortality (8/10 males; 6/10, females) in the 20,000 ppm, as well as hyperkeratosis and acanthosis. One male also died in 10,000 ppm group. Degeneration or atrophy of the seminiferous tubules occurred in the >5,000 ppm males. Minimal to mild extramedullary hematopoiesis of the spleen was observed in all dose groups. The LOAEL for this study is 1,200 ppm, corresponding to 34 and 47 mg B/kg-day for males and females, respectively (NTP 1987) [Kl.score=2].

Male and female SD rats were given in their diet boric acid at doses of 0, 117, 350 or 1,170 ppm boric acid in their diet boric acid for two years. The average intake has been estimated to be approximately 0, 5.9, 17.5 or 58.5 mg B/kg-day, respectively (EPA, 2004). The 1,170 ppm rats had decreased food consumption during the first 13 weeks of the study and suppressed growth throughout the study. Signs of toxicity in the 1,170 ppm animals included swelling and desquamation of the paws, scaly tails, inflammation of the eyelids, and bloody discharge from the eyes. All of the 1,170 ppm males had testicular atrophy at the 6-, 12- and 24-month time points. The seminiferous epithelium was atrophied, and the tubular size in the testes was decreased. There were significant decreases in the absolute and relative testes weights. Brain and relative thyroid weights were increased. The NOAEL for this study is 350 ppm B equivalents or 17.5 mg B/kg-day (Weir &Fisher, 1972) [Kl.score=2].

Male and female B6C3F1 mice were given in their diet 0, 2,500 or 5,000 ppm boric acid in their feed for 103 weeks (NTP, 1987). These dose levels were equivalent to 0, 275 or 550 mg/kg-day boric acid or 0, 48 or 96 mg B/kg-day (EPA, 2004). There was reduced survival in the male mice, which was significantly different from the controls in the 2,500 ppm mice after week 63 and in the 5,000 ppm mice after week 84. The survival rates by the end of the study were 82, 60 and 44% in the 0, 2,500, and 5,000 ppm males, respectively, and 66, 66 and 74% in the 0, 2,500, and 5,000 ppm females, respectively. Mean body weights were 10-17% lower in the 5,000 ppm animals after 32 (males) or 52 (females) weeks compared to the controls. There was testicular atrophy and interstitial cell hyperplasia in the testes of the 5,000 ppm males. A dose-related increase in the incidences of splenic lymphoid depletion in male mice was also observed. NTP considered this lesion to be associated with stress and debilitation, and it is reflected in the increased mortality in these groups of male mice. A NOAEL was not reported in this study but the authors note that there is no evidence of carcinogenicity of boric acid at doses of 2,500 or 5,000 ppm for male and female B6C3F1 mice (NTP, 1987) [Kl.score=2].

<u>Inhalation</u>

Male and female rats were exposed by inhalation to 0, 77, 175, or 470 mg/m^3 boron oxide. The exposures were 6 hours/day, 5 days/week for 24, 12, and 10 weeks for the 77, 175, and 470 mg/m^3 concentrations groups, respectively. The MMAD were 2.5, 1.9, and 2.4 µm for the 77, 175, and 479 mg/m^3 concentrations groups, respectively. There was no evidence of systemic toxicity. Some of the 470 mg/m^3 had reddish exudate from the nose. As these animals were covered with dust, this effect may have been local irritation of the nose and from the animals scratching the nose. The NOAEL for systemic toxicity is 470 mg/m^3, the highest exposure concentration tested. The NOAEL for localized effects (irritation) is 175 mg/m^3 (ECHA) [Kl.score=2].

<u>Dermal</u>

There are no studies available.

F. Genotoxicity

In Vitro Studies

The *in vitro* genotoxicity studies on sodium borate tetrahydrate (or sodium perborate) are presented in Table 2. The in vitro genotoxicity studies on boric acid are shown in Table 3.

Table 2: *In vitro* genotoxicity studies on sodium perborate tetrahydrate (or sodium perborate)

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Bacterial reverse mutation (S. typhimurium TA102 and TA2638; and E. coli WP2/pKM101 and WP2 uvrA/pKM101)	+**	NT	2	Watanabe et al. (1998)
Bacterial reverse mutation (S. typhimurium strains)	(-)TA98 (+) TA100, TA102	(-) TA98 (-) TA100, TA102	2	Seiler (1989)
Chromosomal aberrations (Chinese Hamster Ovary cells)	+	-	2	Seiler (1989)

*+, positive; -, negative; NA, not applicable; NS, not specified; NT, not tested.
**Two independent laboratories.

Table 3: *In vitro* genotoxicity studies on boric acid

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Bacterial reverse mutation (*S. typhimurium* strains)	-	-	1	ECHA
Bacterial reverse mutation (*S. typhimurium* strains)	-	-	2	ECHA
Mammalian cell gene mutation (mouse lymphoma L5178Y cells)	-	-	1	ECHA
Chromosomal aberrations (Chinese Hamster Ovary cells)	-	-	1	ECHA
Chromosomal aberrations (Chinese Hamster Ovary cells)	-	-	1	ECHA
Chromosomal aberrations (Human peripheral lymphocytes)	NS	+	2	ECHA
Unscheduled DNA synthesis (rat liver cells)	NA	-	1	ECHA

*+, positive; -, negative; NA, not applicable; NS, not specified.

The genotoxic potential of sodium perborate in the absence of metabolic activation may be due to the generation of hydrogen peroxide. If so, the results from the *in vitro* tests may not be relevant *in vivo* because hydrogen peroxide is readily reduced by catalase. Boric acid, the other dissociated product from sodium perborate tetrahydrate (or sodium perborate) did not show any genotoxic potential in any of the *in vitro* tests.

In Vivo Studies

No studies are available on sodium perborate tetrahydrate.

Male and female Swiss Webster mice were given two daily doses of 0, 225, 450, 900, 1,800, or 3,500 mg/kg boric acid. The frequency of micronucleated polychromatic erythrocytes were not increased at any dose level (ECHA) [Kl.score=1].

G. Carcinogenicity

Oral

No studies have been conducted on sodium perborate tetrahydrate.

Male and female SD rats were given disodium tetraborate decahydrate (borax) or boric acid at doses of 0, 117, 350, or 1,170 ppm as Boron equivalents (approximately 0, 5.9, 17.5, or 58.5 mg B/kg-day) in their diet for two years. There was no mention of tumours in the report. Nevertheless, NTP (1987) concluded that this study provided adequate data on the lack of carcinogenic effects of boric acid in rats (Weir and Fisher, 1972; EPA, 2004).

Male and female $B6C3F_1$ mice were given 0, 2,500, or 5,000 ppm boric acid in their diet for 103 weeks. The dietary levels are equivalent to 0, 446, or 1,150 mg/kg-day boric acid or 0, 78.1, or 201.3 mg B/kg-day. There was no evidence of carcinogenicity (NTP, 1987) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

There are no studies available.

H. Reproductive Toxicity

A three-generation reproductive toxicity study was conducted in albino rats (strain not specified) with boric acid. Male and female rats were fed a diet containing 0, 117, 350 or 1,170 ppm boron (approximately 0, 5.9, 17.5 or 58.5 mg B/kg-day, respectively). In the lower two dose groups, there were no treatment-related effects on reproduction. Litter size, progeny weights, fertility, live birth indices, lactation, appearance were similar to the controls. No gross abnormalities were noted in these two dose groups. The 1,170 ppm dose group were found to be sterile, and there were no litters from mating the treated females with control males. Lack of viable sperm was found in the atrophied testes of all 1,170 ppm males. Decreased ovulation was also seen in the majority of the ovaries of the 1,170 ppm females. The NOAEL for this study is 350 ppm boron or approximately 17.5 mg B/kg-day (Weir and Fisher, 1972) [Kl.score=2].

A three-generation reproductive toxicity study was conducted in albino rats (strain not specified) with disodium tetraborate decahydrate. Male and female rats were fed a diet containing 0, 117, 350 or 1,170 ppm boron (approximately 0, 5.9, 17.5 or 58.5 mg B/kg-day, respectively). In the lower two dose groups, there were no treatment-related effects on reproduction. Litter size, progeny weights, fertility, live birth indices, lactation, appearance were similar to the controls. No gross abnormalities were noted in these two dose groups. The 1,170 ppm dose group were found to be sterile, and there were no litters from mating the treated females with control males. Lack of viable sperm was found

in the atrophied testes of all 1,170 ppm males. Decreased ovulation was also seen in the majority of the ovaries of the 1,170 ppm females. The NOAEL for this study is 350 ppm boron or approximately 17.5 mg B/kg-day (Weir and Fisher, 1972) [Kl.score=2].

In a continuous breeding protocol, male and female CD-1 mice were given in their diet 0, 1,000, 4,500 or 9,000 ppm boric acid in their feed. The authors estimated that the average daily intakes were 0, 26.6, 111, and 220 mg B/kg-day to males. and 0, 31.8, 152, 257 mg B/kg-day to females. Boric acid consumption did not differ among the groups. There were no litters in the 9,000 ppm breeding pairs. At 4,500 ppm, there was a successful first litter, after which there was a progressive decrease in fertility, only one pair produced a fourth and fifth litter. All fertility indices were affected in the 4,500 ppm group. A complete crossover mating trial was conducted using control mice and the 4,500 ppm mice. The results showed that the probable cause of the reduced fertility was a decrement in male fertility. A dose-related decrease in body, testicular and epididymal weights was observed in the 4,500 and 9,000 ppm F_0 males. Sperm count was significantly decreased in these two dose groups, and percent motile sperm was decreased in all dose groups. Testicular histopathology showed seminiferous tubular atrophy in the 9,000 ppm males and partial atrophy of the seminiferous tubules in the 4,500 ppm males. There were no histopathologic changes in the 4,500 ppm females. No statistically significant decreases in mating index, fertility index, or live pups/litter in the 4,500 ppm females, but the number of days to litter in this dose group was increased. Estrous cyclicity was unaffected. Reproductive organ weights were unaffected, but relative maternal liver and kidney/adrenal weights were reduced. An F_1 fertility trial was performed using offspring from the 1,000 ppm groups. There were no decreases in mating, fertility or reproductive performance. The F_2 adjusted live pup weight was slightly, but significantly, reduced from controls. A clear NOAEL for reproductive toxicity in males was not seen in this study. The 1,000 ppm males had decreased sperm motility in the F_0 generation and decreased sperm concentration in the F_1 generation. Decreased F_2 pup relative body weight was statistically significant from controls. The NOAEL in this study for females is 1,000 ppm boric acid or 32 mg B/kg-day). The LOAEL in this study for males is 1,000 ppm or 27 mg B/kg-day; a NOAEL was not established (Fail et al., 1991) [Kl.score=2].

I. Developmental Toxicity

Oral

Pregnant female Crl:CD(SD)BR rats were dosed by oral gavage with 0, 100, 300, or 1,000 mg/kg sodium perborate tetrahydrate during gestational days 6 to 15. Maternal body weight gain and feed consumption were significantly reduced in the >300 mg/kg dose groups. A dose-related increase was seen in resorptions, placental weights, and fetal body weights in the 300 and 1,000 mg/kg dose groups. Malformations (mainly related to the skeletal and to the cardiovascular system) were increased in the 1,000 mg/kg dose group. The NOAEL for maternal and developmental toxicity is 100 mg/kg-day (ECHA) [Kl.score=1].

Pregnant female SD rats were given 0, 0.1, 0.2 or 0.4% boric acid in their feed on gestational days (GD) 0 to 20 or 0.8% boric acid on GD 6 to 15. The average amounts of boric acid ingested were estimated to be 0, 78, 163, 330 or 539 mg/kg-day (0, 13.6, 28.5 or 57.7 mg B/kg-day), respectively. Effects on the dams were altered food and/or water intake at >0.2% boric acid, increased liver and kidney weights relative to body weights at >0.2%, reduced weight gain at >0.4%, and increased corrected weight gain at 0.4% boric acid. There was a reduction in fetal body weights in all treated groups (94, 87, 63, and 47% of control weight, respectively). Increased malformations occurred at >0.2% and prenatal mortality was increased at 0.8%. There was a dose-response for altered skeletal morphology in rats (>0.1%), and specific findings were significantly elevated above controls at >0.2%. Specifically, there was an increased incidence of short rib XIII (a malformation) and a decreased

incidence or rudimentary or full rib(s) at lumbar I (an anatomical variation) (Heindel et al. 1992) [Kl.score=2].

Pregnant female SD rats were given in their feed 0, 0.025, 0.005, 0.075, 0.1 or 0.2% boric acid in their feed on GD 0 to 20. Approximately half of the dams were terminated on GD 20, and the remaining dams delivered their litters. Pup growth and viability were monitored until postnatal day (PND) 21. The average amounts of boron ingested on GD 20 were 0, 3.3, 6.3, 9.6, 13.3, and 25 mg B/kg-day], respectively. The average amounts of boron ingested on PND 21 were 0, 3.2, 6.5, 9.7, 12.9, and 25.3 mg B/kg-day, respectively. There were no maternal deaths and no treatment-related clinical signs. Maternal body weights were similar across all groups during gestation. However, decreased maternal body weights (GD 19 and 20 at sacrifice) and decreased maternal body weight gain (GD 15-18 and GD 0-20) were statistically significant in trend tests. There was a 10% reduction in gravid uterine weight (statistically significant) in the 0.2% group. Corrected maternal weight (maternal gestational weight minus reduced gravid uterine weight) was unaffected by treatment. Feed intake in the 1,000 ppm dams was minimally affected and only during the first three days of dosing. Water consumption was higher in the treated groups after GD 15. The number of corpora lutea and uterine implantation sites, and the percentage of preimplantation loss were similar across all groups. Increased relative kidney weights were increased in the 0.2% group. There were no differences in the viability of the offspring between treated and controls. On GD 20, fetal body weight was 94% and 88% of controls in the 0.1% and 0.2% groups, respectively; recovery was complete at birth (~GD 22). The incidence of short rib XIII was increased on GD 20 in the >0.1% groups, but only in the 0.2% group at PND 21. The incidence of wavy rib was increased on GD 20 in the >0.1% group; the reversibility of this effect was confirmed on PND 21. There was a slight decrease in extra lumbar ribs in the 0.2% group on GD 20, and extra lumbar ribs were seen in the 0.2% group on PND 21. The developmental NOAEL was 0.075% boric acid or 9.6 mg B/kg-day on GD 20; and 0.1% boric acid or 12.9 mg B/kg-day on PND 21 (Price et al., 1996a) [Kl.score=1].

Pregnant Swiss mice were given 0, 0.1, 0.2 or 0.4% boric acid in their diet on gestational days (GD) 0 to 17. The average amounts of boric acid ingested were estimated to be 248, 452 or 1,003 mg/kg-day (0, 43.4, 79.0 or 175.3 mg/B/kg-day), respectively. Maternal toxicity consisted of mild kidney lesions (>0.1%), increased water intake and relative kidney weights (0.4%), and decreased water intake during treatment. Foetal body weights were reduced in the >0.2% groups, and there were increased incidences of resorptions and malformed foetuses per litter in the 0.4% group. The LOAEL for maternal toxicity is 248 mg/kg-day boric acid or 43.4 mg B/kg-day; a NOAEL was not established. The NOAEL for developmental toxicity is 248 mg/kg-day boric acid or 43.4 mg B/kg-day (Heindel et al. 1992) [Kl.score=2].

Pregnant female New Zealand rabbits were dosed by oral gavage with 0, 62.5, 125 or 250 mg/kg boric acid (0, 10.9, 21.9 or 43.7 mg B/kg) during GD 6-19. Feed intake was in the 250 mg/kg maternal animals during the exposure period, but it was increased in the >125 mg/kg dose groups. In the 250 mg/kg group, maternal body weights during GD 9-30, weight gain during GD 6-19, gravid uterine weight, and number of corpora lutea per dam were significantly reduced.

In the >125 mg/kg groups, maternal corrected gestational weight gain was increased compared to controls. Maternal liver weights were unaffected by treatment. In the 250 mg/kg group, relative, but not absolute, kidney weights were increased, although no effects in the kidney were noted in the histopathological examination. Prenatal mortality was increased in the 250 mg/kg group (90% resorptions/litter versus 6% for controls); the proportion of pregnant females with no live fetuses was increased (73% versus 0%), and live litter size was reduced (2.3 foetuses versus 8.8). Thus, there were only 14 live foetuses (6 live litters) available for evaluation in the 250 mg/kg group. The percentage malformed foetuses/litter was increased in the 250 mg/kg group, primarily due to

cardiovascular defects (72% versus 3% of controls). There was no definitive maternal or developmental toxicity in the 62.5 or 125 mg/kg dose groups. The NOAEL for maternal and developmental toxicity is 125 mg/kg-day boric acid or 21.9 mg B/kg-day (Price et al. 1996b) [Kl.score=1].

Inhalation

There are no studies available.

Dermal

There are no studies available.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for disodium perborate tetrahydrate follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

An oral reference dose was not derived for boric acid or borax.

The Australian drinking water guideline value for boron (4 mg/L) may be applicable (ADWG, 2011). The health-based ADWG value was based on a tolerable daily intake (TDI) of 0.16 mg/kg bw. This TDI is based on the NOAEL of 9.6 mg/kg bw/day for foetal bodyweight effects in a rat developmental study (Price et al. 1996a) with an uncertainty factor of 60 (10 for interspecies and 6 for human intraspecies).

B. Cancer

There was no evidence of carcinogenicity in rat and mouse chronic studies conducted on disodium tetraborate decahydrate and/or boric acid. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Sodium perborate tetrahydrate does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Sodium perborate tetrahydrate has low chronic aquatic toxicity.

B. Aquatic Toxicity

In ecotoxicological tests for boron, the exposure concentrations are expressed as boron equivalents (i.e., mg B/L). This is because sodium perborate tetrahydrate and similar perborates will have the

same boron speciation when dissolved in environmental matrices. Therefore, in the following sections toxicological values are given as mg B/L regardless of the form of boron that was tested.

Acute Studies

Table 4 lists the results of acute aquatic toxicity studies conducted on sodium perborate tetrahydrate.

Table 4: Acute aquatic toxicity studies on sodium perborate tetrahydrate

Test Species	Endpoint	Results (mg B/L)	Klimisch Score	Reference
Brachydanio rerio	96hr LC_{50}	5.5	-	EC, 2007
Daphnia magna	48hr EC_{50}	2.1		EC, 2007
Selenastrum capricomutum	72hr EC_{50}	0.36		EC, 2007

Chronic Studies

The ANZG water quality guideline (2021) derived a very high reliability default guideline value (DGVs) for (dissolved) boron in freshwater from 22 chronic (long-term) toxicity data, comprising eight fish, two amphibians, three crustaceans, one bivalve, three macrophytes, one green microalga, three diatoms and one blue–green alga. The summary of representative data used by ANZG to develop a water quality guideline for boron is presented in Table 5 below. These values are noted to be consistent with those reported in ECHA. Additional chronic aquatic toxicity data is found in the ANZG Technical Brief (ANZG, 2021).

Table 5: Chronic Aquatic Toxicity Studies on Boron[1]

Test Species	Endpoint	Results (mg B/L)
Danio rerio	34-day NOEC (Biomass)	1.8
Pimephales promelas	32-day NOEC (Mortality)	11
Daphnia magna	14-day NOEC (Reproduction)	2.4
Pseudokirchneriella subcapitata	4-day NOEC (Growth)	2.8

1 - The DGVs are based on toxicity data for boron as either boric acid, H_3BO_3 (CAS RN [redacted] or borax, $Na_2B_4O_710H_2O$ (CAS RN [redacted] in freshwater.

In the chronic toxicity data set, fish sensitivity to boron ranged from the least sensitive species in the dataset (*Melanotaenia splendida*, LC10 102 mg/L) to the third most sensitive species in the dataset (*Danio rerio*, NOEC 1.8 mg/L). Of the crustaceans, *D. magna* was best represented in the literature with 18 published NOEC values (ranging from 2.4 mg/L to 29 mg/L) for six different endpoints from six different publications. The final NOEC of 2.4 mg/L used in the DGV derivation was lower than that for *C. dubia* (NOEC 5.6 mg/L) and for the amphipod *H. azteca* (NOEC 6.6 mg/L). For *P. subcapitata*, there were three separate studies available with toxicity data for boron. The toxicity values from these studies ranged from a NOEC of 2.8 mg/L to a NEC of 27 mg/L, varying with endpoint, duration and test medium used. Boron was least toxic to *P. subcapitata* when tested in algal growth medium with added $NaHCO_3$, suggesting that carbonate addition may have influenced boron toxicity.

Therefore, although NECs are preferred to NOECs or EC10s (Warne et al. 2018), in this instance, a reliable NOEC of 2.8 mg/L was the most sensitive toxicity value for *P. subcapitata* (ANZG, 2021).

C. Terrestrial Toxicity

Ecotoxicological tests with plants and soil invertebrates have recorded modest chronic toxicity values (NOECs/ECs) in the range of 15.3 to 84.0 and 5.2 to 315 mg total B/kg, respectively (ECHA, 2017). However, to predict the potential toxicity of boron to plants and soil organisms, measuring the total boron concentration may be unsuitable. Instead, potential toxicity is better predicted using boron concentrations in the soil solution (extractable boron) (Mertens, et al., 2011). In Australia, it is generally accepted that boron toxicity will pose a risk to terrestrial plants when soil concentrations exceed 15 mg/kg of extractable boron (NICNAS, 2019).

D. Calculation of PNEC

The PNEC calculations for sodium perborate tetrahydrate follow the methodology discussed in DEWHA (2009).

PNEC Water

The ANZG water quality guideline (2021) derived a very high reliability DGV for (dissolved) boron in freshwater. The DGVs for 99, 95, 90 and 80% species protection are 340 µg/L, 940 µg/L, 1,500 µg/L and 2,500 µg/L, respectively. The 95% species protection level for boron in freshwater (940 µg/L) is recommended for adoption in the assessment of slightly-to-moderately disturbed ecosystems. (ANZG, 2021).

PNEC Sediment

No experimental toxicity data on sediment organisms are available. Sodium perborate tetrahydrate dissociates completely in water and its environmental distribution is dominated by its high-water solubility. Due to the high water solubility of boron and its low partitioning to sediment, sediment toxicity testing for boron is particularly challenging. It is difficult to ensure that exposure is through the solid phase (i.e., sediment) and not from the aqueous boric acid in the overlying water (NICNAS, 2019). K_{ow} and K_{oc} parameters do not readily apply to inorganics, especially those subject to chemical dissociation, such as sodium perborate tetrahydrate. Thus, the equilibrium partitioning method cannot be used to calculate the $PNEC_{sed}$. Based on its properties, no adsorption of sodium perborate tetrahydrate to sediment is to be expected, and the assessment of this compartment will be covered by the aquatic assessment.

PNEC Soil

In the ECHA REACH database (ECHA), a $PNEC_{soil}$ was derived for boron using the species sensitivity distribution method and an assessment factor of 2. The $PNEC_{soil}$ was determined to be 5.7 mg/kg soil dry weight.

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Sodium perborate tetrahydrate is an inorganic compound that dissociates completely to boric acid and the borate anion in aqueous media. Biodegradation is not applicable to these inorganic

compounds; both boric acid and borate are also ubiquitous and are present in most water, soil and sediment. For the purposes of this PBT assessment, the persistent criteria are not considered applicable to sodium perborate tetrahydrate and thus does not meet the screening criteria for persistence.

A BCF of <0.1 has been reported for borates in fish. This data suggests that sodium perborate tetrahydrate does not bioaccumulate in the aquatic environment. Thus, sodium perborate tetrahydrate does not meet the criteria for bioaccumulation.

The NOECs from the chronic aquatic toxicity studies on sodium perborate tetrahydrate and/or boron are > 0.1 mg/L. Thus, sodium perborate tetrahydrate does not meet the criteria for toxicity.

The overall conclusion is that sodium perborate tetrahydrate is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

H331 Acute Toxicity Category 4 [Inhalation]
H318 Eye Damage Category 1
H360 Reproductive Toxicant Category 1B
H335STOT SE Category 3 [Respiratory irritation]

In addition to the hazard statements corresponding the GHS classifications, the following non-GHS hazard statement is to be added to the SDS: AUH071: Corrosive to the Respiratory Tract.

B. Labelling

Danger

According to the classification provided by companies to ECHA in CLP notifications this substance may damage fertility or the unborn child, causes serious eye damage, is harmful if swallowed, is harmful if inhaled, is suspected of damaging fertility or the unborn child, may cause respiratory irritation and causes skin irritation.

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

Eye Contact

Immediately flush open eyes with plenty of water for at least 15 minutes. Remove contacts, if present and easy to do. Get medical attention.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion

Rinse mouth with water. Do not induce vomiting. Get medical attention. Never give anything by mouth to an unconscious person.

B. Firefighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

None identified.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus and chemical-protective clothing.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Avoid dust formation. Ensure adequate ventilation. Do not breathe dust. Wear respiratory protection if ventilation is inadequate. Avoid contact with skin, eye, and clothing.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

Scoop up and remove.

D. Storage and Handling

General Handling

Keep product and empty container away from heat and sources of ignition. Ensure adequate ventilation, especially in confined areas.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place. Do not store with alkalis, acids, or reducing agents.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for sodium perborate tetrahydrate.

Engineering Controls

Ensure adequate ventilation. Localized ventilation should be used to control dust levels below permissible exposure limits.

Personal Protection Equipment

Respiratory Protection: Use respiratory protection when airborne concentrations are expected to be high.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Eyewash fountains and safety showers must be easily accessible.

F. Transport Information

Sodium perborate tetrahydrate is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

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SODIUM POLYACRYLATE (CAS NO. [redacted]
2-PROPENOIC ACID, HOMOPOLYMER, AMMONIUM SALT (CAS NO. [redacted]

This group contains a sodium salt and ammonium salt of polyacrylic acid homopolymers. They are expected to have similar environmental concerns and have consequently been assessed as a group. Information provided in this dossier is based on sodium polyacrylate (CAS No. [redacted]

This dossier on sodium polyacrylate and similar polymers presents the most critical studies pertinent to the risk assessment of these polymers in their use in coal seam or shale gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

NICNAS has assessed sodium polyacrylate in an IMAP Tier 1 assessment and considers it a polymer of low concern[1] .

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): 1-Propenoic acid, homopolymer, sodium salt

CAS RN: [redacted]

Molecular formula: $(C_3H_4O_2)$ x-.x-Na

Molecular weight: 94.0447 g/mol (monomer); Variable (polymer)

Synonyms: 2-Propenoic acid, homopolymer, sodium salt; polyacrylic acid, sodium salt, sodium polyacrylate; acrylic acid, polymers, sodium salt; poly (acrylic acid), sodium salt; polyacrylate sodium salt

SMILES: Not available

Chemical Name (IUPAC): 2-Propenoic acid, homopolymer, ammonium salt

CAS RN: [redacted]

Molecular formula: $(C_3\text{-}H_4\text{-}O_2)$x-.x-$H_3$-N

Molecular weight: 89.0933 g/mol (monomer); Variable (polymer)

Synonyms: 2-Propenoic acid, homopolymer, ammonium salt;2-Propenoic acid, homopolymer, sodium salt; ammonium polyacrylate; poly(acrylic acid),ammonium salt; ammonium acrylate

SMILES: Not available; C=CC(=O)[O-].[Na]

[1] https://www.nicnas.gov.au/chemical-information/imap-assessments/how-chemicals-are-assessed/Low-concern-polymers.

II. PHYSICO-CHEMICAL PROPERTIES

Sodium polyacrylates are polymers that range in molecular weight (MW) from 1,000 to 78,000 g/mol (HERA, 2014). The sodium polyacrylates mostly used in detergents have a typical molecular weight of approximately 4,500 g/mol (HERA, 2014). For sodium polyacrylate (MW 4,500), the melting point is >150oC, where it decomposes; and the water solubility is >400 g/L (HERA, 2014).

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Sodium polyacrylates are not readily biodegradable. Due to their high molecular weights, sodium polyacrylates are not expected to bioaccumulate. In addition, these water-soluble polymers can form insoluble calcium salts in natural waters, suggesting that bioaccumulation is unlikely.

B. Partitioning

Abiotic degradation mechanisms like photolytic and hydrolytic processes do not significantly influence the environmental fate of sodium polyacrylates (HERA, 2014).

C. Biodegradation

Sodium polyacrylates are not readily biodegradable but are partly accessible to ultimate biodegradation particularly under long incubation conditions. Sodium polyacrylates with MW of <2,000 g/mol are partly biodegradable under the conditions of soil and sediment inoculation. Test results with activated sludge inoculum indicate different elimination degrees, apparently due to adsorption and precipitation processes. The removal degrees of different sodium polyacrylates show no clear relationship between elimination extent and molecular weight (HERA, 2014).

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

D. Environmental Distribution

Adsorption onto solids and precipitation are the principal mechanisms of abiotic elimination for this type of polymer, the degree of elimination differs and is strongly influenced by test concentration and water hardness (HERA, 2014).

E. Bioaccumulation

No experimental studies are available on sodium polyacrylates. Estimated bioconcentration factors based on octanol-water coefficients are not appropriate since the molecular weights of these polymers are higher than the molecular weight range for the QSAR models. Due to their high molecular weights, sodium polyacrylates are not expected to bioaccumulate. In addition, these water-soluble polymers can form insoluble calcium salts in natural waters, suggesting that bioaccumulation is unlikely (HERA, 2014).

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

The acute toxicity of sodium polyacrylates are very low by the oral and dermal routes. These polymers are not irritating to the skin and eyes; nor are they skin sensitisers. No systemic toxicity was observed in rats given high oral doses of a sodium polyacrylate for four weeks; pulmonary irritation was seen in rats that inhaled an aerosol or dust of a sodium polyacrylate for 13 weeks, but there was no systemic toxicity. No developmental toxicity was seen in rats when given high oral doses of sodium polyacrylates. Sodium polyacrylates are not genotoxic or mutagenic.

B. Acute Toxicity

Oral

Acute oral toxicity studies have been conducted in rats on sodium polyacrylates with molecular weights (MW) of 1,000 to 78,000. The oral LD50 values are >5,000 or >10,000 mg/kg (the highest doses tested), except for one study on a 3,500 MW sodium polyacrylate, which was reported to be >1,000 mg/kg (the attainable limit dose of a 10% aqueous solution) (HERA, 2014). [Kl. scores = 2].

Inhalation

There are no acute inhalation studies available.

Dermal

The dermal LD50 values in rabbits for sodium polyacrylates with MW of 1,000 or 4,500 are >5,000 mg/kg (HERA, 2014). [Kl. scores = 2].

C. Irritation

According to (HERA, 2014) sodium polyacrylates with MW of 1,000 to 78,000 are not irritating to the skin or eyes [Kl. scores = 2]. However, as per ECHA current classification, the substance 2-Propenoic acid, homopolymer, sodium is considered a skin and eye irritant. Thus, this classification will be retained for purposes of this dossier.

D. Sensitisation

Sodium polyacrylates with MW of 4,500 or 78,000 were not dermal sensitisers in the guinea pig maximisation test (HERA, 2014). [Kl. scores = 2 and 4, respectively].

E. Repeated Dose Toxicity

Oral

Male rats were fed diets containing 0 or 2.5% sodium polyacrylate (MW 2,500) for four weeks. Body weight, body weight gain, and appearance of the animals were similar between treated and control animals. In the fourth week of the study, a small, but significant, decrease in total weight of bone minerals was detected and confirmed by radiographic and histological examination. There was a significant reduction in the concentration of magnesium in the bones and plasma of the treated animals. Calcium loss was slight and not statistically significant. Urinary excretion of sodium and phosphorus was markedly increased, calcium only slightly increased. The authors of the study

interpreted the finding as a metabolic imbalance rather than systemic toxicity. Sodium excretion could have been increased by the high intake of the sodium-neutralised test substance. The NOAEL for the study was considered to be 2.5% sodium polyacrylate in the diet, which was estimated to be 1,136 mg/kg-day (HERA, 2014). [Kl. score = 2].

Inhalation

Male and female rats were exposed by inhalation to 0, 0.2, 1.0, or 5.0 mg/m3 sodium polyacrylate (MW 4,500) as an aerosol for 6 hours/day, 5 days/week for 13 weeks. Additional groups of animals were exposed for 13 weeks followed by a 91-day recovery period. There were no treatment-related effects on body weights, organ weights, feed and water consumption, clinical observations, and blood chemistry. In the histopathologic examination, the lungs of the mid- and high-dose animals showed signs of mild pulmonary irritation increases in polymorphonuclear granulocytes or alveolar macrophages, pneumocyte hyperplasia, alveolar wall thickening and focal alveolitis. The lung effects were reversible and were not seen in the recovery group animals. The NOEC for systemic effects in this study was considered to be 5 mg/m3, and the NOEC for localised irritation is 0.2 mg/m3 (HERA, 2014). [Kl. score = 2].

Dermal

There are no studies available.

F. Genotoxicity

In vitro Studies

The results of the *in vitro* studies on sodium polyacrylates are presented below in Table 1. All the studies show that sodium polyacrylates are not mutagenic or genotoxic.

The *in vitro* genotoxicity studies on sodium polyacrylates are presented in Table 1.

Table 1: *In vitro* Genotoxicity Studies on Sodium Polyacrylates (HERA, 2014)

Mean MW	Test System	Results*	Klimisch Score	Reference
2,000	Bacterial reverse mutation	-	2	HERA (2014)
2,000	Mouse lymphoma	-	2	HERA (2014)
2,000	Unscheduled DNA synthesis	-	2	HERA (2014)
4,500	Bacterial reverse mutation	-	2	HERA (2014)
4,500	Mouse lymphoma	-	2	HERA (2014)
4,500	Unscheduled DNA synthesis	-	2	HERA (2014)
4,500	Cytogenetic (CHO cells)	-	2	HERA (2014)
4,500	Bacterial reverse mutation	-	2	HERA (2014)
4,500	Mammalian cell gene mutation	-	2	HERA (2014)
4,500	Unscheduled DNA synthesis	-	2	HERA (2014)

*+, positive; -, negative

In vivo Studies

There was no increase in micronuclei in polychromatic erythrocytes from the bone marrow of mice given a single oral gavage dose of 13,850 mg/kg sodium polyacrylate with a MW of 2,000 (HERA, 2014).

G. Carcinogenicity

Oral

There are no studies available.

Inhalation

There are no studies available.

Dermal

There are no studies available.

H. Reproductive Toxicity

There are no studies available.

I. Developmental Toxicity

Oral

Pregnant female rats were dosed by oral gavage with 0, 500, 1,000, or 3,000 mg/kg sodium polyacrylate (MW 4,500) on GD 6 to 15. At 3,000 mg/kg, the dams had soft or liquid stools during the treatment period. There was no maternal or developmental toxicity observed in this study. The NOAEL for maternal and developmental toxicity is 3,000 mg/kg-day (HERA, 2014). [Kl. score = 2]

Pregnant female rats were dosed by oral gavage with 0, 125, 375, or 1,125 mg/kg sodium polyacrylate (MW 90,000 as a 77.5% aq. solution) during GD 6 to 13. Some of the dams were sacrificed on GD 13 and the remaining on GD 19. One mid-dose dam and 6 high-dose dams died during the study; of these, three of the high-dose deaths were treatment-related and the remaining were considered the result of gavage errors. There was a transient decrease in feed consumption in the high-dose dams during GD 7-9, but not other indications of maternal toxicity. There was no developmental toxicity. The NOAELs for maternal and developmental toxicity are 375 and 1,125 mg/kg-day (HERA, 2014). [Kl. score = 2]

Inhalation

There are no studies available.

Dermal

There are no studies available.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for sodium polyacrylate follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

A 4-week dietary study showed no systemic toxicity in rats given 2.5% sodium polyacrylate (MW 2,500) in their feed. The estimated dose is 1,136 mg/kg-day. Two pre-natal developmental toxicity studies showed no effects at the highest dose tested: 3,000 and 1,125 mg/kg-day for sodium polyacrylates with MW of 4,500 and 90,000, respectively. The NOAEL of 1,136 mg/kg-day from the 4-week dietary study will be used for determining the oral Reference dose (RfD) and the drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / (UF_A x UF_H x UF_L x UF_{Sub} x UF_D)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 10
UF_D (database uncertainty) = 1
Oral RfD = 1,136/ (1 x 10 x 1 x 1 x 1) = 1,136/1,000 = 1.1 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) x (human weight) x (proportion of intake from water) / (volume of water consumed) x (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) x (human weight) x (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (1.1 x 70 x 0.1)/2 = 3.85 mg/L

B. Cancer

No carcinogenicity studies have been conducted on sodium polyacrylates. Therefore, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Sodium polyacrylates does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Sodium polyacrylates are a low toxicity concern for aquatic organisms, terrestrial invertebrates, and plants.

B. Aquatic Toxicity

Acute Studies

Table 2 lists the results of acute aquatic toxicity studies conducted on sodium polyacrylates.

Table 2: Acute Aquatic Toxicity Studies on Sodium Polyacrylates

Mean MW	Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
1,000	*Brachydanio rerio*	96-hour LC_{50}	>200	1	HERA, 2014
1,000	*Salmo gairdneri*	96-hour LC_{50}	>1,000	1	HERA, 2014
1,200	*Leuciscus idus*	96-hour LC_{50}	>500	1	HERA, 2014
2,000	*Brachydanio rerio*	96-hour LC_{50}	>200	1	HERA, 2014
2,500	*Leuciscus idus*	96-hour LC_{50}	>500	1	HERA, 2014
4,500	*Lepomis macrochirus*	96-hour LC_{50}	>1,000	1	HERA, 2014
4,500	*Lepomis macrochirus*	96-hour LC_{50}	>1,000	1	HERA, 2014
8,000	*Leuciscus idus*	96-hour LC_{50}	>500	1	HERA, 2014
10,000	*Lepomis macrochirus*	96-hour LC_{50}	>1,000	1	HERA, 2014
15,000	*Leuciscus idus*	96-hour LC_{50}	>10,000	1	HERA, 2014
78,000	*Brachydanio rerio*	96-hour LC_{50}	>400	2	HERA, 2014
1,000	*Daphnia magna*	48-hour EC_{50}	>200	1	HERA, 2014
1,000	*Daphnia magna*	48-hour EC_{50}	>1,000	1	HERA, 2014
2,000	*Daphnia magna*	48-hour EC_{50}	>200	1	HERA, 2014
4,500	*Daphnia magna*	48-hour EC_{50}	>200	1	HERA, 2014
4,500	*Daphnia magna*	48-hour EC_{50}	>1,000	1	HERA, 2014
78,000	*Daphnia magna*	24-hour EC_{50}	276	2	HERA, 2014

Mean MW	Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
8,000	*Selenastrum capricornutum*	72-hour EC_{50}	40	1	HERA, 2014
78,000	*Scenedesmus subspicatus*	96-hour EC_{50}	44	2	HERA, 2014

Chronic Studies

Table 3 lists the results of chronic aquatic toxicity studies conducted on sodium polyacrylates.

Table 3: Chronic Aquatic Toxicity Studies on Sodium Polyacrylates (HERA, 2014)

Mean MW	Test Species	Endpoint	Results (mg/L)	Klimisch score	Reference
4,500	*Pimephales promelas*	32-day NOEC	56	2	HERA, 2014
4,500	*Brachydanio rerio*	28-day NOEC	>450	1	HERA, 2014
78,000	*Brachydanio rerio*	14-day NOEC	>400	2	HERA, 2014
4,500	*Daphnia magna*	21-day NOEC	450	1	HERA, 2014
4,500	*Daphnia magna*	21-day NOEC	58	1	HERA, 2014
4,500	*Daphnia magna*	21-day NOEC	12	2	HERA, 2014
78,000	*Daphnia magna*	21-day NOEC	100	2	HERA, 2014
4,500	*Scenedesmus subspicatus*	96-hour NOEC	180	2	HERA, 2014
78,000	*Scenedesmus subspicatus*	96-hour NOEC	32.8	2	HERA, 2014

There is considerable variability in the chronic aquatic toxicity results for Daphnia magna for sodium polyacrylates with the same molecular weight of 4,500. This was discussed in HERA (2014) and was explained by the solubility of sodium polyacrylates in water. In distilled water, the solubility of sodium polyacrylates with the molecular weight of 4,500 is >400 mg/L; however, under test conditions water solubility will decrease due to the presence of Ca++ and Mg++ (as measured by water hardness). In a study by BASF (reviewed in HERA, 2014), the water solubility of sodium polyacrylate (MW 4,500) was determined with radiolabelled compounds in a test system with a calcium concentration of 70 mg/L, which corresponds to the mean water hardness to the media used in an OECD TG 202 test. Under these conditions, the water solubility of sodium polyacrylate was 1.3 mg/L after 24 hours. So, one explanation for the variability of the chronic Daphnia studies may be due to differences in water hardness.

C. Toxicity to Sediment Organisms

The 96-hour EC0 to Chironomus riparius (larvae) is >4,500 mg/kg sediment dry weight (HERA, 2014).

D. Terrestrial Toxicity

Table 4 lists the results of terrestrial toxicity studies on sodium polyacrylates polymers.

Table 4: Terrestrial Toxicity Studies on Sodium Polyacrylates (HERA, 2014)

Mean MW	Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
4,500	*Eisenia foetida foetida*	14-day EC_0	1,000	1	HERA, 2014
78,000	*Eisenia foetida andrei*	14-day EC_0	1,000	2	HERA, 2014
78,000	*Brassica rapa*	21-day NOEC	1,000	2	HERA, 2014
4,500	Nitrogen transformation*	28-day EC_{10}	>2,500	1	HERA, 2014
4,500	Carbon transformation*	28-day EC_{10}	>2,500	1	HERA, 2014

*Soil organisms

E. Calculation of PNEC

The PNEC calculations for sodium polyacrylate follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels. Acute $E(L)C_{50}$ values are available for fish (>200mg/L), *Daphnia* (>200 mg/L), and algae (40 mg/L). NOEC values from long-term studies are available for fish (56 mg/L), invertebrates (12 mg/L) and algae (32.8 mg/L). On the basis that the data consists of short-term and long-term results from three trophic levels, an assessment factor of 10 has been applied to the lowest reported NOEC value of 12 mg/L for invertebrates. The $E(L)C_{50}$ value is used because the value for fish is lower than the NOEC values for all three trophic levels. The $PNEC_{water}$ is 1.2 mg/L.

PNEC Sediment

Experimental results are available for one trophic level. There were no visual signs of toxicity to Chironomus riparius (larvae) at the highest concentration tested (>4,500 mg/kg sediment dry weight) (HERA) 2014). The EC_0 is considered to be above 4,500 mg/kg and an assessment factor cannot apply. Thus, the equilibrium partitioning method will be used to determine the $PNEC_{sed}$. The HERA (2014) risk assessment calculated a $PNEC_{sed}$ of 130 mg/kg sediment wet weight using the default of 0.05 as the weight fraction of organic carbon in sediment according to the EU Technical Guidance Document (TGD) (EU 2003).

PNEC Soil

Experimental results are available for three trophic levels. An acute LC_{50} value is available for earthworms (1,000 mg/kg soil dry weight). A 21-day NOEC for Brassica rapa was reported to be 1,000 mg/kg soil dry weight. Results from two long-term studies are available for soil microorganisms, with the NOECs for nitrogen and carbon transformation being >2,500 mg/kg soil dry weight. On the basis that the data consists of short-term tests, as well as one long-term test from

one trophic level, an assessment factor of 100 has been applied to the lowest reported long-term NOEC of >2,500 mg/kg soil dry weight. The $PNEC_{soil}$ is 25 mg/kg soil dry weight.

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (DEWHA, 2009; ECHA, 2017).

Sodium polyacrylates are not readily biodegradable, thus does not meet the screening criteria for persistence.

The sodium polyacrylates are expected to have high molecular weights and are not expected to be bioavailable. Thus, these polymers do not meet the criteria for bioaccumulation.

Chronic NOECs for fish, daphnia and algae are available for sodium polyacrylates, and the NOEC values are >0.1 mg/L. Thus, sodium polyacrylates do not meet the screening criteria for toxicity.

The overall conclusion is that sodium polyacrylates are not PBT substances.

IX. CLASSIFICATION AND LABELLING

A. Classification

Aquatic Acute Toxicity Category 3

B. Labelling

Warning

According to the classification provided by companies to ECHA in CLP notifications this substance causes serious eye irritation and causes skin irritation.

A. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

<u>Eye Contact</u>

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention.

Ingestion

Rinse mouth with water and then drink a glass of water. Get medical attention. Never give anything by mouth to an unconscious person.

B. Fire Fighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Keep product and empty container away from heat and sources of ignition. May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon dioxide.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Handle in accordance with good industrial hygiene and safety practice.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

For large amounts: dike spillage and pump off product. For residues: pick up with suitable absorbent material. Dispose of contaminated material as prescribed.

D. Storage And Handling

General Handling

Keep product and empty container away from heat and sources of ignition. Ensure adequate ventilation, especially in confined areas.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

The are no workplace exposure standards for sodium polyacrylates in Australia.

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Respiratory protection is not required.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is recommended. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

Sodium polyacrylate is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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SORBITAN, MONO-9-OCTADECENOATE, (Z)

This dossier on sorbitan, mono-9-octadecenoate, (Z) presents the most critical studies pertinent to the risk assessment of sorbitan, mono-9-octadecenoate, (Z) in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): [(2*R*)-2-[(2*R*,3*R*,4*S*)-3,4-dihydroxyoxolan-2-yl]-2-hydroxyethyl] (*Z*)-octadec-9-enoate

CAS RN: [redacted]

Molecular formula: $C_{24}H_{44}O_6$

Molecular weight: 428 g/mol

Synonyms: Sorbitan monooleate; sorbitan, mono-9-octadecenoate, (Z)

SMILES: CCCCCCCCC=CCCCCCCCC(=O)OCC(C1C(C(CO1)O)O)O

II. PHYSICO-CHEMICAL PROPERTIES

Key physical and chemical properties for sorbitan, mono-9-octadecenoate, (Z) are shown in Table 1.

Table 1: Overview of the physico-chemical properties of sorbitan mono-9-octadecenate, (Z)

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Yellow to amber liquid		HPVIS
Melting Point	223°C (estimated, pressure not provided)		HPVIS
Boiling Point	535°C (estimated, pressure not provided)		HPVIS
Density	1000 kg/m^3 @ 25°C		HPVIS
Vapour Pressure	Negligible		HPVIS
Partition Coefficient (log K_{ow})	5.89 (estimated), temperature not provided		HPVIS
Water Solubility	0.0191 (estimated) (insoluble) @ 25°C		NCBI, 2024
Flash Point	Not Available		-
Auto flammability	Not Available		-
Viscosity	100 m Pa/s		NCBI, 2024
Henry's Law Constant	Not available	-	--

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Environmental fate data of the substance or reasonable surrogates suggests that it will degrade in the environment, not persist, and due to expected metabolism is not likely to bioaccumulate.

The data supporting these conclusions are discussed below.

B. Biodegradation

Sorbitan, mono-9-octadecenoate, (Z) is readily biodegradable. In an OECD 301 C test, degradation was 58% after 14 days and 62% after 28 days (HPVIS). In a read-across, sorbitan stearate (CAS RN [redacted] is readily biodegradable. In an OECD 301 C test, degradation was 88% after 28 days (ECHA) [Kl.score=1].

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

C. Environmental Distribution

No experimental data are available for sorbitan, mono-9-octadecenoate, (Z). Using KOCWIN in EPISUITE™ (EPA, 2019), the estimated Koc value from log Kow is 1,599 L/kg. The estimated Koc value from the molecular connectivity index (MCI) is 2,423 L/kg. Based on these estimated K_{oc} values, the substance is likely to adsorb to soil or sediments, and unlike other more immobile Sorbitan Esters in this category, will have slight mobility.

D. Bioaccumulation

There are no bioaccumulation studies on sorbitan, mono-9-octadecenoate, (Z). Sorbitan, mono-9-octadecenoate, (Z) has an estimated log Kow of 5.89 (EPA, 2019). However, sorbitan, mono-9-octadecenoate, (Z) is expected to be metabolized and excreted. The metabolic pathway involves enzymatic hydrolysis by esterases to D-glucitol and the respective fatty acid. The fatty acids are metabolized by the beta-oxidation pathway and D-glucitol will undergo metabolism by the fructose metabolic pathway in the liver (ECHA). Using the Arnot-Gobas method involving biotransformation in the QSAR model BCFBAF v3.01, the BCF values ranged from 36 to 92 L/kg, indicating a low potential for bioaccumulation (USEPA, 2019).

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Based on read-across to similar sorbitan esters, sorbitan, mono-9-octadecenoate, (Z)is a lipophilic substance with low volatility and low dermal absorption. This substance is expired as CO_2 after metabolic degradation and depending on the cleavage products, biliary excretion with the faeces (fatty acids) and via urine (D-glucitol) is likely. It has low acute oral, inhalation and dermal toxicity. Sorbitan, mono-9-octadecenoate, (Z)is not expected to be irritating to the eyes, or the skin and it is not a skin sensitiser. It has low oral repeated dose toxicity, and it was not reported as genotoxic in any in vitro assay. It is not carcinogenic nor is it a reproductive or developmental toxicant.

B. Toxicokinetics/Metabolism

Metabolism of the sorbitan esters in animals has been reported to occur initially via enzymatic hydrolysis, leading to sorbitan and the corresponding natural fatty acids. Oral gavage studies in rats with radiolabeled sorbitan monostearate (CAS RN [redacted] which is structurally similar to sorbitan, mono-9-octadecenoate, (Z), have demonstrated that about 90% of the sorbitan monostearate dose was absorbed and hydrolyzed to stearic acid and sorbitan (Elder, 1985; Wick, 1953). The resulting sorbitan and fatty acid metabolites, in turn would be expected to be metabolized further (via fatty acid beta-oxidation or carbohydrate metabolic pathways) to either smaller and more polar water-soluble metabolites, which can be excreted in the urine or as carbon dioxide exhaled in the lungs.

As the molecular weight of sorbitan stearate (CAS RN [redacted] ranges between 402.57 and 981.56 g/mol, an absorption of the molecule in the gastrointestinal tract is in general improbable. Sorbitan stearate has a low vapour pressure of < 0.0001 Pa at 25 °C, thus, being of low volatility. Therefore, under normal use and handling conditions, inhalation exposure and thus availability for respiratory absorption of the substance in the form of vapours, gases, or mists is not expected to be significant. However, the substance may be available for respiratory absorption in the lung after inhalation of aerosols, if the substance is melted and sprayed. In humans, particles with aerodynamic diameters below 100 µm have the potential to be inhaled. Particles with aerodynamic diameters below 50 µm may reach the thoracic region and those below 15 µm the alveolar region of the respiratory tract (ECHA, 2008). Lipophilic compounds with a log Pow > 4 that are poorly soluble in water (1 mg/L or less) like sorbitan stearate can be taken up by micellar solubilisation. Overall, a systemic bioavailability of Sorbitan stearate in humans is considered likely after inhalation of aerosols with aerodynamic diameters below 15 µm. Dermal absorption of sorbitan stearate was predicted to be very low with an estimated dermal permeability coefficient (Kp) of 0.068 cm/h and a dermal absorption rate of 0.000037 mg/cm²/h (=0.00000918 mg/cm²/event) (ECHA) [Kl.score=2]. The high log P_{ow} of > 5 implies that Sorbitan stearate may have the potential to accumulate in adipose tissue (ECHA). Sorbitan fatty acid esters will undergo esterase-catalysed hydrolysis, leading to the cleavage products D-glucitol and fatty acids. The log Pow of the first cleavage product D-glucitol is -2.2, indicating a high solubility in water. Consequently, there is no potential for D-glucitol to accumulate in adipose tissue. The second cleavage product, the fatty acids, can be stored as triglycerides in adipose tissue depots or be incorporated into cell membranes. At the same time, fatty acids are also required as a source of energy. Thus, stored fatty acids underlie a continuous turnover as they are permanently metabolized and excreted. Bioaccumulation of fatty acids only takes place, if their intake exceeds the caloric requirements of the organism. Due to the high molecular weight and the insolubility in water, excretion of Sorbitan stearate via urine is unlikely after oral administration. After oral ingestion, sorbitan fatty acid esters will undergo stepwise chemical changes in the gastro-intestinal fluids as a result of enzymatic hydrolysis. As the physico-chemical characteristics of the cleavage products (e.g. physical form, water solubility, molecular weight, log Pow vapour pressure, etc.) will be different from those of the parent substance the predictions based upon the physico-chemical characteristics of the parent substance do no longer apply (ECHA) However, also for both cleavage products, it is anticipated that they will be absorbed in the gastro-intestinal tract. Overall, the available information indicates that sorbitan stearate is expired as CO_2 after metabolic degradation. Moreover, depending on the cleavage products, biliary excretion with the faeces (fatty acids) and via urine (D-glucitol) is likely (ECHA).

C. Acute Toxicity

No studies are available on sorbitan, mono-9-octadecenoate, (Z).

Oral

The oral LD_{50} in rats for sorbitan monopalmitate is >15,900 mg/kg (ECHA) [Kl.score=2].

An OECD Guideline 401 (Acute Oral Toxicity) study was conducted using male and female Wistar rats exposed to 2000 mg/kg bw/day sorbitan stearate (CAS RN [redacted] via oral gavage. No mortality occurred during the study period. The LD_{50} was reported as >2,000 mg/kg bw/day (ECHA) [Kl.score=2].

Inhalation

The 4-hour inhalation LC_{50} value for sorbitan monolaurate (CAS RN [redacted] was reported as >5000 mg/m^3 based on a study conducted using male and female Wistar rats exposed to sorbitan monolaurate via a nose only aerosol for four hours. No mortality was reported in this study. (ECHA) [Kl.score=2].

Dermal

No acute dermal toxicity studies are available.

D. Irritation

Skin

Application of 0.5 g sorbitan palmitate (CAS RN [redacted] to the skin of New Zealand white rabbits for 24 hours under occlusive conditions was not irritating (ECHA) [Kl.score=2].

Eye

An OECD guideline 405 (Acute Eye irritation/Corrosion) study was conducted using an unspecified strain for rabbits exposed to 0.1 grams of sorbitan stearate (CAS RN [redacted] for 7 days. Sorbitan stearate was reported as non irritating in under the conditions of this study (ECHA) [Kl.score =2].

E. Sensitisation

No studies are available for sorbitan, mono-9-octadecenoate, (Z)

F. Repeated Dose Toxicity

Oral

Sorbitan stearate was tested in a combined repeated dose toxicity study with a reproductive/developmental screening (OECD 422) test. Male and female SD rats were dosed by oral gavage with 0, 40, 200, or 1,000 mg/kg sorbitan stearate (CAS RN [redacted] There were no systemic effects that were considered to be treatment-related. The NOAEL for systemic toxicity is 1,000 mg/kg-day, the highest dose tested (ECHA) [Kl.score=2].

Inhalation

No studies are available.

Dermal

No reliable studies are available.

G. Genotoxicity

In Vitro Studies

There are no *in vitro* genotoxicity studies on sorbitan mono-9-octadecenate, (Z). Table 2 shows the results of *in vitro* genotoxicity studies on read-across substances sorbitan stearate (CAS RN [redacted] and sorbitan laurate (CAS RN [redacted]

Table 2: *In vitro* genotoxicity studies on sorbitan stearate and sorbitan laurate

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Bacterial reverse mutation (*S. typhimurium* and *E. coli* strains)	-	-	2	ECHA
Mammalian cell gene mutation (mouse lymphoma L5178Y cells)**	-	-	2	ECHA
Chromosomal aberration (human lymphocytes)**	-	-	2	ECHA

*+, positive; -, negative

In Vivo Studies

No studies are available.

H. Carcinogenicity

No studies are available on sorbitan mono-9-octadecenoate, (Z). Furthermore, there is no evidence that sorbitan fatty acid esters induce gene mutations in bacteria or chromosome aberrations in mammalian cells, as the results of all genotoxicity studies were consistently negative. Furthermore, in the available repeated dose toxicity studies and developmental studies, no substance-related increases in the incidence of hyperplasia or pre-neoplastic lesions were observed. The available and relevant studies do not indicate that sorbitan fatty acid esters fulfil the criteria for classification as germ cell mutagen or that they are able to induce hyperplasia and/or pre-neoplastic lesions. Furthermore, the weight of evidence from all available information leads to the conclusion that sorbitan fatty acid esters are not carcinogenic. Therefore, a carcinogenicity study is scientifically unjustified (ECHA).

Oral

Male and female TO mice were given in their diet 0, 0.5, 2, or 4% sorbitan stearate (CAS RN [redacted] for 80 weeks. The estimated daily intakes were 0, 650, 2,600, and 5,200 mg/kg. Body weights were similar across all groups throughout the study. There were no increases in tumour incidence that were considered to be treatment-related (ECHA) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

There are no studies available.

I. Reproductive Toxicity

No studies are available on sorbitan mono-9-octadecenoate, (Z).

Sorbitan stearate (CAS RN [redacted] was tested in a combined repeated dose toxicity study with a reproductive/developmental screening (OECD 422) test. Male and female SD rats were dosed by oral gavage with 0, 40, 200, or 1,000 mg/kg sorbitan stearate. There were no systemic, reproductive, or developmental effects that were considered to be treatment-related. The NOAEL for reproductive and developmental toxicity is 1,000 mg/kg-day, the highest dose tested (ECHA) [Kl.score=2].

J. Developmental Toxicity

Oral

A combined repeated dose/developmental toxicity screening study was performed according to OECD 422 with sorbitan stearate (CAS RN [redacted] in male and female Sprague-Dawley rats. Seven to 12 rats were daily orally treated with 40, 200, 1000 mg/kg bw/d of the sorbitan stearate. Females were treated 2 weeks before mating through day 4 of lactation (about 40 days) and the males for 42 days. Control animals were treated with the vehicle. In parental animals, no mortality was observed, and no abnormalities related to the treatment. In the offspring, mortality was observed as follows: 2 dams of the 40 mg/kg bw/d dose group lost all pups and an additional dam lost 9/13 pups, potentially due to lack of lactation on day 1. No further mortalities of newborns were observed at any dose. The number of abnormalities seen in the visceral and skeletal tissues in test animals did not differ from spontaneously occurring abnormalities in the controls. The only exception was the occurrence of a filamentous tail in one pup of the 1000 mg/kg bw/d dose group. The effect was considered as not treatment-related but as common effect in Sprague-Dawley rats. With regard to the described effects, a developmental NOAEL of≥1000 mg/kg bw/d was determined (ECHA) [Kl.score=2].

The effects of sorbitan stearate (CAS RN [redacted] on foetal development after oral administration to pregnant animals was also investigated in Wistar rats. The rats were given oral doses 500 or 1000 mg/kg bw/d of sorbitan stearate from day 0 to day 20 of gestation. At sacrifice on day 20 of gestation, no differences between dose and control groups were observed with regard to clinical signs, body weights and post-mortem examinations of organs. One foetus of the highest dose group showed retardation (no further details were given). As this effect was not observed in other foetuses of the same dose group, it was considered to be incidental and not treatment-related. Two foetuses of the 500 mg/kg bw dose group and one fetus of the 1000 mg/kg bw dose groups showed incomplete ossification of cervical vertebral arches. A cervical rib was observed in one control group animal, in four animals of the 500 mg/kg bw/day dose group, and in three foetuses at dosing of 1000 mg/kg bw/d. Asymmetry of sternebrae was observed in four foetuses of the 500 mg/kg bw group and five foetuses of the highest dose group. Incompletely ossified sternebrae was found in 27 foetuses at dosing of 500 mg/kg bw and in 39 foetuses at dosing of 1000 mg/kg bw/d. A lumber rib was observed in one fetus of the 500 mg/kg bw/d dose group and in three control group animals. Since the effects described occurred to the same extent in control and test group animals, the changes were not assumed to be caused by sorbitan stearate, but as natural occurrence in comparison with background data of the test laboratory. In the 1000 mg/kg bw/d dose group, body weight gain of foetuses was slightly suppressed but there was no significant difference when

compared to controls. Therefore, a developmental NOAEL of≥1000 mg/kg bw/d was determined (ECHA) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

There are no studies available.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for sorbitan mono-9-octadecenoate, (Z) follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

There are no repeated dose toxicity studies on sorbitan mono-9-octadecenoate, (Z). Sorbitan monostearate, a structurally similar substance to sorbitan mono-9-octadecenoate, (Z) has been tested in an OECD 422 rat oral gavage study. The NOAEL for systemic, reproductive, and developmental toxicity is 1,000 mg/kg-day. The NOAEL of 1,000 mg/kg-day will be used to derive an oral RfD and drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 10
UF_D (database uncertainty) = 1
Oral RfD = 1,000/(10 × 10 × 1 × 10 × 1) = 1,000/1,000 = 1.0 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)

Drinking water guidance value = (1.0 × 70 × 0.1)/2 = 3.5 mg/L

B. Cancer

There are no carcinogenicity studies on sorbitan mono-9-octadecenoate, (Z). Sorbitan monostearate (CAS RN [redacted] was not carcinogenic to mice. Thus, a cancer reference value was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Sorbitan mono-9-octadecenoate, (Z) does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Acute and chronic studies indicate that the substance is of relatively low toxicity to aquatic organisms. Data to support this conclusion are discussed below.

B. Aquatic Toxicity

Acute Studies

Table 3 lists the results of acute aquatic toxicity studies conducted on sorbitan, mono-9-octadecenoate, (Z) or sorbitan stearate.

Table 3: Acute aquatic toxicity studies on sorbitan, mono-9-octadecenoate, (Z) and sorbitan stearate

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Salmo gairdneri	96-hr LL_{50}	>1,000 [WAF]	2	HPVIS
Oryzias latipes	96-hr LL_{50}	>1,000 [WAF]*	1	ECHA
Daphnia magna	48-hr EL_{50}	>1,000 [WAF]*	2	ECHA
Pseudokirchneriella subcapitata	72-hr EL_{50}	>1,000 [WAF]*	1	ECHA

*Studies conducted on sorbitan stearate (CAS No. [redacted]

Chronic Studies

The 21-day NOELR (no-observed-effect-loading-rate) in a *Daphnia* reproduction test for sorbitan stearate (CAS No. [redacted] is 16 mg/L WAFA (ECHA) [Kl.score=2].

The 72-hr NOELR (no-observed-effect-loading-rate) to *Pseudokirschneriella subcapitata* for sorbitan stearate is 560 mg/L [WAF] (ECHA) [Kl.score=1].

C. Terrestrial Toxicity

No data are available.

D. Calculation of PNEC

The PNEC calculations for sorbitan, mono-9-octadecenoate, (Z) follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels. Acute $E(L)L_{50}$ values are available for fish (>1,000 mg/L WAF), invertebrates (>1,000 mg/L WAF), and algae (>1,000 mg/L WAF). Results from chronic studies are available for invertebrates (16 mg/L WAF) and algae (560 mg/L WAF). On the basis that the data consists of short-term studies for three trophic levels and long-term results studies for two trophic levels, an assessment factor of 50 has been applied to the lowest reported NOELR of 16 mg/L for invertebrates. The $PNEC_{water}$ is 0.32 mg/L WAF.

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 11.83 mg/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (47.3/1280) \times 1000 \times 0.32$
$= 11.83$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 96.9/1000 \times 2400]$
$= 47.3\ m^3/m^3$

Where:
Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 2{,}423 \times 0.04$
$= 96.9$ L/kg

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for sorbitan, mono-9-octadecenoate, (Z) calculated from EPISUITE™ using the MCI is 2,423 L/kg.
f_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 10.3 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (48.46/1500) \times 1000 \times 0.32$
$= 10.3$ mg/kg

Where:
Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]
$Kp_{soil} = K_{oc} \times f_{oc}$
$= 2{,}423 \times 0.02$
$= 48.46\ m^3/m^3$

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for sorbitan, mono-9-octadecenoate, (Z) calculated from EPISUITE™ using the MCI is 2,423 L/kg.
F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Sorbitan, mono-9-octadecenoate, (Z) is readily biodegradable. Thus, it does not meet the screening criteria for persistence.

The estimated BCF values (involving biotransformation) for sorbitan, mono-9-octadecenoate, (Z) ranged from 36 to 92 L/kg. Thus, it does not meet the criteria for bioaccumulation.

The lowest chronic NOELR for sorbitan stearate, the surrogate for sorbitan, mono-9-octadecenoate, (Z), is >0.1 mg/L. The acute $E(L)L_{50}$ values are >1 mg/L. Thus, sorbitan, mono-9-octadecenoate, (Z) does not meet the screening criteria for toxicity.

The overall conclusion is that sorbitan, mono-9-octadecenoate, (Z) is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

No classified.

B. Labelling

No signal word.

C. Pictogram

None

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

Eye Contact

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention.

Ingestion

Rinse mouth with water and then drink a glass of water. Get medical attention. Never give anything by mouth to an unconscious person.

B. Firefighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Keep product and empty container away from heat and sources of ignition. May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon dioxide.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Handle in accordance with good industrial hygiene and safety practice.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

For large amounts: dike spillage and pump off product. For residues: pick up with suitable absorbent material. Dispose of contaminated material as prescribed.

D. Storage and Handling

General Handling

Keep product and empty container away from heat and sources of ignition. Ensure adequate ventilation, especially in confined areas.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for sorbitan, mono-9-octadecenoate, (Z).

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Respiratory protection is not required.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is recommended. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

Sorbitan, mono-9-octadecenoate, (Z) is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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SORBITAN MONOOLEATE POLYOXYETHYLENE DERIVATIVE

This dossier on sorbitan monooleate polyoxyethylene derivative presents the most critical studies pertinent to the risk assessment of sorbitan monooleate polyoxyethylene derivative in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA) and the European Food and Safety Authority (EFSA, 2015). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Sorbitan monooleate polyoxyethylene derivative

CAS RN: [redacted]

Molecular formula: Not available (UVCB substances)

Molecular weight: Not available (UVCB substances)

Synonyms: See below.

SMILES: No available (UVCB substances)

The composition of sorbitan monooleate polyoxyethylene derivative (CAS No. [redacted] is unknown. The CAS No. [redacted] is a generically CAS No. that can include at least the following UVCB substance groups (CIR, 2015):

1. An ethoxylated sorbitan ester of oleic acid with an average of 3 moles of ethylene oxide (e.g., PEG-3-sorbitan oleate). PubChem CID: 78382488

2. A mixture of oleate esters of sorbitol and sorbitol anhydrides, consisting predominantly of the monoester, condensed with approximately 5 moles of ethylene oxide (e.g., Polysorbate 81).

3. An ethoxylated sorbitan ester of oleic acid with an average of 6 moles of ethylene oxide (e.g., PEG-6 sorbitan oleate).

4. An ethoxylated sorbitan ester of oleic acid with an average of 20 moles of ethylene oxide (e.g., PEG-20 sorbitan oleate).

5. A mixture of oleate esters of sorbitol and sorbitol anhydrides, consisting predominantly of the monoester, condensed with approximately 20 moles of ethylene oxide (e.g., Polysorbate 80).

This dossier will include information from the following substances: sorbitan monooleate, ethoxylated (1-6.5 moles ethoxylated), Polysorbate 80, and sorbitan monolaurate, ethoxylated (1-6.5 moles ethoxylated) [CAS RN [redacted]

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the physico-chemical properties of sorbitan monooleate, ethoxylated (1 – 6.5 Moles Ethoxylated) [CAS No. [redacted]

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Organic Liquid	2	ECHA
Melting Point	-32.7°C @ 101.3 kPa -33.9°C @ 101.3 kPa	2 2	ECHA
Boiling Point	No data	-	ECHA
Density	1030 kg/m^3 @ 25°C	2	ECHA
Vapour Pressure	0 Pa @ 20°C (QSAR)	2	ECHA
Partition Coefficient (log K_{ow})	4.51 to 5.06 (QSAR)**@ 25°C	2	ECHA
Water Solubility	0.035 to 0.1 g/L @ 20°C***	1	ECHA
Flash Point	256°C	4	ECHA
Auto flammability	Not flammable in air	-	ECHA
Viscosity	Not applicable for this non-newtonian fluid	-	ECHA
Henry's Law Constant	Not available	-	ECHA

*Data located in REACH database for dehydrated sorbitol, C18 (unsaturated) fatty acid esters, ethoxylated (EC No. 701-203-3).
**QSAR (KOWWIN v1.68): sorbitan monooleate, ethoxylated 5EO and sorbitan monooleate, ethoxylated 3EO, respectively.
***Sorbitan monooleate, ethoxylated 3EO: ~100 mg/L; sorbitan monooleate, ethoxylated 5EO: ~35 mg/L.

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

The substance is likely to biodegrade, has a low potential to bioaccumulate and, based on its non-ionic surfactant properties, will adsorb to soils. The data supporting these conclusions are discussed below.

B. Biodegradation

In an ISO Standard 14593 ready biodegradation test, degradation of Tween 81 (CAS No. [redacted] was 61% after 28 days, indicating ready biodegradability (ECHA) [Kl.score=2].

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017)

C. Environmental Distribution

No experimental data are available for sorbitan monooleate polyoxyethylene derivative. Using KOCWIN v2.00, the estimated K_{oc} values for the main components in sorbitan monooleate, ethoxylated (1-6.5 moles ethoxylated) [CAS No. [redacted] based on the molecular connectivity

index (MCI) ranged from 794 to 1,259 L/kg (ECHA). Based on these estimated K_{oc} values, the substance is likely to adsorb to soil or sediments.

Further, the molecular structure indicates a potential of surface-active properties, which are not considered by the QSAR model calculations. As a result, the adsorption of non-ionic surfactants to soil is generally high (ECHA). Based on these considerations, there is a low potential for mobility.

D. Bioaccumulation

There are no experimental bioaccumulation studies on sorbitan monooleate polyoxyethylene derivative. The bioaccumulation potential was estimated for sorbitan monooleate, ethoxylated (1-6.5 moles ethoxylated) [CAS No. [redacted] using BCFBAF v3.01 (Arnot-Gobas method, including biotransformation). The calculated BCF values were 12.6 to 14.6 L/kg. When biotransformation was excluded, the BCF values were 18.6 to 42.8 L/kg (ECHA). Thus, sorbitan monooleate polyoxyethylene derivative has a low potential for bioaccumulation.

IV. HUMAN HEALTH HAZARD ASSESSMENT

The information in this section is from studies conducted on read-across polysorbates.

Read-across substance Polysorbate 80 is composed of a sorbitan ring with ethylene oxide polymers attached at three different hydroxyl positions. While the number of repeat ethylene oxide subunits varies at each position, their total number equals 20 and is constant for each polysorbate. The major fatty acid side chains of Polysorbate 80 is oleic acid. The commercial polysorbates are complex mixtures, i.e., UVCB (Unknown or Variable Composition, Complex Reaction Products and Biological Materials) substances. The composition data reported in Kerwin et al. (2008) shows that oleic acid ester of Polysorbate 80 is ≥58% of the total number of fatty acid species; the remaining fatty acids are a mixture of both saturated and unsaturated fatty acids. The average molecular weight of Polysorbate 80 is 1,310 g/mol (Kerwin et al., 2008).

A. Summary

The acute toxicity of Polysorbate 80 is low by the oral and dermal routes. It is non-irritating to the skin and eyes, and it is not a dermal sensitizer. Polysorbate 80 is poorly absorbed from the gastrointestinal tract. Dietary studies conducted for up to two years with Polysorbate 80 indicate that it is essentially non-toxic to rats and mice. Polysorbate 20 is not genotoxic. A similar substance to Polysorbate 20 (Polysorbate 80) was not carcinogenic to mice when given in the diet; nor was it carcinogenic to female rats. Male rats showed a marginal increase in the number of benign adrenal medulla pheochromocytomas in the high-dose male rats. Adrenal medulla hyperplasia, a lesion considered to be the precursor to pheochromocytoma, was increased in the low-dose, but not high-dose, male rats. The increased adrenal medulla pheochromocytomas in the Polysorbate 80-treated male rats does not have relevance to humans. This conclusion is based on the lack of genotoxicity of Polysorbate 80, the equivocal finding in the NTP study, and that pheochromocytomas have been associated with poorly metabolized food additives (i.e., polyols such as sorbitol, xylitol, lactitol; lactose) given to animals at high doses and have been regarded as of no significance to humans. Polysorbates have not shown any indication of reproductive or developmental toxicity when tested in rats.

B. Toxicokinetics/Metabolism

Pharmacokinetic and metabolism studies are available for Polysorbate 20 and 80. These polysorbates have similar absorption, distribution, metabolic fate and elimination, which would be expected given that they only differ in their fatty acid side-chain.

Following the oral administration of polysorbates, the ester link of the polysorbate molecule is hydrolysed in the gastrointestinal tract by pancreatic lipase; the fatty acid moiety that is released is absorbed and metabolized by the same pathways that exist for long-chain fatty acids from dietary sources. The remaining polyoxyethylene sorbitan moiety is not well absorbed from the gastrointestinal tract and is excreted in the feces. The polyoxyethylene sorbitan moiety that is absorbed is not metabolized and is excreted in the urine (CIR, 1984).

Polysorbate 20 with [^{14}C]-labelled lauric acid was fed to rats. Twenty-hours later, 80% of the lauric acid was oxidized and expired as CO_2; 12% was in the carcass; 4% was not absorbed from the gastrointestinal tract; 2.5% was excreted in the urine; and 1.2% was in the liver (Nelson et al., 1966).

In a study with the [^{14}C]-label in the polyoxyethylene portion of Polysorbate 20, 82–90% of the radioactivity was excreted in the feces and 8–11% in the urine, but little to no radioactivity was found in the liver, carcass or expired CO_2 (Nelson et al., 1966). When the sorbitol moiety of Polysorbate 80 was labeled, 91% of the radioactivity was recovered in the feces, 2.1% in the urine, 1.6% in the carcass, and none in expired CO_2, liver, kidney, spleen, adrenals, brain, gonads or fat (Treon et al., 1967).

A similar pattern of polysorbate metabolism occurs in humans as in rats following oral administration (Culver et al., 1951). In four subjects fed 4.5 g of unlabelled Polysorbate 80 per day (study duration not stated), 90–97% of the polyoxyethylene fraction was excreted in the feces, and 2.3–3.1% was excreted in the urine. The analytical method measured the oxyethylene value of Polysorbate 80 and could not distinguish between the free polyoxyethylene moiety and the unhydrolyzed parent ester. Since no fatty acids containing the polyoxyethylene moiety were detected in the urine, it was concluded that it was polyoxyethylene sorbitan excreted in the urine.

The Polysorbates are rapidly hydrolysed by blood esterases following intravenous administration. In a study using mice, plasma concentrations of Polysorbate 80 rapidly declined to about 66% of the initial concentration by 15 minutes after post-bolus intravenous injection, with a plasma concentration of <0.05% (van Tellingen et al., 1999). The released fatty acids are metabolized similar to other fatty acids in the blood, and the remaining polyoxyethylene moiety is not metabolized, but is excreted primarily in the urine (Nelson et al., 1966). A small percentage is found in the feces, indicating biliary excretion (Nelson et al., 1966; Treon et al., 1967).

C. Acute Toxicity

The oral LD_{50} values for Polysorbate 20 in rats are >36,700 mg/kg (ECHA) [Kl.score=4]; >33,800 mg/kg (ECHA) [Kl.score=4]; and >30 mL/kg (ECHA) [Kl. score=4]. The oral LD_{50} value for mice is >30 mL/kg (ECHA) [Kl.score=4].

No acute inhalation studies are available for the Polysorbates.

There are no acute dermal toxicity studies on Polysorbate 20. The dermal LD_{50} value in rats for Polysorbate 60 (polyoxyethylene sorbitan monostearate) is >2,000 mg/kg (ECHA) [Kl.score= 4].

D. Irritation

Application of 0.5 mL Polysorbate 20 to the skin of rabbits for 4 hours under semi-occlusive conditions was not irritating (ECHA) [Kl.score=1]. The mean of the 24-, 48- and 72-hour scores were 0.89 for erythema and 0.00 for edema (ECHA) [Kl.score=1].

Instillation of 0.1 mL Polysorbate 20 into the eyes of rabbits was not irritating. The mean of the 24-, 48- and 72-hour scores were: 0.00 for corneal opacity; 0.00 for iridial lesions; and 0.00 for conjunctival redness (ECHA) [Kl.score=2].

E. Sensitisation

Polysorbate 20 was not considered a skin sensitizer when tested in a guinea pig maximization test (ECHA) [Kl.score=1].

F. Repeated Dose Toxicity

The polysorbates have been well-studied in multiple species, including rats, mice, hamsters, monkeys and dogs. A complete review of all the studies can be found in JECFA (1974) and EFSA (2015). Two of the more reliable polysorbate studies were conducted on polyoxyethylene sorbitan monostearate or Polysorbate 60 (CAS No. [redacted]

There does not appear to be any toxicological differences between the polysorbates. No target organs were identified in these studies, and diarrhea is the primary non-neoplastic effect at concentrations of >5% in feed. The diarrhea is related to the composition of the diet. Polysorbates in diets without dietary fiber resulted in exfoliated or damaged brush border membrane of the small intestinal cells, inducing diarrhea and reduced body weight (Kimura et al., 1982).

<u>Oral</u>

Male and female Sprague-Dawley rats were given 0, 1, 2 or 5% Polysorbate 60 in their feed for 13 weeks. Effects were noted only in the 5% dietary group and consisted of diarrhea, increased water consumption, enlarged cecum and slightly decreased hemoglobin. The NOAEL for this study is 2% in the diet, which corresponds to 1,355 and 1,565 mg/kg-day for males and females, respectively (BIBRA, 1981; EFSA, 2015) [Kl.score=2].

Male and female Osborne-Mendel rats were given 0, 2, 5, 10 or 25% Polysorbate 60 in their feed for 24 months. There was no treatment-related mortality or in feed consumption. In the 25% dietary group, there was severe diarrhea and reduced body weight gain the males. Liver weights were increased with no corresponding histopathologic changes. The cecum was also enlarged, but the histopathologic examination showed no treatment-related changes. The only changes seen in the 10% and 5% dietary groups were moderate and slight diarrhea, respectively. The NOAEL for this study is 2% in the diet, which corresponds to 1,000 mg/kg-day (Fitzburgh et al., 1959; EFSA, 2015) [Kl.score=2].

Male and female F344/N rats were given 0, 3,100, 6,200, 12,500, 25,000 or 50,000 ppm Polysorbate 80 in their feed for 13 weeks. There were no treatment-related effects. The NOAEL for this study is 50,000 ppm in the diet, which corresponds to 4,500 mg/kg-day (NTP, 1992a) [Kl.score=2].

Male and female B6C3F$_1$ mice were given 0, 3,100, 6,200, 12,500, 25,000 or 50,000 ppm Polysorbate 80 in their feed for 13 weeks. There were no treatment-related effects. The NOAEL for this study is 50,000 ppm in the diet, which corresponds to 10,000 mg/kg-day (NTP, 1992a) [Kl.score=2].

Male and female F344/N rats were given in their feed 0, 25,000 or 50,000 ppm Polysorbate 80 in their feed for two years. There was reduced survival in the male, but not female, rats; there were no other non-neoplastic treatment-related effects. The NOAEL for this study is 50,000 ppm in the diet, which corresponds to 2,500 mg/kg-day (NTP, 1992a) [Kl.score=2].

Male and female B6C3F$_1$ mice were given 0, 25,000 or 50,000 ppm Polysorbate 80 in their feed for two years. The 50,000 ppm animals had forestomach squamous hyperplasia, and the 50,000 ppm females had forestomach ulcers. These effects were the localized effects of the test material and not due to systemic toxicity. The NOAEL for systemic toxicity in this study is 50,000 ppm in the diet, which corresponds to 3,700 mg/kg-day (NTP, 1992a) [Kl.score=2].

Inhalation

No data are available.

Dermal

No data are available.

G. Genotoxicity

In Vitro Studies

The *in vitro* genotoxicity studies on Polysorbate 80 are presented in Table 2.

Table 2: *In vitro* genotoxicity studies on Polysorbate 80

Test System	Results*		Klimisch Score	Reference
	-S9	+S9		
Bacterial reverse mutation (*S. typhimurium*)	-	-	2	EFSA, 2015
Chromosomal aberration (Chinese hamster fibroblasts)	-	-	2	EFSA, 2015

*+, positive; -, negative

In Vivo Studies

Male CBA mice were given a single oral gavage dose of 0 or 75 mg/kg Polysorbate 80. There was no significant increase in micronuclei in the bone marrow cells of the treated mice compared with controls (Jenssen & Ramel, 1980) [Kl.score=2].

H. Carcinogenicity

Oral

The NTP conducted two-year dietary carcinogenicity studies on Polysorbate 80 in F344/N rats and B6C3F$_1$ mice. The dietary levels were 0, 25,000 or 50,000 ppm Polysorbate 80. The average daily

intakes in rats were 0, 1,174 and 2,415 mg/kg-day for males and 0, 1,344, and 2,745 mg/kg-day for females. There was no evidence of carcinogenic activity for Polysorbate 80 in female rats or in male and female mice at any dose level. In male rats, the incidence of benign or malignant adrenal medulla pheochromocytomas (combined) was significantly increased in the high-dose males (21/50, 19/50, and 29/50 for the 0, 25,000 and 50,000 ppm groups, respectively). The incidence of the high-dose group (58%) exceeded the upper historical control range of 48% for males from the current NTP 2-year dietary studies. But when NTP evaluated the historical control incidence in male F344/N rats based on a broader range of NTP studies than those included in the recent historical control data, the incidence of pheochromocytomas in untreated male rats was as high as 65% (Haseman et al., 1990). The increased incidence of pheochromocytomas in the high-dose males was due to an increase in the number of benign pheochromocytomas occurring in a single gland. The incidence of hyperplasia of the adrenal medulla was increased in the low-dose male rats, but not in the high-dose male rats (11/50, 22/50, 12/50, respectively). The NTP concluded that the marginal increased incidence of pheochromocytomas in combination with the increased incidence of hyperplasia were considered to be an equivocal finding (NTP, 1992a) [Kl.score=2].

A review of the NTP (1992a) data by the EU Scientific Committee on Foods (SCF, 1995) and a subsequent review by the European Food Safety Authority (EFSA, 2015) concluded that the increased adrenal medulla pheochromocytomas in the Polysorbate 80-treated male rats did not have relevance to humans. This conclusion was based on the lack of genotoxicity of Polysorbate 80, the equivocal finding in the NTP study, and that pheochromocytomas have been associated with poorly metabolized food additives (i.e., polyols such as sorbitol, xylitol, lactitol; lactose) given to animals at high doses and have been regarded as of no significance to humans. In the long-term (mainly 2-year) studies on polyols and lactose, adrenal medullary hyperplasia and pheochromocytomas occurred at dietary concentrations of ≥5% and usually at 10–20%, with no proliferative lesions and tumours seen at lower concentrations (reviewed in Lynch et al., 1996). The pheochromocytomas in these studies were seen in rats, but not in mice and dogs, with male rats having a higher incidence than female rats. In their evaluation of the human significance of these tumours from polyols and lactose, Lynch et al. (1996) discuss the significant morphological, functional and etiological differences between rats and humans with regards to the nature of proliferative lesions that occur in the adrenal medulla. They conclude that the rat is much more susceptible to induction of proliferative lesions of the adrenal medulla compared with humans. There are also mechanistic data on polyols and lactose that support a high-dose rat-specific mode-of-action for these adrenal medulla pheochromocytomas. Although there are no mechanistic studies on Polysorbate 80, the similarity in the toxicity profile of Polysorbate 80 with these poorly metabolized carbohydrates would suggest that the pheochromocytomas seen in the male rats in the NTP two-year carcinogenicity study also occurs by a high-dose rat-specific mode-of-action.

<u>Inhalation</u>

There are no studies available.

<u>Dermal</u>

There are no studies available.

I. Reproductive Toxicity

In a three-generation reproductive toxicity study, male and female rats were given in their feed 0, 5, 10 or 20% (0, 2,500, 5,000 or 20,000 mg/kg-day) Polysorbate 80. Diarrhea was seen in the >10% parental animals. There was reduced postnatal survival in the pups in the 20% dietary group as well as reduced lactation and breeding efficiency. There were no other effects that were indicative of

reproductive or developmental toxicity. The NOAEL for reproductive and developmental toxicity is 10% in the diet, which corresponds to 5,000 mg/kg-day (Oser and Oser, 1956a,b; Oser and Oser, 1957a,b) [Kl.score=2].

J. Developmental Toxicity

Oral

Pregnant female SD rats were dosed by oral gavage with 0, 500 or 5,000 mg/kg Polysorbate 80 on GD 6–15. At 500 and 5,000 mg/kg, liver weights were slightly increased in the maternal dams, but the change was not enough to be considered adverse. There was no indication of developmental toxicity. The NOAEL for maternal toxicity is 5,000 mg/kg-day. The NOAEL for developmental toxicity is 5,000 mg/kg-day, the highest dose tested (NTP, 1992b; Price et al., 1994) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

There are no studies available.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for Polysorbate 80 follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

A two-year carcinogenicity study was conducted in rats given 0, 25,000 or 50,000 ppm Polysorbate 80 in feed (NTP, 1992a). For non-cancer effects, there were no adverse findings at any dose level. In female rats, there were no carcinogenic effects; but in the male rats, there was a marginal increase in the number of benign adrenal medulla pheochromocytomas in the high-dose male rats. Adrenal medulla hyperplasia, a lesion considered to be the precursor to pheochromocytoma, was increased in the low-dose, but not high-dose, male rats. The NOAEL for this study is 25,000 ppm for male rats, which corresponds to average daily intake of 1,174 mg/kg-day. The NOAEL of 1,174 mg/kg-day will be used to derive an oral reference dose and drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 1
UF_D (database uncertainty) = 1
Oral RfD = 1,174/(10 × 10 × 1 × 1 × 1) = 1,174/100 = <u>12 mg/kg/day</u>

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (11.7 × 70 × 0.1)/2 = 41 mg/L

B. Cancer

A two-year dietary carcinogenicity study on Polysorbate 80 showed a marginal increase in the number of benign adrenal medulla pheochromocytomas in the high-dose male rats. Adrenal medulla hyperplasia, a lesion considered to be the precursor to pheochromocytoma, was increased in the low-dose, but not high-dose, male rats. he increased adrenal medulla pheochromocytomas in the Polysorbate 80-treated male rats did not have relevance to humans. This conclusion was based on the lack of genotoxicity of Polysorbate 80, the equivocal finding in the NTP study, and that pheochromocytomas have been associated with poorly metabolized food additives (i.e., polyols such as sorbitol, xylitol, lactitol; lactose) given to animals at high doses and have been regarded as of no significance to humans. A cancer reference value for Polysorbate 80 was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Sorbitan monooleate polyoxyethylene derivative does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Based on read across from a similar substance, acute and chronic toxicities are relatively low. Data to support this conclusion are discussed below.

B. Aquatic Toxicity

Acute Studies

There are no adequate aquatic toxicity studies on sorbitan monooleate polyoxyethylene derivative. Aquatic toxicity data have been read-across from sorbitan monolaurate, ethoxylated (1-6.5 moles ethoxylated) [CAS No. [redacted] Table 3 lists the results of acute aquatic toxicity studies conducted on Sorbitan Monolaurate, Ethoxylated (1-6.5 Moles Ethoxylated).

Table 3: Acute aquatic toxicity studies on sorbitan monolaurate, ethoxylated (1-6.5 Moles Ethoxylated) [CAS No. [redacted]

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Brachydanio rerio	96-hr LL50	>100 [WAF]	2	ECHA
Pseudokirchneriella subcapitata	72-hr EL50	58.84 [WAF]	2	ECHA

Chronic Studies

The 21-day NOELR (No-Observed-Effect-Loading-Rate) for sorbitan monolaurate, ethoxylated (1-6.5 moles ethoxylated) [CAS No. [redacted] in a Daphnia reproduction test was 10 mg/L WAF (ECHA) [Kl.score=2].

The 72-hr EL_{10} for sorbitan monolaurate, ethoxylated (1-6.5 moles ethoxylated) [CAS No. [redacted] to Pseudokirchneriella subcapitata is 19.05 mg/L WAF (ECHA) [Kl. score = 2].

C. Terrestrial Toxicity

No studies are available.

D. Calculation of PNEC

The PNEC calculations for sorbitan monooleate polyoxyethylene derivative follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for two trophic levels. Acute $E(L)L_{50}$ values are available for fish (>100 mg/L WAF) and algae (58.84 mg/L WAF). The EL_{10} or NOELR values from chronic studies are available for invertebrates (10 mg/L WAF) and algae (58.8 mg/L WAF). On the basis that the data consist of short-term and long-term studies from two trophic levels, an assessment factor of 50 has been applied to the lowest reported EL_{10} value of 10 mg/L for *Daphnia*. The $PNEC_{water}$ is 0.2 mg/L [WAF].

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 3.90mg/kg sediment wet weight.

The calculations are as follows:

$$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$$
$$= (25/1280) \times 1000 \times 0.2$$
$$= 3.90 \text{ mg/kg}$$

Where:

$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]
$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$

$= 0.8 + [(0.2 \times 50.36/1000 \times 2400]$
$= 25.0\ m^3/m^3$

Where:

Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 1259 \times 0.04$
$= 50.36$ L/kg

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for for sorbitan monooleate, ethoxylated (1-6.5 moles ethoxylated) [CAS No. [redacted] calculated from EPISUITE™ using the MCI ranged from 794 to 1,259 L/kg. A value of 1,259 L/kg was used for the calculation.

f_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 3.4 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (25.18/1500) \times 1000 \times 0.2$
$= 3.4$

Where:

Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]
$Kp_{soil} = K_{oc} \times f_{oc}$
$= 1{,}259 \times 0.02$
$= 25.18\ m^3/m^3$

Where:

K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for sorbitan monooleate, ethoxylated (1-6.5 moles ethoxylated) [CAS No. [redacted] calculated from EPISUITE™ using the MCI ranged from 794 to 1,259 L/kg. A value of 1,259 L/kg was used for the calculation.
F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Sorbitan monooleate polyoxyethylene derivative is readily biodegradable and thus does not meet the screening criteria for persistence.

The measured BCF in fish ranges from 12.6 to 14.6 L/kg. Thus, sorbitan monooleate polyoxyethylene derivative does not meet the criteria for bioaccumulation.

The NOECs from the chronic aquatic toxicity studies on sorbitan monooleate polyoxyethylene derivative are > 0.1 mg/L. The acute $E(L)C_{50}$ values from the acute aquatic toxicity studies on sorbitan monooleate polyoxyethylene derivative are > 1 mg/L. Thus, sorbitan monooleate polyoxyethylene derivative does not meet the criteria for toxicity.

The overall conclusion is that sorbitan monooleate polyoxyethylene derivative is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

Not Classified

B. Labelling

No signal word.

C. Pictogram

None.

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

Eye Contact

Rinse immediately with plenty of running water. If easy to do, remove contact lenses. Get medical attention if symptoms persist.

Skin Contact

Wash with soap and water. Get medical attention if symptoms occur.

Inhalation

Treat symptomatically. Move to fresh air. Get medical attention if symptoms persist.

Ingestion

Rinse mouth with water and then drink plenty of water. Never give anything by mouth to an unconscious person. Seek medical attention.

B. Firefighting Information

Extinguishing Media

Water spray, dry chemical, foam, carbon dioxide.

Specific Exposure Hazards

None known.

Special Protective Equipment for Firefighters

Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

C. Accidental Release Measures

Personal Precautions

Wear appropriate personal protective equipment.

Environmental Precautions

Not regarded as dangerous to the environment.

Steps to be Taken if Material is Released or Spilled

Absorb spill with inert absorbent material, then place in a container for chemical waste.

D. Storage and Handling

General Handling

No special precautions are necessary beyond normal good hygiene practices.

Other Handling Precautions

Wash hands thoroughly after handling.

Storage

Keep container closed.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for Polysorbate 80.

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Respiratory protection is not required.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Eyewash fountains and safety showers must be easily accessible.

F. Transport Information

Polysorbate 80 is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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SOYBEAN OIL

This dossier on soybean oil presents the most critical studies pertinent to the risk assessment of soybean oil in its use in coal seam or shale gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

NICNAS has assessed soybean oil in an Inventory Multi-tiered Assessment and Prioritisation (IMAP) Tier 1 assessment and concluded that it poses no unreasonable risk to human health or the environment. Soybean oil is a substance primarily composed of glycerides. They are expected to be rapidly and ultimately degradable and to have low aquatic toxicity. This substance and its degradation products are unlikely to cause harm in the environment.[1]

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Soybean Oil

CAS RN: [redacted]

Molecular formula: Not applicable

Molecular weight: Not applicable

Synonyms: A6OIL;CAP 18;D04962;HY 3050;CT 7000; Soy oil; soybean; SOYA OIL; Bionatrol; CLINOLEIC.

SMILES:

II. PHYSICO-CHEMICAL PROPERTIES

Key chemical and physical properties for soybean oil are shown in Table 1.

Table 1: Overview of the physico-chemical properties of soybean oil

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Oily; Colourless to Yellow Liquid	2	Chemical Book
Melting Point	-10 to -6°C @ 101.3 kPa	---	IPMP
Boiling Point	Crude: 185°C; Refined & Bleached 228-234°C @ 101.3 kPa	---	IPMP
Density	917 kg/m^3@ 25°C (lit.)	2	Chemical Book
Vapour Pressure	347.97 Pa		IPMP

[1] https://www.industrialchemicals.gov.au/chemical-information/search-assessments-keywords?keywords=soybean+oil

Property	Value	Klimisch Score	Reference
Partition Coefficient (log K_{ow})	1.36	---	IPMP
Water Solubility	Immiscible with water	2	Chemical Book
Flash Point	328°C	---	IPMP
Auto flammability	363°C	---	IPMP
Viscosity	60 h mPa s	---	IPMP
Henry's Law Constant	No data	---	

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

Environmental fate data was not available for soybean oil. Environmental fate properties were evaluated using read-across for a similar substance in the group: fatty acids, soybean oil, conjugated. Substances in this group similar in chain length to fatty acids found in soybean oil are insoluble, immobile and have high adsorption to soil and sediment. Fatty acids occur naturally in all aquatic organisms and are ubiquitous in the aquatic environment, where fatty acids are predominantly readily biodegraded in an aerobic environment by microorganisms. As fatty acids are naturally stored in the form of triacylglycerols primarily within fat tissue until they are used for energy production (fat storage tactic), it is therefore considered that there will be no risk to aquatic organisms from potential bioconcentration/biomagnification of fatty acids (ECHA).

B. Partitioning

In water, fatty acids are abiotically stable. Based on high insolubility and molecular structure (aliphatic, mostly saturated carbon chains), hydrolysis is not a relevant degradation pathway. Direct photolysis is not expected to contribute appreciably to the overall breakdown rate in water and soil, since the environmental degradation of these substances is predominantly of biotic nature (ECHA).

C. Biodegradation

The biodegradation data for the members of the fatty acids category includes standard biodegradation studies as well as modelling data (QSAR). Most of the experimental results revealed ready biodegradability which was supported by reliable QSAR predictions. As summarized in the category justification, the members of the fatty acids will predominantly ready biodegrade (ECHA).

If a chemical is found to be readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

D. Environmental Distribution

Based on the chemical structure and physical properties (insoluble), soybean oil is expected to have high adsorption to soil or sediment and be immobile. Estimated soil organic carbon partition coefficient (K_{oc}) values for read-across linoleic acid (CAS RN [redacted] was 11,360 (ECHA) [Kl. Score = 2].

E. Bioaccumulation

A fish bioaccumulation study is available for the analogue substance C12 fatty acid-sodium laurate, which showed negligible evidence of bioaccumulation potential in fish tissues with an estimated BCF of 255 L/kg after 28 days exposure (ECHA) [Kl. Score = 2].

As fatty acids are naturally stored in the form of triacylglycerols primarily within fat tissue until they are used for energy production (fat storage tactic), it is therefore considered that there will be no risk to aquatic organisms from potential bioconcentration/biomagnification of fatty acids (ECHA).

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

Soybean oil and derivatives have low potentials for acute toxicity, non-irritating to the skin and eyes and are not sensitisers. Soybean oil and derivatives have demonstrated low toxicity potential in several repeated dose studies. No data were available to evaluate its genotoxicity or carcinogenicity. It is not a reproductive or developmental toxicant.

B. Metabolism

Rats were given a single oral dose of a soybean extract containing 74 µmol genistein and 77 µmol daidzein/kg as conjugates, the urinary excretion of daidzein and genistein was 17.9% and 11.9%, respectively, over a 48-h post-dose period. No other details regarding this study were provided (CIR).

In a human study, 11 German post-menopausal women were given a bolus dose of a commercial soy extract. Sulfoglucuronides were the major metabolites of daidzein and genistein in the plasma, and 7-O-glucuronides were the predominant metabolites in the urine (CIR).

C. Acute Toxicity

No acute oral, dermal, or inhalation toxicity studies available for soy-derived ingredients. However, an oral toxicity study with soybean hull extract was conducted. Sprague-Dawley rats (n = 6), as well as C57BL/6 mice (n = 6) were given a single oral dose of black soybean hull extract (2500 mg/kg bw) via gavage. Control animals were given purified water (n = 3). Rats were observed for 14 days, and mice were observed for 15 days for signs of morbidity or mortality. No deaths, significant decreases in body weight, or gross pathological abnormalities were observed in either species. The LD_{50} was reported to be greater than 2500 mg/kg bw in rats and mice (CIR).

D. Irritation

<u>Dermal</u>

The dermal irritation potential of soybean oil was assessed in a Human Repeat Insult Patch Test (HRIPT). A sample containing 39% soybean oil was applied under occlusion to the backs of 108 participants. No effects were observed. In this study, soybean oil was not a dermal sensitiser (CIR).

The irritation potential of a cosmetic water-in-oil emulsion incorporating 4% soybean extract was studied in 11 subjects. One gram of base emulsion and emulsion with soy was used to treat sites, and covered with a surgical dressing for 48 h. It was not stated whether or not the dressing used was occlusive. No irritation was observed (CIR).

The irritation potential of a mixture containing water and Glycine Soja (Soybean) Seedcake Extract (13%) was studied in 10 subjects. The test material was applied to the skin at a concentration of 5% and covered with an occlusive patch for 48 h. The test substance was considered to be non-irritating (CIR).

The irritation potential of a black soybean sprout extract (4 or 40 mg/mL) was studied in 30 subjects (15/sex). Extracts were applied on the arm, under a patch, for 24 h. It was not stated whether or not the dressing used was occlusive. No other details regarding this study were provided. No signs of irritation were observed in any subject (CIR).Eye

The ocular irritation potential of black soybean sprout extract (4 mg/mL and 40 mg/mL) was studied using a hen's egg test chorioallantoic membrane (HET-CAM) assay. Sodium dodecyl sulfate (0.4% and 4%) was used as a positive control, and 0.9% saline was used as a negative control. Similar results were observed in both the negative control group and groups treated with the soybean sprout extract. The test substance was considered to be non-irritating. No other details regarding this study were provided (CIR).

A neutral red release assay was performed to evaluate the ocular irritation potential of a mixture containing water and Glycine Soja (Soybean) Seedcake Extract (13%). Rabbit cornea fibroblasts were exposed to the test substance at concentrations of 5 - 50%. The IC_{50} (i.e., the concentration causing 50% mortality) was greater than 50%. (The percent mortality observed at the dilution of 50% was less than 20%). Thus, the cytotoxicity of the test substance was considered to be negligible, and the mixture non-irritating to the eye (CIR).

E. Sensitisation

In vitro

The sensitising potential of an aqueous trade name mixture containing water Glycine Max (Soybean) Callus Culture (13 – 18%), citric acid (1.5%), sodium benzoate (0.2%), and potassium sorbate (0.1%), was tested. In this assay, the expression of CD80 and CD86 were evaluated in a monocyte cell line. The test substance was predicted to be non-sensitising (CIR).

Clinical

The sensitisation potential of soybean oil was assessed in a HRIPT. A sample containing 39% soybean oil was applied under occlusion to the backs of 108 participants. No effects were observed. In this study, soybean oil was not a sensitiser (CIR).

F. Repeated Dose Toxicity

Oral

Sprague-Dawley IGS rats (6/sex/group) were given 0, 0.5, 1.5, or 5% black soybean extract in the diet for 28 days. No deaths or abnormalities regarding the general conditions of the animals were reported throughout the study. At week 4, a statistically significant increase in urinary potassium values were found in females receiving 5% black soybean extract compared to controls. No treatment-related hematological adverse effects were observed. Platelet count levels were significantly lower in all dosed males; however, changes were minimal, and values were within historical control data. Significant elevation of mean corpuscular volumes and reticulocytes levels were noted in the highest dosed males; however, these changes were also minimal and values were within historical control data. A statistically significant increase in alkaline phosphatase enzymes was

found in male rats given 1.5% black soybean extract; however, these changes were not dose-dependent. A statistically significant lowering of relative epididymis weights was found in all extract-dosed males. In addition, a statistically significant but non-dose-dependent elevation of relative heart weight was found in females given 0.5% black soybean extract (CIR).

The systemic toxicity a soybean extract was studied in F344 rats (40 rats/sex). The ground extract was mixed into the diet for 13 weeks at concentrations of 0, 1.25, 2.5, and 5% (equivalent to doses of 707.2, 1449.1, and 2830.4 mg/kg/day, respectively, in males and 751.8, 1498.6, and 3028.1 mg/kg/day, respectively, in females). The composition of the extract was 94% saponins and 6% isoflavones (3.78 daidzein, 1.6% glycitein, 0.6% genistein). Neither mortality nor deterioration in general conditions were observed during the course of the study. Results given in this study did not specify which solvent was used when stating extract-induced effects. Statistically significant body weight reductions were noted in males treated with 5% soybean extract, and in all treated females. Statistically significant decreases in red blood cell count, hematocrit levels, and an increase in mean corpuscular volume were detected in males given 5% extract. This effect was not seen in females. Statistically significant, but minimal increases in total protein, albumin, calcium, and aspartate aminotransferase were found in males treated with 2.5% or higher. In females, significant increases of potassium and decreases in chloride were observed in the 5% group. Males in the 5% group displayed a decrease in absolute heart and spleen weights. Dose-dependent decreases in absolute brain weights were observed in male rats dosed with 2.5% and higher. A statistically significant increase in absolute liver weight was observed, in a dose-dependent manner, in all treated animals. Relative kidney weights were also increased in the highest dosed groups of both sexes. Females in the high-dose group displayed a statistically significant decrease in absolute lung weight. Dose-dependent decreases in the absolute weights of the heart and spleen were observed in females at 2.5% and 5%. Soybean-extract related effects were noted in the prostate, vagina, and ovaries. Male rats in the 5% group displayed epithelial atrophy in the ventral prostate, accompanied by cytoplasmic vacuolation and decreases of the luminal secretory fluid. In female rats treated with 2.5% and above, increased incidences of mucification and atrophy of the vaginal epithelium, as well as increased atretic follicles, were observed (CIR).

C57BL/6 mice (11 males and 12 females/group) were fed a diet supplemented with 0, 2, or 5% of a black soybean hull extract (acidic water and ethanol used as the extraction agent) for 26 weeks. The mean intake of the extract in males and females was 1468.9 and 2621 mg/kg bw/day, respectively, in the 2% treated group, and 5074.1 and 7619.9 mg/kg bw/day, respectively, in the 5% treated group. A significant reduction in body weights was noted in 5% extract-exposed males compared to 2% extract-exposed males and control males. At week 26, the abdominal fat of 5% extract-exposed males was 40% lower than that of controls. This effect was not seen in females. The white blood cell count in 5% extract-exposed males and red blood cell count, hemoglobin, and hematocrit levels in 5% extract-exposed females were significantly increased compared to control animals. Triglyceride and chloride levels in males treated with 5% extract were significantly decreased. In female animals, triglyceride and blood urea nitrogen levels were decreased in the 5% extract-exposed group. In males treated with 5% extract, an increase in the relative weights of the kidney, spleen, and brain was apparent. In the same dosing group, a decrease in the relative weight of the spleen was noted. In females treated with 5% extract, absolute weights of the heart, liver, and kidney were decreased. No significant changes in final body weights were noted in any dosed females. In animals dosed with both 2% and 5% soybean seedcoat extract, in the duodenum, slight pigment accumulation in histiocytes of the lamina propria was found. Slight accumulation of pigment in Kupffer cells of the liver was apparent in 5% extract-exposed males and females. The study authors identified the 5% dietary concentration (5074.1 mg/kg bw/day males; 7617.9 mg/kg bw/day females) as the no-observed adverse-effect-level (NOAEL) for mice (CIR).

Inhalation

No data available

Dermal

No data available

G. Genotoxicity

No data available

H. Carcinogenicity

Oral

No data available

Inhalation

No data available

Dermal

No data available

I. Reproductive Toxicity

The potential reproductive toxicity of the soybean was tested in a study involving 5 male albino rats/group. Male rats were treated with processed soybean meal in the diet at 0, 100, 200, and 300 mg/kg bw for 65 days. Each treated male rat was mated with 3 untreated female rats. No statistically significant effect of soybean meal on the weight of the testes and epididymis was observed. Sperm viability and sperm count were significantly reduced in a dose-dependent manner. In addition, sperm head abnormality was significantly increased in a dose-dependent manner. Rats in the control group displayed seminiferous tubules at various stages of development. Rats in the 100 mg/kg bw group had testicular tissues with compacted interstitial spaces, mild haemorrhaging along the Sertoli cells, and slight degeneration of the spermatids. Rats treated with 200 mg/kg bw displayed similar effects, and rats treated with 300 mg/kg bw displayed adverse effects such as testicular tissues with inflammation of interstitial cells, severe haemorrhaging along the Sertoli cells, and excessive degeneration of spermatids, and necrosis. The conception rate of female rats mated with treated males was reduced in a dose dependent manner when compared to controls. The NOAEL was less than 100 mg/kg bw/day, the lowest dose tested (CIR).

J. Developmental Toxicity

Oral

No data available

Inhalation

No data available

Dermal

No data available

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for soybean oil follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

In a repeated-dosed oral toxicity study with soybean oil, NOAELs of 707.2 mg/kg bw/day and 751.8 mg/kg bw/day were established in males and females, respectively, based on observed dose-dependent systemic effects. The NOAEL of 707 mg/kg bw/day will be used to derive an oral RfD and drinking water guidance value.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 10
UF_D (database uncertainty) = 1
Oral RfD = 707/(10 × 10 × 1 × 10 × 1) = 707/1000 = 0.71 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (0.71 × 70 × 0.1)/2 = 2.49 mg/L

B. Cancer

There are no experimental data are available

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

Soybean oil does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

Soybean oil is expected to readily biodegrade be of low toxicity to environmental receptors.

B. Aquatic Toxicity

No study is available on the aquatic toxicity of fatty acids, soybean oil, conjugated (CAS RN 1176286 - 43 -3) with fish, invertebrates or algae.

Soybean oil is of low acute toxicity concern to fish and invertebrates based on studies conducted on the surrogate compound glycerol trioleate (CAS RN [redacted] The LC_{50} value of glycerol trioleate to fish has been reported to be 10,000 mg/L. The EL_{50} of glycerol trioleate (WAF) to Daphnia indicates that it is considerably greater than its water solubility (Willing et al., 2001).

C. Terrestrial Toxicity

Fatty acids occur in soils naturally, are part of physiological pathways and can be used as energy source. Thus, low toxicity is expected for terrestrial organisms exposed to the test substance (ECHA).

D. Calculation of PNEC

Insufficient toxicity data was available to generate a PNEC values. Soybean oil is low toxicity concern for aquatic and terrestrial receptors.

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

Soybean oil is expected to degrade in the environment and thus, does not meet the criterion for persistence.

There are no specific data on the bioaccumulation potential for soybean oil but its expected degradation and read-across from a similar substance suggests that bioaccumulation is unlikely. Therefore, soybean oil does not meet the criterion for bioaccumulation.

Soybean oil is of low concern for toxicity and does not meet the criterion for this parameter.

The overall conclusion is that soybean oil is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

Does not meet the criteria for classification

B. Labelling

None required

C. Pictogram

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

Eye Contact

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes.

Skin Contact

Wash thoroughly with soap and water.

Inhalation

If inhaled, remove from area to fresh air. Get medical attention.

Ingestion

Rinse mouth with water and then drink a glass of water. Get medical attention. Never give anything by mouth to an unconscious person.

B. Firefighting Information

Extinguishing Media

Water spray, carbon dioxide, foam, dry chemical.

Specific Exposure Hazards

Keep product and empty container away from heat and sources of ignition. May emit toxic fumes under fire conditions. Depending on conditions, decomposition products may include the following: carbon monoxide, carbon dioxide.

Special Protective Equipment for Firefighters

Wear self-contained breathing apparatus.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment. Handle in accordance with good industrial hygiene and safety practice.

Environmental Precautions

Prevent from entering sewers, waterways or low areas.

Steps to be Taken if Material is Released or Spilled

For large amounts: dike spillage and pump off product. For residues: pick up with suitable absorbent material. Dispose of contaminated material as prescribed.

D. Storage and Handling

General Handling

Keep product and empty container away from heat and sources of ignition. Ensure adequate ventilation, especially in confined areas.

Storage

Keep container tightly closed and in a dry and well-ventilated place. Keep in a cool place.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

The workplace exposure standards for soybean oil in Australia is as follows: 10 mg/m^3.

Engineering Controls

Good general ventilation should be used.

Personal Protection Equipment

Respiratory Protection: Respiratory protection is not required.

Hand Protection: Chemical resistant protective gloves.

Skin Protection: Body protection must be chosen depending on activity and possible exposure.

Eye Protection: Safety glasses with side-shields.

Other Precautions: Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is recommended. Ensure that eyewash stations and safety showers are close to the workstation location.

F. Transport Information

Soybean oil is not considered hazardous for purposes of transportation by road or rail. An Australian Dangerous Goods code is not required.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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TRIBUTYL TETRADECYL PHOSPHONIUM CHLORIDE

This dossier on tributyl tetradecyl phosphonium chloride (TTPC) presents the most critical studies pertinent to the risk assessment of TTPC in its use in coal seam gas extraction activities. This dossier does not represent an exhaustive or critical review of all available data. The majority of information presented in this dossier was obtained from the ECHA database that provides information on chemicals that have been registered under the EU REACH (ECHA). Where possible, study quality was evaluated using the Klimisch scoring system (Klimisch et al., 1997).

I. SUBSTANCE IDENTIFICATION

Chemical Name (IUPAC): Tributyl(tetradecyl)phosphonium;chloride

CAS RN: [redacted]

Molecular formula: $C_{26}H_{56}PCl$

Molecular weight: 435.15 g/mol

Synonyms: Tributyl tetradecyl phosphonium chloride; TTPC; tri-n-butyltetradecylphosphonium chloride; Bellacide 350; Bellacide 355

SMILES: CCCCCCCCCCCCCC[P+](CCCC)(CCCC)CCCC.[Cl-]

II. PHYSICO-CHEMICAL PROPERTIES

Table 1: Overview of the physico-chemical properties of TTPC

Property	Value	Klimisch Score	Reference
Physical state at 20°C and 101.3 kPa	Clear, colourless liquid	4	BWA Additives (2016)
Melting Point	Not available	-	-
Boiling Point	100°C* @ 101.3 kPa	4	BWA Additives (2016)
Specific Gravity	0.98–1.00 @ 20°C	4	BWA Additives (2016)
Density	Not available	-	-
Vapour Pressure	Not available	-	-
Partition Coefficient (log K_{ow})	2.45 @ X°C	4	BuruEnergy
Water Solubility	Not available	-	-
Flash Point	Not available	-	-
Auto flammability	Not available	-	-
Viscosity	55-65 mm^2/s @ 25°C	4	BWA Additives (2016)
Henry's Law Constant	Not available	-	-

*5% aqueous solution of TTPC

TTPC is a non-oxidizing biocide. Information on TTPC in this dossier has been obtained from BWA™ Water Additives, a producer of TTPC. BWA™ Water Additives produces a 5% or 50% aqueous

solution of TTPC, which is sold under the product names Bellacide® 355 and Bellacide® 350, respectively.

III. ENVIRONMENTAL FATE PROPERTIES

A. Summary

TTPC is stable over a wide pH range and is not susceptible to photodegradation. TTPC is biodegradable, but not readily biodegradable. It will strongly adsorb to soil and sediment. TTPC is not expected to bioaccumulate.

B. Abiotic Degradation

TTPC is considered stable to hydrolysis at environmentally relevant pH values, and therefore, hydrolysis is not expected to be a significant route of transformation in waterbodies. In addition, TTPC is not expected to undergo photolysis. Based on its negligible vapour pressure, volatilization of TTPC from moist soil or water surfaces is not expected (Health Canada, 2018).

C. Biodegradation

OECD Ready Biodegradability studies conducted by the United States Environmental Protection Agency (USEPA) for re-registration of TTPC as a biocide determined that TTPC degraded with a first-order half-life of 6.6 hours (USEPA, 2018).

TTPC was identified as readily biodegradable and not persistent in a qualitative (screening) environmental risk assessment (ERA) conducted by the Australian Department of the Environment and Energy, Bureau of Meteorology, CSIRO and Geoscience Australia, Australia.[1]

However, abiotic biodegradation experiments for TTPC produced mixed results. In the subsurface, TTPC showed little to no degradation at temperatures below 105°C. However, when shale was present, increasing temperature increased rates of degradation and the presence of other hydraulic fracturing chemicals also enhanced degradation. In addition, the loss of TTPC is influenced by the adsorption of TTPC to the surface of the shale organic matter. TTPC was observed to be highly immobile in the subsurface as it significantly adsorbed to the rocks in the formation. In flowback water, TTPC exhibited partial degradation (Lupton et al., 2024).

Overall, TTPC is expected to ultimately biodegrade in the environment. If a chemical is found to be inherently or readily biodegradable, it is categorised as Not Persistent since its half-life is substantially less than 60 days (DoEE, 2017).

D. Environmental Distribution

Using KOCWIN in EPISuite™ (USEPA, 2019), the estimated K_{oc} value for TTPC using the MCI method is 4.555×10^7 L/kg.

In research conducted to demonstrate the environmental fate of hydraulic fracturing chemicals, TTPC was “shown to be generally highly adsorbing and likely to be hardly mobile in the subsurface.”

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[1] Kirby, J.K., Golding, L., Williams, M., Apte, S., Mallants, D., & Kookana, R. (2020) Qualitative (screening) environmental risk assessment of drilling and hydraulic fracturing chemicals for the Cooper GBA region. Technical appendix for the Geological and Bioregional Assessment: Stage 2. Department of the Environment and Energy, Bureau of Meteorology, CSIRO and Geoscience Australia, Australia.

Soil adsorption coefficient (K_{oc}) values measured from batch experiments were 920 L/kg and 25,629 L/kg (Lupton et al., 2024). Health Canada (2018) reported K_{oc} values of 61,443 L/kg – 607,518 L/kg in six soil types with the highest values reported in loamy sand.

E. Bioaccumulation

No bioaccumulation studies are available on TTPC. TTPC is not expected to bioaccumulate based on the experimental log K_{ow} of 2.45 (BuruEnergy) [Kl.score=4].

IV. HUMAN HEALTH HAZARD ASSESSMENT

A. Summary

TTPC exhibits moderate acute toxicity by the oral route but is highly toxic by the inhalation route. It is corrosive to the skin and eyes, but it is not a skin sensitizer. No target organ effects were noted in a 90-day rat drinking water study. TTPC was not mutagenic in a bacterial reverse mutation (Ames) test. There are no carcinogenicity studies on TTPC. In rats, developmental toxicity was shown to occur at oral dose levels that were not maternally toxic; whereas, in rabbits, developmental toxicity occurred only at maternally toxic doses.

B. Acute Toxicity

An oral LD_{50} in rats for Bellacide 350 (50% aq. solution of TTPC) was reported to be >1,002 mg/kg (BWA Additives, 2011) [Kl.score=4]. An oral LD_{50} in rats for Bellacide 355 (5% aqueous solution of TTPC) was reported to be >4,000 mg/kg (BWA Additives, 2009) [Kl.score=4].

The 4-hour inhalation LC_{50} in male and female rats for a 50% aq. solution of TTPC was <0.05 mg/L (aerosol). The mass median aerodynamic diameter for the aerosol was 1.93 µm (Cytec, 2012) [Kl.score=1]. The 1-hour inhalation LC_{50} in male and female rats for a 50% aq. solution of TTPC is 0.227 mg/L (aerosol). The mass median aerodynamic diameter for the aerosol was 1.92 µm (Cytec, 2013) [Kl.score=1].

C. Irritation

Both Bellacide 350 (50% aq. solution TTPC) and Bellacide 355 (5% aq. solution TTPC) are considered to be corrosive to the skin and eyes (BWA Additives, 2011; 2015) [Kl.score=4].

D. Sensitisation

TTPC is not considered to be a skin sensitizer (BWA Additives, 2011, 2015) [Kl.score=4].

E. Repeated Dose Toxicity

<u>Oral</u>

A 90-day rat drinking water study has been conducted on a product containing TTPC. The LOAEL for the active ingredient (TTPC) is 27.2 and 32.3 mg/kg-day in males and females, respectively, based on various clinical signs and significantly reduced body weights, feed and water consumption. The NOAEL for this study is 8.66 mg/kg-day (EPA, 2006) [Kl.score=2].

Inhalation

No data are available.

Dermal

No data are available.

F. Genotoxicity

In Vitro Studies

TTPC was not mutagenic in a reverse mutation bacterial (Ames) test (BWA Additives, 2015) [Kl.score=4].

In Vivo Studies

No studies are available.

G. Carcinogenicity

No studies are available.

H. Reproductive Toxicity

There are no studies available.

I. Developmental Toxicity

Oral

Female Tif:RAIf(SPF) rats were dosed by oral gavage with 0, 20, 60 or 120 mg/kg Belclene® [50% active ingredient: TTPC] during gestational days (GD) 6 through 15. In the high-dose group, there were two possible treatment-related spontaneous deaths (GD 9 and 14) and another death on GD 15 due to an intubation error. Clinical signs included dyspnea in one mid-dose and four high-dose animals, and vaginal bleeding in one mid-dose female on GD 15. In the high-dose group, maternal body weight gain was significantly lower during the treatment period (GD 6–15) and throughout the gestational period (GD 0–20). Mean food consumption was significantly reduced during GD 6–11 for both the mid- and high-dose animals. The number of females with implantations and the number of implantations/females were similar across all groups. Embryonic and fetal deaths were similar between treated and control groups. There were no soft tissue changes. There was an increased incidence of incomplete ossification of the 5th sternebra in the mid- and high-dose groups. The NOAELs for maternal and developmental toxicity for the active ingredient TTPC in this study is 30 and 10 mg/kg-day, respectively (EPA, 2006) [Kl.score=2].

Female chinchilla rabbits were dosed by oral gavage with 0, 7.5, 22.5 or 45 mg/kg Belclene® [50% active ingredient: TTPC] during gestational days (GD) 6 through 18. In the mid- and high-dose groups, body weight gain was significantly reduced during GD 6–18, and feed consumption was reduced during GD 6–11. Fetal body weights were significantly reduced in the mid-(males only) and high-dose dose groups. There was also an increased incidence of delayed ossification of the hindlimb phalangeal nuclei in the mid- and high-dose groups. The NOAEL for maternal and developmental toxicity for the active ingredient TTPC in this study is 3.75 mg/kg-day (EPA, 2006) [Kl.score=2].

Inhalation

There are no studies available.

Dermal

There are no studies available.

V. DERIVATION OF TOXICOLOGICAL REFERENCE AND DRINKING WATER GUIDANCE VALUES

The toxicological reference values developed for TTPC follow the methodology discussed in enHealth (2012). The approach used to develop drinking water guidance values is described in the Australian Drinking Water Guidelines (ADWG, 2011).

A. Non-Cancer

Oral

The NOAEL from a rat 90-day drinking water study based on various clinical signs and significantly reduced body weight and reduced feed and water consumption is 8.66 mg a.i./kg-day (EPA, 2006). This NOAEL will be used to derive the oral Reference Dose.

Oral Reference Dose (oral RfD)

Oral RfD = NOAEL / ($UF_A \times UF_H \times UF_L \times UF_{Sub} \times UF_D$)

Where:

UF_A (interspecies variability) = 10
UF_H (intraspecies variability) = 10
UF_L (LOAEL to NOAEL) = 1
UF_{Sub} (subchronic to chronic) = 10
UF_D (database uncertainty) = 1
Oral RfD = 8.66/(10 × 10 × 1 × 10 × 1) = 8.66/1000 = 0.009 mg/kg/day

Drinking water guidance value

Drinking water guidance value = (animal dose) × (human weight) × (proportion of intake from water) / (volume of water consumed) × (safety factor)

Using the oral RfD,

Drinking water guidance value = (oral RfD) × (human weight) × (proportion of water consumed) / (volume of water consumed)

Where:

Human weight = 70 kg (ADWG, 2011)
Proportion of water consumed = 10% (ADWG, 2011)
Volume of water consumed = 2L (ADWG, 2011)
Drinking water guidance value = (0.009 × 70 × 0.1)/2 = 0.03 mg/L

B. Cancer

No carcinogenicity studies are available on TTPC. Thus, a cancer reference dose was not derived.

VI. HUMAN HEALTH HAZARD ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES

TTPC does not exhibit the following physico-chemical properties:

- Explosivity
- Flammability
- Oxidising potential

VII. ENVIRONMENTAL HAZARD ASSESSMENT

A. Summary

TTPC has a very high acute toxicity concern to aquatic organisms.

B. Aquatic Toxicity

Acute Studies

Table 2 lists the results of acute aquatic toxicity studies conducted on TTPC.

Table 2: Acute aquatic toxicity studies on TTPC

Test Species	Endpoint	Results (mg/L)	Klimisch Score	Reference
Bluegill sunfish	96-h LC50	58.6	2	ECOTOX
Common Carp	96-h LC50	87	2	ECOTOX
Rainbow trout	96-h LC50	490	2	ECOTOX
Rainbow trout	96-h LC50	200	2	ECOTOX
Daphnia magna	48-h EC50	25.2	2	ECOTOX
Selenastrum capricornutum	72-h EC50	19	4	BuruEnergy

Chronic Studies

No studies are available.

C. Terrestrial Toxicity

Table 3 lists the avian toxicity studies conducted on TTPC.

Table 3: Avian toxicity studies on TTPC

Test Species	Endpoint	Results	Kl. score	Reference
Bobwhite Quail	8-d dietary	LC_{50}: 4,215 ppm NOEL: 1,980 ppm	2	ECOTOX
Mallard Duck	8-d dietary	LC_{50}: 3,663 ppm NOEL: 1,780 ppm	2	ECOTOX

Test Species	Endpoint	Results	Kl. score	Reference
Mallard Duck	14-d oral gavage	LD_{50}: 232 mg/kg NOEL: <178 mg/kg	2	ECOTOX

D. Calculation of PNEC

The PNEC calculations for TTPC follow the methodology discussed in DEWHA (2009).

PNEC Water

Experimental results are available for three trophic levels. Acute $E(L)C_{50}$ values are available for fish (58.6 µg/L), *Daphnia* (25 µg/L) and algae (19 µg/L). No chronic toxicity studies are available on TTPC. On the basis that the data consists of short-term results from three trophic levels, an assessment factor of 1,000 has been applied to the effect concentration of 19 µg/L for algae. The $PNEC_{aquatic}$ is calculated to be 0.019 µg/L (1.9×10^{-5} mg/L).

PNEC Sediment

There are no toxicity data for sediment-dwelling organisms. Therefore, the $PNEC_{sed}$ was calculated using the equilibrium partitioning method. The $PNEC_{sed}$ is 7.316 mg/kg sediment wet weight.

The calculations are as follows:

$PNEC_{sed} = (K_{sed\text{-}water}/BD_{sed}) \times 1000 \times PNEC_{water}$
$= (493/1280) \times 1000 \times 0.019$
$= 7.316$ mg/kg

Where:
$K_{sed\text{-}water}$ = suspended matter-water partition coefficient (m^3/m^3)
BD_{sed} = bulk density of sediment (kg/m^3) = 1,280 [default]

$K_{sed\text{-}water} = 0.8 + [(0.2 \times Kp_{sed})/1000 \times BD_{solid}]$
$= 0.8 + [(0.2 \times 1{,}025/1000 \times 2400]$
$= 493\ m^3/m^3$

Where:
Kp_{sed} = solid-water partition coefficient (L/kg)
BD_{solid} = bulk density of the solid phase (kg/m^3) = 2,400 [default]
$Kp_{sed} = K_{oc} \times f_{oc}$
$= 25{,}629 \times 0.04$
$= 1{,}025$ L/kg

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for TTPC (25,629 L/kg) calculated from experimental values presented (Lupton et al., 2024 and Health Canada, 2018).
F_{oc} = fraction of organic carbon in sediment = 0.04 [default].

PNEC Soil

There are no toxicity data for terrestrial or soil organisms. Therefore, the $PNEC_{soil}$ was calculated using the equilibrium partitioning method. The $PNEC_{soil}$ is 6.49 mg/kg soil dry weight.

The calculations are as follows:

$PNEC_{soil} = (Kp_{soil}/BD_{soil}) \times 1000 \times PNEC_{water}$
$= (513/1500) \times 1000 \times 0.019$
$= 6.49$ mg/kg

Where:
Kp_{soil} = soil-water partition coefficient (m^3/m^3)
BD_{soil} = bulk density of soil (kg/m^3) = 1,500 [default]
$Kp_{soil} = K_{oc} \times f_{oc}$
$= 25{,}629 \times 0.02$
$= 513\ m^3/m^3$

Where:
K_{oc} = organic carbon normalised distribution coefficient (L/kg). The K_{oc} for TTPC (25,629 L/kg) calculated from experimental values presented (Lupton et al., 2024 and Health Canada, 2018).
F_{oc} = fraction of organic carbon in soil = 0.02 [default].

VIII. PERSISTENCE, BIOACCUMULATION AND TOXICITY (PBT) ASSESSMENT

The methodology for the Persistent, Bioaccumulative and Toxic (PBT) substances assessment is based on the Australian and EU REACH Criteria methodology (IChEMS, 2022; ECHA, 2023).

TTPC is inherently or readily biodegradable; thus, it does not meet the screening criteria for persistence.

The log K_{ow} for TTPC is 2.45. Thus, TTPC does not meet the screening criteria for bioaccumulation.

There are no chronic aquatic toxicity studies available on TTPC. The lowest acute E(L)C50 value for TTPC is <1 mg/L in algae. Thus, TTPC does meet the criteria for toxicity.

The overall conclusion is that TTPC is not a PBT substance.

IX. CLASSIFICATION AND LABELLING

A. Classification

)
H302 Acute Toxicity Category 4 [Oral]
H330 Acute Toxicity Category 1 [Inhalation]
H314 Skin Corrosion Category 1
H318 Eye Damage Category 1
H400 Aquatic Acute Category 1
H410 Aquatic Chronic Category1

B. Labelling

Danger

C. Pictogram

In addition to the hazard statements corresponding the GHS classifications, the following non-GHS hazard statement is to be added to the SDS: AUH071: Corrosive to the Respiratory Tract.

X. HANDLING AND SAFETY INFORMATION (OCCUPATIONAL LIMITS AND TRANSPORTATION REQUIREMENTS)

A. First Aid

Please refer to the product SDS for additional information and confirmation of the information provided herein.

Eye Contact

Flush with plenty of fresh water for 15 minutes holding eyelids open, lifting eyelids occasionally to ensure complete removal of the product. DO NOT allow rubbing of eyes or keeping eyes closed. Remove contact lenses. Seek medical advice.

Skin Contact

Rinse with soap and plenty of water for several minutes. Remove contaminated clothing. Seek medical attention immediately.

Inhalation

Remove person to fresh air. Apply artificial respiration if not breathing. Seek medical attention.

Ingestion

Rinse mouth with water (only if the person is conscious). Do NOT induce vomiting. Seek medical advice immediately.

B. Firefighting Information

Extinguishing Media

Suitable Extinguishing Media: carbon dioxide, water spray, foam, dry chemical.

Specific Exposure Hazards

Containers may explode when heated. May form explosive mixtures with strong acids. Hazardous combustion products may include the following materials: carbon monoxide, carbon dioxide, phosphorus oxides, chlorine.

Special Protective Equipment for Firefighters

Full protective clothing and approved self-contained breathing apparatus required for firefighting personnel.

C. Accidental Release Measures

Personal Precautions

Use appropriate protective equipment and avoid direct contact. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate the area before entry.

Environmental Precautions

Prevent spills from entering storm drains or sewers and contact with soil.

Steps to be Taken if Material is Released or Spilled

Use an absorbent material to recover as much product as possible, and then rinse the affected area with water to dilute the residue. Disposal of leftover product and used containers should be carried out in accordance with all local, state and federal regulations.

D. Storage and Handling

General Handling

Wear appropriate personal protective equipment. Avoid contact with eyes, skin or clothing. Avoid breathing mist, vapours or spray. Use only with adequate ventilation. Wash hands after use. Launder contaminated clothing.

Storage

Keep container closed when not in use. Store in a cool well-ventilated area.

E. Exposure Controls / Personal Protection

Occupational Exposure Standards

Workplace Australia has not established an occupational exposure standard for TTPC.

Engineering Controls

Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level

Personal Protection Equipment

Respiratory Protection: Use a mask or approved air-purifying respirator with appropriate cartridge or canister in spray applications or in confined spaces.

Hand Protection: Wear impervious gloves to prevent skin contact and absorption of this material. Rubber or Neoprene gloves may afford adequate skin protection.

Skin Protection: Wear appropriate clothes (i.e., coveralls). Use non-slip footwear.

Eye Protection: Wear eye protection in situations where splash or thick mists are possible.

Other Precautions: Avoid contact with skin, eyes and clothing. When using, do not eat or drink. Wash hands thoroughly with soap and water before eating or drinking. Remove contaminated clothing and launder before reuse.

F. Transport Information

UN2922 CORROSIVE LIQUID, TOXIC N.O.S. (contains tributyltetradecyl phosphonium chloride)
Class 8 and 6.1
Packing Group: II

Environmentally Hazardous Substance.

XI. DISPOSAL MANAGMENT

Disposal should be in accordance with all local, state and federal regulations.

XII. REGULATORY STATUS

Australian AICS Inventory: Listed.

XIII. REFERENCES

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Appendix D Safety Data Sheets

Appendix D.1 March 2020 Safety Data Sheets

Standard Hydraulic Fracturing System SDS

HALLIBURTON

SAFETY DATA SHEET

ACETIC ACID 60%

Revision Date: 19-Mar-2015 **Revision Number:** 9

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name ACETIC ACID 60%

Other means of Identification

Synonyms: None

Product Code: HM004481

Recommended use of the chemical and restrictions on use

Recommended Use Solvent

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-Mail address: fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion / irritation	Category 1 - H314
Serious Eye Damage / Eye Irritation	Category 1 - H318
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Flammable liquids.	Category 3 - H226

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Danger

Hazard Statements
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation
H226 - Flammable liquid and vapor

Precautionary Statements

Prevention
P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P233 - Keep container tightly closed
P240 - Ground/Bond container and receiving equipment
P241 - Use explosion-proof electrical/ventilating/lighting/equipment
P242 - Use only non-sparking tools
P243 - Take precautionary measures against static discharge
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response
P301+ P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P370 + P378 - In case of fire: Use water spray for extinction

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P403 + P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Acetic acid	[redacted]

Other hazards which do not result in classification
None known

Australia Classification
For the full text of the H-phrases mentioned in this Section, see Section 16

Classification C - Corrosive.

Risk Phrases
R10 Flammable.
R34 Causes burns.
R37 Irritating to respiratory system.

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Acetic acid	[redacted]	60 - 100%	Skin Corr. 1A (H314) Eye Corr. 1 (H318) STOT SE 3 (H335) Flam. Liq. 3 (H226)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special Exposure Hazards

Use water spray to cool fire exposed surfaces. Decomposition in fire may produce harmful gases. Do not allow runoff to enter waterways.

Special protective equipment and precautions for fire fighters

Special Protective Equipment for Fire-Fighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Neutralize to pH of 6-8. Scoop up and

remove.

7. Handling and storage

7.1. Precautions for Safe Handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 24 months. Store locked up.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Acetic acid	[redacted]	TWA: 10 ppm TWA: 25 mg/m³ STEL: 15 ppm STEL: 37 mg/m³	TWA: 10 ppm STEL: 15 ppm

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Respiratory Protection Organic vapor/acid gas respirator.
Hand Protection Impervious rubber gloves.
Skin Protection Full protective chemical resistant clothing.
Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color:** Clear
Odor: Acrid **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	1.38
Freezing Point/Range	16 °C
Melting Point/Range	No data available
Boiling Point/Range	117 °C / 244 °F
Flash Point	55 °C / 131 °F PMCC
upper flammability limit	16%
lower flammability limit	5.4%
Evaporation rate	No data available
Vapor Pressure	11.7 mmHg @ 20 C
Vapor Density	No data available
Specific Gravity	1.05
Water Solubility	Soluble in water
Solubility in other solvents	No data available

Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	60.6 (g/mole)
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
Keep away from heat, sparks and flame.
10.5. Incompatible Materials
Strong alkalis.
10.6. Hazardous Decomposition Products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Acetic acid	[redacted]	3310 mg/kg (Rat) 600 mg/kg (Rabbit) 4960 mg/kg (Mouse)	1060 mg/kg (Rabbit)	11.4 mg/L (Rat) 4h

Immediate, delayed and chronic health effects from exposure

Inhalation	Causes severe respiratory irritation.
Eye Contact	Causes eye burns.
Skin Contact	Causes skin burns which may not be immediately painful or visible.
Ingestion	Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Prolonged, excessive exposure may cause erosion of the teeth.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Acetic acid	[redacted]	Corrosive to skin

Substances	CAS Number	Eye damage/irritation
Acetic acid	[redacted]	Corrosive to eyes

Substances	CAS Number	Skin Sensitization
Acetic acid	[redacted]	Not regarded as a sensitizer.

Substances	CAS Number	Respiratory Sensitization
Acetic acid	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Acetic acid	[redacted]	In vivo tests did not show mutagenic effects. In vitro tests did not show mutagenic effects

Substances	CAS Number	Carcinogenic Effects
Acetic acid	[redacted]	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Acetic acid	[redacted]	Did not show teratogenic effects in animal experiments. Animal testing did not show any effects on fertility.

Substances	CAS Number	STOT - single exposure
Acetic acid	[redacted]	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Acetic acid	[redacted]	Not applicable due to corrosivity of the substance.

Substances	CAS Number	Aspiration hazard
Acetic acid	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Acetic acid	[redacted]	EC50 90 mg/L (Microcystis aeruginosa) EC50 (72h) > 1000 mg/L (>300.82 mg/L – acetate ion) (Skeletonema costatum)	LC50 79 mg/L (Pimephales promelas) LC50 75 mg/L (Pimephales promelas) LC50 (96h) > 1000 mg/L (>300.82 mg/L – acetate ion) (Oncorhynchus mykiss)	NOEC (16h) 1150 mg/L (Pseudomonas putida)	EC50 47 mg/L (Daphnia magna) LC50 32 mg/L (Artemia salina) EC50 (48h) > 1000 mg/L (>300.82 mg/L – acetate ion) (Daphnia magna) NOEC (21d) 31.4 - 37.9 mg/L (Daphnia magna) (reproduction)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Acetic acid	[redacted]	Readily biodegradable (99% @ 7d)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Acetic acid	[redacted]	-0.17 BCF = 3.16 (Calculated)

12.4. Mobility in soil

Substances	CAS Number	Mobility
Acetic acid	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number: UN2790
UN Proper Shipping Name: Acetic Acid Solution
Transport Hazard Class(es): 8
Packing Group: II
Environmental Hazards: Not applicable

Special precautions during transport

None

HazChem Code

2R

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals All components listed on inventory or are exempt.
EINECS Inventory This product, and all its components, complies with EINECS
US TSCA Inventory All components listed on inventory or are exempt.
Canadian DSL Inventory All components listed on inventory or are exempt.

Poisons Schedule number

S6

16. Other information

Date of preparation or review

Revision Date: 19-Mar-2015

Revision Note Revision Note
SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
R10 Flammable.
R34 Causes burns.
R35 Causes severe burns.
R37 Irritating to respiratory system.

Full text of H-Statements referred to under sections 2 and 3
H226 - Flammable liquid and vapor
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight CAS – Chemical Abstracts Service EC50 – Effective Concentration 50% LC50 – Lethal Concentration 50% LD50 – Lethal Dose 50% LL50 – Lethal Loading 50% mg/kg – milligram/kilogram mg/L – milligram/liter NOEC – No Observed Effect Concentration OEL – Occupational Exposure Limit PBT – Persistent Bioaccumulative and Toxic ppm – parts per million STEL – Short Term Exposure Limit TWA – Time-Weighted Average vPvB – very Persistent and very Bioaccumulative h - hour mg/m^3 - milligram/cubic meter mm - millimeter mmHg - millimeter mercury w/w - weight/weight d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

BE-9

Revision Date: 13-Oct-2017 **Revision Number:** 20

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BE-9

Other means of Identification

Synonyms None

Hazardous Material Number: HB006583

Recommended use of the chemical and restrictions on use

Recommended Use Biocide

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Acute Aquatic Toxicity	Category 1 - H400
Chronic Aquatic Toxicity	Category 2 - H411

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H400 - Very toxic to aquatic life
H411 - Toxic to aquatic life with long lasting effects

Precautionary Statements

Prevention
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P391 - Collect spillage

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Tributyl tetradecyl phosphonium chloride	[redacted]

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Tributyl tetradecyl phosphonium chloride	[redacted]	5 - 10%	Acute Tox. 4 (H302) Acute Tox. 2 (H330) Skin Corr. 1B (H314) Eye Corr. 1 (H318) Aquatic Acute 1 (H400) Aquatic Chronic 1 (H410)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin	In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases. Do not allow runoff to enter waterways. Use water spray to cool fire exposed surfaces.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse. Do NOT consume food, drink, or tobacco in contaminated areas.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a cool well ventilated area. Keep container closed when not in use. Store away from direct sunlight. Store in a dry location. Store in a manner to prevent commingling with incompatible materials. Store away from alkalis. Store away from reducing agents. Store locked up.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Tributyl tetradecyl phosphonium chloride	[redacted]	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Dust/mist respirator. (N95, P2/P3)

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Neoprene gloves. (>= 0.75 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Wear impervious protective clothing, including boots, gloves, lab coat, apron, rain jacket, pants or coverall, as appropriate, to prevent skin contact.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Clear colorless
Odor: Slight **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	6-8
Freezing Point / Range	-8 - -10 °C
Melting Point / Range	No data available
Boiling Point / Range	100 °C / 212 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	0.95 - 1.0
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Reducing agents. Strong alkalis.

10.6. Hazardous decomposition products

Chlorine. Phosphorus acids. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tributyl tetradecyl phosphonium chloride	[redacted]	= 611 mg/kg (rat)	No data of sufficient quality are available	> 0.908 mg/L (rat, 4hr, mist)

Immediate, delayed and chronic health effects from exposure

Inhalation May cause respiratory irritation.

Eye Contact Causes severe eye irritation which may damage tissue. May cause eye burns.

Skin Contact Causes severe skin irritation with tissue destruction.

Ingestion Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

Lung disorders. Skin disorders.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Tributyl tetradecyl phosphonium chloride	[redacted]	Causes burns (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Tributyl tetradecyl phosphonium chloride	[redacted]	Causes severe eye irritation which may damage tissue. (Rabbit)

Substances	CAS Number	Skin Sensitization
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	Respiratory Sensitization
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Tributyl tetradecyl phosphonium chloride	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	Carcinogenic Effects
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	Reproductive toxicity
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	STOT - single exposure
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	STOT - repeated exposure
Tributyl tetradecyl phosphonium chloride	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	Aspiration hazard
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available	LC50 (96 h) 0.46 mg/L (Oncorhynchus mykiss) LC50 (96 h) 0.06 mg/L (Lepomis macrochirus)	No information available	EC50 (48 h) 0.025 mg/L (Daphnia sp.)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Tributyl tetradecyl phosphonium chloride	[redacted]	(0% @ 28d)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Tributyl tetradecyl phosphonium chloride	[redacted]	< 3

12.4. Mobility in soil

Substances	CAS Number	Mobility
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Disposal should be made in accordance with federal, state, and local regulations. Incineration recommended in approved incinerator according to federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging
Follow all applicable national or local regulations.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information
Australia ADG

UN Number	UN2922
UN proper shipping name:	Corrosive Liquid, Toxic, N.O.S. (contains Tributyl Tetradecyl Phosphonium Chloride)
Transport Hazard Class(es):	8, (6.1)
Packing Group:	II
Environmental Hazards:	Marine Pollutant

IMDG/IMO

UN Number	UN2922
UN proper shipping name:	Corrosive Liquid, Toxic, N.O.S. (contains Tributyl Tetradecyl Phosphonium Chloride)
Transport Hazard Class(es):	8, (6.1)
Packing Group:	II
Environmental Hazards:	Marine Pollutant
EMS:	EmS F-A, S-B

IATA/ICAO

UN Number	UN2922
UN proper shipping name:	Corrosive Liquid, Toxic, N.O.S. (contains Tributyl Tetradecyl Phosphonium Chloride)
Transport Hazard Class(es):	8, (6.1)
Packing Group:	II
Environmental Hazards:	Marine Pollutant

Special precautions during transport
None

HazChem Code
2X

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 13-Oct-2017

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H330 - Fatal if inhaled
H400 - Very toxic to aquatic life
H401 - Toxic to aquatic life
H410 - Very toxic to aquatic life with long lasting effects
H411 - Toxic to aquatic life with long lasting effects

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

CAUSTIC SODA LIQUID

Revision Date: 16-Apr-2015 **Revision Number:** 8

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name CAUSTIC SODA LIQUID

Other means of Identification

Synonyms None

Hazardous Material Number: HM005652

Recommended use of the chemical and restrictions on use

Recommended Use pH Control

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Substances/mixtures corrosive to metal.	Category 1 - H290

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Precautionary Statements

Prevention
P234 - Keep only in original packaging.
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/eye protection/face protection

Response
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P363 - Wash contaminated clothing before reuse
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P390 - Absorb spillage to prevent material damage
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Sodium hydroxide	[redacted]

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Sodium hydroxide	[redacted]	30 - 60%	Skin Corr. 1A (H314) Eye Corr. 1 (H318) STOT SE 3 (H335) Met. Corr. 1 (H290)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes	Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.
Skin	Remove contaminated clothing and launder before reuse. Destroy or properly dispose of contaminated shoes. In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

May cause eye and skin burns. May cause respiratory irritation. Causes severe skin irritation with tissue destruction. Causes severe eye irritation which may damage tissue.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

May form explosive mixtures with strong acids. Reaction with steel and certain other metals generates flammable hydrogen gas.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Contain spill with sand or other inert materials. Neutralize to pH of 6-8. Scoop up and remove. Isolate spill and stop leak where safe.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from acids. Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 12 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Sodium hydroxide	[redacted]	2 mg/m³	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Dust/mist respirator. (N95, P2/P3)

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Butyl rubber gloves. (>= 0.7 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Full protective chemical resistant clothing.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Clear colorless
Odor: Odorless **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	14
Freezing Point / Range	12 °C
Melting Point / Range	No data available
Boiling Point / Range	144 °C / 291 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	13 mmHg
Vapor Density	No data available
Specific Gravity	1.52
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available

Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	40
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong acids. Peroxides. Halogenated compounds. Amphoteric metals such as aluminum, magnesium, lead, tin, or zinc.
10.6. Hazardous decomposition products
None known.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
May cause eye and skin burns. May cause respiratory irritation. Causes severe skin irritation with tissue destruction. Causes severe eye irritation which may damage tissue.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium hydroxide	[redacted]	Not applicable due to corrosivity of the substance.	Not applicable due to corrosivity of the substance.	Not applicable due to corrosivity of the substance.

Immediate, delayed and chronic health effects from exposure

Inhalation	Causes severe respiratory burns.
Eye Contact	Causes severe eye burns.
Skin Contact	Causes severe burns.
Ingestion	Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Prolonged, excessive exposure may cause erosion of the teeth.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Sodium hydroxide	[redacted]	Causes severe burns

Substances	CAS Number	Serious eye damage/irritation
Sodium hydroxide	[redacted]	Causes severe eye burns (Rabbit)

Substances	CAS Number	Skin Sensitization
Sodium hydroxide	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Sodium hydroxide	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Sodium hydroxide	[redacted]	Did not show mutagenic effects in animal experiments In vitro tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Sodium hydroxide	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	Reproductive toxicity
Sodium hydroxide	[redacted]	No information available

Substances	CAS Number	STOT - single exposure
Sodium hydroxide	[redacted]	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Sodium hydroxide	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. Not applicable due to corrosivity of the substance.

Substances	CAS Number	Aspiration hazard
Sodium hydroxide	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium hydroxide	[redacted]	No information available	LC50(48h) 189 mg/L (Leuciscus idus melanotus) LLC50(48h) 189 mg/L (Leuciscus melanotus) LC50(24h) 145 mg/L (Poecilia reticulate) LC50(96h) 125 mg/L (Gambusia affinis) LOEL(150 d) = 25 mg/L (Lebistes reticulatus)	No information available	EC50 (48h) 40.4 mg/L (Ceriodaphnia sp.)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Sodium hydroxide	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Sodium hydroxide	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Sodium hydroxide	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging
Follow all applicable national or local regulations.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information
Australia ADG

UN Number	UN1824
UN proper shipping name:	Sodium Hydroxide Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	UN1824
UN proper shipping name:	Sodium Hydroxide Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable
EMS:	EmS F-A, S-B

IATA/ICAO

UN Number	UN1824
UN proper shipping name:	Sodium Hydroxide Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
2R

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 16-Apr-2015

Revision Note

Full text of H-Statements referred to under sections 2 and 3
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

D-AIR 3500L

Revision Date: 05-Apr-2018 **Revision Number:** 5

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name D-AIR 3500L

Other means of Identification

Synonyms None

Hazardous Material Number: HM008316

Recommended use of the chemical and restrictions on use

Recommended Use Defoamer

Uses advised against Consumer use

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Aspiration Toxicity	Category 1 - H304

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements: H304 - May be fatal if swallowed and enters airways

Precautionary Statements

Prevention None
Response P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P331 - Do NOT induce vomiting
Storage P405 - Store locked up
Disposal P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Hydrotreated distillate	Proprietary

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Hydrotreated distillate	Proprietary	60 - 100%	Asp. Tox. 1 (H304)

The specific chemical identity of the composition has been withheld as proprietary. The exact percentage (concentration) of the composition has been withheld as proprietary.

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin Wash with soap and water. Get medical attention if irritation persists.
Ingestion Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration. Rinse mouth. Never give anything by mouth to an unconscious person.

Symptoms caused by exposure
Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.

Medical Attention and Special Treatment
Notes to Physician Aspiration may cause severe lung damage. Evacuate stomach in a way which avoids aspiration.

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

Do NOT spray pool fires directly with water. A solid stream of water directed into hot burning liquid can cause splattering.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation. Use appropriate protective equipment. Do not breathe dust/fume/gas/mist/vapors/spray.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Dike far ahead of liquid spill for later disposal. Soak up with inert absorbent material. Pick up and transfer to properly labeled containers.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Do not breathe dust/fume/gas/mist/vapors/spray. Ensure adequate ventilation. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a well ventilated area.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Hydrotreated distillate	Proprietary	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Ensure adequate ventilation, especially in confined areas

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational

	exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Organic vapor respirator.
Hand Protection	Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.
Skin Protection	Wear protective clothing appropriate for the work environment.
Eye Protection	Safety glasses with side-shields. If splashes are likely to occur, wear: Goggles, Face-shield.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Opaque
Odor:	Hydrocarbon	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	> 100 °C / > 212 °F PMCC
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	0.910 - 0.950
Water Solubility	Immiscible in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers. Strong acids. Strong alkalis.
10.6. Hazardous decomposition products
Carbon oxides.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure	Ingestion. Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrotreated distillate	Proprietary	>5000 mg/kg-bw (rat) (similar substance)	>2000 mg/kg-bw (rabbit) (similar substance)	>5.2 mg/L (rat, 4 h, vapor) (similar substance)

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact May cause mild eye irritation.

Skin Contact May cause mild skin irritation.

Ingestion Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.

Exposure Levels

No data available

Interactive effects

No data available

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Hydrotreated distillate		Non-irritating to the skin (similar substances)

Substances	CAS Number	Serious eye damage/irritation
Hydrotreated distillate		Non-irritating to rabbit's eye (similar substances)

Substances	CAS Number	Skin Sensitization
Hydrotreated distillate		Did not cause sensitization on laboratory animals (guinea pig) (similar substances)

Substances	CAS Number	Respiratory Sensitization
Hydrotreated distillate		Based on available data, the classification criteria are not met.

Substances	CAS Number	Mutagenic Effects
Hydrotreated distillate		In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Hydrotreated distillate		Did not show carcinogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Hydrotreated distillate		Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)

Substances	CAS Number	STOT - single exposure
Hydrotreated distillate		No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Hydrotreated distillate		No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	Aspiration hazard
Hydrotreated distillate		Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing,

		wheezing, coughing up blood and pneumonia, which can be fatal.

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Hydrotreated distillate	Proprietary	ErL50(72 h)>10000 mg/L (Skeletonema costatum)	LC50(96 h)>10000 mg/L (Scophthalmus maximus) NOELR(28 d)>1000 mg/L (fish)	No information available	LC50(48 h)>10000 mg/L (Acartia tonsa) NOELR(21 d)=1000 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Hydrotreated distillate	Proprietary	Readily biodegradable (68.1% @ 28d)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Hydrotreated distillate	Proprietary	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Hydrotreated distillate	Proprietary	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 05-Apr-2018

Revision Note
SDS sections updated:
11

Full text of H-Statements referred to under sections 2 and 3
H304 - May be fatal if swallowed and enters airways
H336 - May cause drowsiness or dizziness

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight

CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

Disclaimer Statement
This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-11001

Revision Date: 23-Jan-2017 **Revision Number:** 19

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-11001

Other means of Identification

Synonyms None

Hazardous Material Number: HM007644

Recommended use of the chemical and restrictions on use

Recommended Use Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Multi-Chem Mintech
1 Ward Road
East Rockingham
WA 6168
Australia

Telephone Number: 61 (08) 9419 5300
Fax Number: 61 (08) 9439 1055
Emergency Telephone Number: + 61 1 800 686 951

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion/Irritation	Category 2 - H315
Serious Eye Damage/Irritation	Category 1 - H318
Specific Target Organ Toxicity - (Repeated Exposure)	Category 2 - H373
Acute Aquatic Toxicity	Category 3 - H402

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H315 - Causes skin irritation
H318 - Causes serious eye damage
H373 - May cause damage to organs through prolonged or repeated exposure
H402 - Harmful to aquatic life

Precautionary Statements

Prevention
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P273 - Avoid release to the environment
P280 - Wear protective gloves/eye protection/face protection

Response
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash before reuse
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P314 - Get medical attention/advice if you feel unwell

Storage None

Disposal P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Diethanolamine	[redacted]

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Diethanolamine	[redacted]	10 - 30%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) STOT RE 2 (H373) Aquatic Acute 2 (H401) Aquatic Chronic 3 (H412)

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, move victim to fresh air and seek medical attention.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Seek immediate medical attention/advice. Suitable emergency eye wash facility should be immediately available
Skin	Remove contaminated clothing and launder before reuse. In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes skin irritation. Prolonged or repeated exposure may cause damage to organs.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Carbon dioxide, dry chemical, foam.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation. Evacuate all persons from the area.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas. Consult local authorities.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse. Ensure adequate ventilation. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of

12 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Diethanolamine	[redacted]	TWA: 3 ppm TWA: 13 mg/m³	TWA: 1 mg/m³

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Wear a NIOSH certified, European Standard EN 149 (FFP2/FFP3), AS/NZS 1715, or equivalent respirator when using this product.

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Butyl rubber gloves. (>= 0.7 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Rubber apron.
Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Water white
Odor: Characteristic **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	10.5
Freezing Point / Range	16 °C
Melting Point / Range	No data available
Boiling Point / Range	250 °C / 482 °F
Flash Point	194 °C / 382 °F PMCC
Upper flammability limit	8.5
Lower flammability limit	1.3
Evaporation rate	No data available
Vapor Pressure	0.01 mmHg
Vapor Density	No data available
Specific Gravity	1.11
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available

Autoignition Temperature	315 °C / 600 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers. Violent, explosive reaction with sulfur trioxide, decaborane, silver perchlorate, triethenyl aluminum, and hydrogen in presence of nickel catalyst at temperatures above 200 C.
10.6. Hazardous decomposition products
Oxides of nitrogen. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes skin irritation. Prolonged or repeated exposure may cause damage to organs.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Diethanolamine	[redacted]	620 µL/kg (Rat) 1600 mg/kg (Rat)	7640 µL/kg (Rabbit) 13,000 mg/kg (Rabbit)	3.35 mg/L (Rat)

Immediate, delayed and chronic health effects from exposure

Inhalation	May cause respiratory irritation.
Eye Contact	Causes severe eye irritation which may damage tissue.
Skin Contact	Causes skin irritation.
Ingestion	Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity Repeated overexposure may cause liver and kidney effects. Amines may form nitrosamines, a suspect carcinogen, if product is mixed with nitrates, nitrites, nitrogen oxides or other nitrosamines.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Diethanolamine	[redacted]	Causes moderate skin irritation. (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Diethanolamine	[redacted]	Causes severe eye irritation (Rabbit)

Substances	CAS Number	Skin Sensitization
Diethanolamine	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Diethanolamine	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Diethanolamine	[redacted]	In vivo tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Diethanolamine	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	Reproductive toxicity
Diethanolamine	[redacted]	Animal testing did not show any effects on fertility. (similar substances) Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Diethanolamine	[redacted]	No information available

Substances	CAS Number	STOT - repeated exposure
Diethanolamine	[redacted]	Causes damage to organs through prolonged or repeated exposure if swallowed: (Liver) (Blood) (Kidney)

Substances	CAS Number	Aspiration hazard
Diethanolamine	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Diethanolamine	[redacted]	EC50 7.8 mg/L (Desmodesmus subspicatus) EC50 (96h) 2.2 mg/L (growth rate) (Selenastrum capricornutum)	LC50 4460-4980 mg/L (Pimephales promelas) LC50 (96h) 1460 mg/L (Pimephales promelas)	EC20 >1000 mg/L (respiration rate) (activated sludge) EC90 (30min) > 1000 mg/L (Activated sludge)	EC50 (48h) 30.1 mg/L (Ceriodaphnia dubia) EC50 (48h) 55 mg/L (Daphnia magna) NOEC (21d) 0.78 mg/L (Daphnia magna) (Reproduction)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Diethanolamine	[redacted]	Readily biodegradable (88 - 97% @ 28d)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Diethanolamine	[redacted]	-1.71

12.4. Mobility in soil

Substances	CAS Number	Mobility
Diethanolamine	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 23-Jan-2017

Revision Note

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed
H315 - Causes skin irritation
H318 - Causes serious eye damage
H373 - May cause damage to organs through prolonged or repeated exposure if swallowed
H401 - Toxic to aquatic life
H402 - Harmful to aquatic life
H412 - Harmful to aquatic life with long lasting effects

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

Disclaimer Statement
This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all

conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-13001

Revision Date: 20-Jan-2016 **Revision Number:** 10

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-13001

Other means of Identification

Synonyms: None

Product Code: HM007646

Recommended use of the chemical and restrictions on use

Recommended Use Concentrate

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-Mail address: fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Acute Inhalation Toxicity - Dusts and Mists	Category 4 - H332
Serious Eye Damage / Eye Irritation	Category 1 - H318
Reproductive Toxicity	Category 2 - H361
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Acute Aquatic Toxicity	Category 3 - H402

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Danger

Hazard Statements

H302 - Harmful if swallowed
H318 - Causes serious eye damage
H332 - Harmful if inhaled
H335 - May cause respiratory irritation
H361 - Suspected of damaging fertility or the unborn child
H402 - Harmful to aquatic life

Precautionary Statements

Prevention

P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear eye protection/face protection
P281 - Use personal protective equipment as required

Response

P301+ P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P308 + P313 - IF exposed or concerned: Get medical advice/attention

Storage

P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up

Disposal

P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Sodium perborate tetrahydrate	[redacted]

Other hazards which do not result in classification

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

Australia Classification

For the full text of the H-phrases mentioned in this Section, see Section 16

Classification Xn - Harmful.

Risk Phrases

R20 Harmful by inhalation.
R22 Harmful if swallowed.
R37 Irritating to respiratory system.

R41 Risk of serious damage to eyes.
R60 May impair fertility.

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Sodium perborate tetrahydrate	[redacted]	60 - 100%	Acute Tox. 4 (H302) Acute Tox. 4 (H332) Eye Corr. 1 (H318) Repr. 2 (H361) STOT SE 3 (H335) Aquatic Acute 3 (H402)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Harmful if swallowed. Harmful if inhaled. Potential reproductive hazard. May cause birth defects. May cause respiratory irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special Exposure Hazards

Decomposition in fire may produce harmful gases. Releases oxygen at high temperatures.

Special protective equipment and precautions for fire fighters

Special Protective Equipment for Fire-Fighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for Safe Handling
Handling Precautions
Use appropriate protective equipment. Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from combustibles. Store in a cool, dry location. Store locked up.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Sodium perborate tetrahydrate	[redacted]	Not applicable	2 mg/m³

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Dust/mist respirator. (N95, P2/P3)
Hand Protection Impervious rubber gloves.
Skin Protection Rubber apron.
Eye Protection Dust proof goggles.
Other Precautions Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties
Physical State: Powder **Color:** White
Odor: Odorless **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	10.2 (1%)
Freezing Point/Range	No data available
Melting Point/Range	No data available
Boiling Point/Range	130 °C / 266 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	6.2 mmHg
Vapor Density	No data available
Specific Gravity	0.82
Water Solubility	Partly soluble
Solubility in other solvents	No data available

Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	153.86 g/mol
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Heating may cause a fire
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
Avoid contact with organic materials.
10.5. Incompatible Materials
Organic matter. All flammables, especially petroleum products, asphalt & other volatile flammables. Metal salts such as aluminum chloride. Contact with water.
10.6. Hazardous Decomposition Products
Oxygen.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Harmful if swallowed. Harmful if inhaled. Potential reproductive hazard. May cause birth defects. May cause respiratory irritation.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium perborate tetrahydrate	[redacted]	1800 mg/kg (Rat)	> 2000 mg/kg (Rabbit) (similar substance)	1.164 mg/L (Rat) 4h

Immediate, delayed and chronic health effects from exposure

Inhalation	Harmful if inhaled. May cause respiratory irritation. May be absorbed through inhalation contributing to symptoms listed under ingestion.
Eye Contact	Causes severe eye irritation which may damage tissue.
Skin Contact	May cause skin irritation.
Ingestion	Harmful if swallowed. Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity Prolonged or repeated exposure may cause gastrointestinal effects and muscular dysfunction. Prolonged or repeated exposure may cause blood forming system, nervous, urinary tract and reproductive system damage.

Exposure Levels
No data available

Interactive effects

Skin disorders. None known.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Sodium perborate tetrahydrate	[redacted]	Not irritating to skin in rabbits.

Substances	CAS Number	Eye damage/irritation
Sodium perborate tetrahydrate	[redacted]	Causes severe eye irritation. (Rabbit)

Substances	CAS Number	Skin Sensitization
Sodium perborate tetrahydrate	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)

Substances	CAS Number	Respiratory Sensitization
Sodium perborate tetrahydrate	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Sodium perborate tetrahydrate	[redacted]	While some in vitro tests were positive and/or equivocal, in vivo results were negative. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Sodium perborate tetrahydrate	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Sodium perborate tetrahydrate	[redacted]	Experiments have shown reproductive toxicity effects on laboratory animals

Substances	CAS Number	STOT - single exposure
Sodium perborate tetrahydrate	[redacted]	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Sodium perborate tetrahydrate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Sodium perborate tetrahydrate	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium perborate tetrahydrate	[redacted]	EC50 (96h) 19 mg/L (S. subspicatus)	LC50 (96h) 51 mg/L (Danio rerio) LOAEL (72h) 400 mg/L (Brachydanio rerio)	NOEC (3wks) 1.4 mg/L (Multi-species)	EC50 (48h) 30 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability

Sodium perborate tetrahydrate	[redacted]	Readily biodegradable (86% @ 48h) (similar substances)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Sodium perborate tetrahydrate	[redacted]	0.175 (similar substances) BCF 0.1 - 1.25 (similar substances)

12.4. Mobility in soil

Substances	CAS Number	Mobility
Sodium perborate tetrahydrate	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stolkhom Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 20-Jan-2016

Revision Note
SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
R20 Harmful by inhalation.
R22 Harmful if swallowed.
R37 Irritating to respiratory system.
R41 Risk of serious damage to eyes.
R60 May impair fertility.

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed
H318 - Causes serious eye damage
H332 - Harmful if inhaled
H335 - May cause respiratory irritation
H361 - Suspected of damaging fertility or the unborn child
H402 - Harmful to aquatic life

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-13002

Revision Date: 21-Sep-2017 **Revision Number:** 22

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-13002

Other means of Identification

Synonyms None

Hazardous Material Number: HM007647

Recommended use of the chemical and restrictions on use

Recommended Use Breaker

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Skin Corrosion/Irritation	Category 2 - H315
Serious Eye Damage/Irritation	Category 2 - H319
Respiratory Sensitization	Category 1 - H334
Skin Sensitization	Category 1 - H317
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Oxidizing solids.	Category 3 - H272

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:

H272 - May intensify fire; oxidizer
H302 - Harmful if swallowed
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H319 - Causes serious eye irritation
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 - May cause respiratory irritation

Precautionary Statements

Prevention

P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P221 - Take any precaution to avoid mixing with combustibles
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P285 - In case of inadequate ventilation wear respiratory protection

Response

P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash before reuse
P304 + P341 - IF INHALED: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing
P342 + P311 - If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P370 + P378 - In case of fire: Use water spray for extinction

Storage

P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up

Disposal

P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Sodium persulfate	[redacted]

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Sodium persulfate	[redacted]	60 - 100%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Irrit. 2 (H319) Resp. Sens. 1 (H334) Skin Sens. 1 (H317) STOT SE 3 (H335) Ox. Sol. 3 (H272)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash off immediately with soap and plenty of water for at least 15 minutes while removing all contaminated clothing and shoes.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Causes eye irritation. Causes skin irritation. May cause allergic skin reaction. May cause allergic respiratory reaction. May cause respiratory irritation. Harmful if swallowed.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Oxidizer. May ignite combustibles. Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Remove sources of ignition. Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. Evacuate all persons from the area.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas. Consult local authorities.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Remove sources of ignition. Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Avoid dust accumulations. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from combustibles. Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 12 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Sodium persulfate	[redacted]	0.01 mg/m^3	TWA: 0.1 mg/m^3

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Localized ventilation should be used to control dust levels.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Dust/mist respirator. (N95, P2/P3)

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Butyl rubber gloves. (>= 0.7 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Rubber apron.

Eye Protection Dust proof goggles.

Other Precautions None known.

Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	6
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2.47
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	238.1 g/mol
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Avoid contact with readily oxidizable materials.
10.5. Incompatible materials
Avoid halogens. Contact with acids. Strong alkalis. Combustible materials.
10.6. Hazardous decomposition products
Oxides of sulfur. Oxygen. Sulfuric acid.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes eye irritation. Causes skin irritation. May cause allergic skin reaction. May cause allergic respiratory reaction. May cause respiratory irritation. Harmful if swallowed.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation

Sodium persulfate	[redacted]	895 mg/kg (Rat) 1200 mg/kg 930 mg/kg 1000 mg/kg 920 mg/kg	> 10000 mg/kg (Rat)	19.0 mg/L (Rat) 4h > 5.1 mg/L (Rat) 4h

Immediate, delayed and chronic health effects from exposure

Inhalation May cause respiratory irritation. May cause allergy or asthma symptoms or breathing difficulties if inhaled

Eye Contact Causes eye irritation.

Skin Contact Causes skin irritation. May cause an allergic skin reaction.

Ingestion Harmful if swallowed. Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Lung disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Sodium persulfate	[redacted]	Causes skin irritation. (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Sodium persulfate	[redacted]	Causes severe eye irritation (Rabbit)

Substances	CAS Number	Skin Sensitization
Sodium persulfate	[redacted]	Skin sensitizer in guinea pig.

Substances	CAS Number	Respiratory Sensitization
Sodium persulfate	[redacted]	May cause sensitization by inhalation

Substances	CAS Number	Mutagenic Effects
Sodium persulfate	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Sodium persulfate	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Sodium persulfate	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)

Substances	CAS Number	STOT - single exposure
Sodium persulfate	[redacted]	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Sodium persulfate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Sodium persulfate	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium persulfate	[redacted]	EC50 (72h) 116 mg/L (biomass) (Pseudokirchnerella subcapitata)	LC50 (96h) 163 mg/L (Oncorhynchus mykiss)	EC10 (18h) 36 mg/L (Pseudomonas putida)	EC50 (48h) 133 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Sodium persulfate	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Sodium persulfate	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Sodium persulfate	[redacted]	No information available

12.6. Other adverse effects
Endocrine Disruptor Information
This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging
This bag may contain residue of a hazardous material. Some authorities may regulate such containers as hazardous waste. Dispose of container according to national or local regulations.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information
Australia ADG

UN Number	UN1505
UN proper shipping name:	Sodium Persulfate
Transport Hazard Class(es):	5.1
Packing Group:	III
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	UN1505
UN proper shipping name:	Sodium Persulfate
Transport Hazard Class(es):	5.1
Packing Group:	III
Environmental Hazards:	Not applicable
EMS:	EmS F-A, S-Q

IATA/ICAO

UN Number	UN1505
UN proper shipping name:	Sodium Persulfate
Transport Hazard Class(es):	5.1

Packing Group: III
Environmental Hazards: Not applicable

Special precautions during transport
None

HazChem Code
1Z

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 21-Sep-2017

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H272 - May intensify fire; oxidizer
H302 - Harmful if swallowed
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H319 - Causes serious eye irritation
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 - May cause respiratory irritation

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight

CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
OSHA
ECHA C&L

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-13003

Revision Date: 05-Jul-2016 **Revision Number:** 13

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-13003

Other means of Identification

Synonyms None

Hazardous Material Number: HM007648

Recommended use of the chemical and restrictions on use

Recommended Use Breaker

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute toxicity - Dermal	Category 4 - H312
Acute inhalation toxicity - vapor	Category 4 - H332
Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Acute Aquatic Toxicity	Category 2 - H401

Label elements, including precautionary statements

Hazard pictograms

Signal Word Danger

Hazard Statements:
H312 - Harmful in contact with skin
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H332 - Harmful if inhaled
H401 - Toxic to aquatic life

Precautionary Statements

Prevention
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P271 - Use only outdoors or in a well-ventilated area
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Chlorous acid, sodium salt	[redacted]
Sodium chloride	[redacted]

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Chlorous acid, sodium salt	[redacted]	5 - 10%	Acute Tox. 3 (H301) Acute Tox. 2 (H310) Acute Tox. 2 (H330) Skin Corr. 1B (H314) Eye Corr. 1 (H318) STOT SE 3 (H335) STOT RE 2 (H373) Aquatic Acute 1 (H400) Aquatic Chronic 3 (H412) Ox. Sol. 2 (H272)

Sodium chloride	[redacted]	10 - 30%	Not Classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Seek immediate medical attention/advice. Suitable emergency eye wash facility should be immediately available

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. Harmful in contact with skin. Harmful if inhaled.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Product is not expected to burn unless all the water is boiled away. Use water spray to cool fire exposed surfaces. Decomposition in fire may produce harmful gases. If allowed to dry, this product is an oxidizer.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Wear self-contained breathing apparatus in enclosed areas. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation. Evacuate all persons from the area.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder

contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from acids. Store away from reducing agents. Store away from direct sunlight. Keep from excessive heat. Product has a shelf life of 24 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Chlorous acid, sodium salt	[redacted]	Not applicable	Not applicable
Sodium chloride	[redacted]	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Organic vapor/acid gas/chlorine respirator.

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Butyl rubber gloves. (>= 0.7 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Full protective chemical resistant clothing.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Clear tan

Odor: Mild chlorine **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	11.5-12.5
Freezing Point / Range	3-4 °C
Melting Point / Range	No data available
Boiling Point / Range	106 - 108 °C
Flash Point	No data available

Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.17 - 1.23
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions

10.4. Conditions to avoid
Keep away from heat, sparks and flame. Avoid contact with organic materials. Avoid friction.
10.5. Incompatible materials
Prolonged contact with aluminum. Contact with metals. Organic matter. Contact with ammonia. All flammables, especially petroleum products, asphalt & other volatile flammables. Ammonium compounds. Strong acids.
10.6. Hazardous decomposition products
Chlorine.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. Harmful in contact with skin. Harmful if inhaled.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Chlorous acid, sodium salt	[redacted]	165 mg/kg (Rat) 390 - 500 mg/kg (Rat) 212 – 284 mg/kg (Rat)	315 mg/kg (Rat) 134 mg/kg (Rabbit)	0.29 mg/L (Rat) 4h 230 mg/m^3 (Rat) 4h
Sodium chloride	[redacted]	3000 mg/kg-bw (rat)	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation	Harmful if inhaled. Causes severe respiratory irritation.
Eye Contact	Causes severe eye irritation which may damage tissue.
Skin Contact	Harmful in contact with skin. Causes severe burns.
Ingestion	Causes burns of the mouth, throat and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity Prolonged or repeated exposure may cause adverse effects on the blood.

Exposure Levels

No data available

Interactive effects
Blood disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Chlorous acid, sodium salt	[redacted]	Corrosive to skin (Rabbit)
Sodium chloride	[redacted]	Non-irritating to the skin (Rabbit) Not a dermal irritant

Substances	CAS Number	Serious eye damage/irritation
Chlorous acid, sodium salt	[redacted]	Corrosive to eyes (Rabbit)
Sodium chloride	[redacted]	May cause mild eye irritation. (Rabbit)

Substances	CAS Number	Skin Sensitization
Chlorous acid, sodium salt	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)
Sodium chloride	[redacted]	No information available Not confirmed to cause skin or respiratory sensitization.

Substances	CAS Number	Respiratory Sensitization
Chlorous acid, sodium salt	[redacted]	No information available
Sodium chloride	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Chlorous acid, sodium salt	[redacted]	Not regarded as mutagenic.
Sodium chloride	[redacted]	No information available

Substances	CAS Number	Carcinogenic Effects
Chlorous acid, sodium salt	[redacted]	Did not show carcinogenic effects in animal experiments
Sodium chloride	[redacted]	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Chlorous acid, sodium salt	[redacted]	Animal testing did not show any effects on fertility. (fetotoxic and teratogenic effects).
Sodium chloride	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Chlorous acid, sodium salt	[redacted]	May cause respiratory irritation.
Sodium chloride	[redacted]	No information available

Substances	CAS Number	STOT - repeated exposure
Chlorous acid, sodium salt	[redacted]	Causes damage to organs through prolonged or repeated exposure if swallowed: (spleen) (Blood)
Sodium chloride	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Chlorous acid, sodium salt	[redacted]	Not applicable
Sodium chloride	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Chlorous acid, sodium salt	[redacted]	EC50 (72h) 9.09 mg/L (Skeletonema costatum) EC50 (72h) 0.2 mg/L (Pseudokirchnerella	LC50 (96h) 210 mg/L (Scophthalmus maximus) TLM96 290 mg/L (Oncorhynchus mykiss)	EC50 (3h) > 75 mg/L (activated sludge)	LC50 (48h) 50.67 mg/L (Acartia tonsa) TLM96 0.29 mg/L (Daphnia magna)

		subcapitata)	TLM96 208 mg/L (Lepomis macrochirus)		NOEC (22d) 25 ug/L (Daphnia magna)
Sodium chloride	[redacted]	EC50 (120h) 2430 mg/L (Nitzschia sp.)	TLM96 > 1000 mg/L (Oncorhynchus mykiss) LC50 (96h) 5840 mg/L (Lepomis macrochirus) NOEC (33d) 252 mg/L (Pimephales promelas)	NOEC 5000 – 8000 mg/L (activated sludge) NOEC 292-584 mg/L (Escherichia coli)	TLM96 > 1,000,000 ppm (Mysidopsis bahia) LC50 (48h) 874-4136 mg/L (Daphnia magna) NOEC (21d) 314 mg/L (Daphnia pulex)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Chlorous acid, sodium salt	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.
Sodium chloride	[redacted]	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Chlorous acid, sodium salt	[redacted]	No information available
Sodium chloride	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Chlorous acid, sodium salt	[redacted]	No information available
Sodium chloride	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number UN1908
UN proper shipping name: Chlorite Solution (14% Available Chlorine)
Transport Hazard Class(es): 8
Packing Group: III
Environmental Hazards: Not applicable

IMDG/IMO

UN Number UN1908
UN proper shipping name: Chlorite Solution (14% Available Chlorine)
Transport Hazard Class(es): 8
Packing Group: III
Environmental Hazards: Not applicable
EMS: EmS F-A, S-B

IATA/ICAO

UN Number	UN1908
UN proper shipping name:	Chlorite Solution (14% Available Chlorine)
Transport Hazard Class(es):	8
Packing Group:	III
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
2X

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stolkhom Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 05-Jul-2016

Revision Note
SDS sections updated: 2

Full text of H-Statements referred to under sections 2 and 3
H272 - May intensify fire; oxidizer
H301 - Toxic if swallowed
H310 - Fatal in contact with skin
H312 - Harmful in contact with skin
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H320 - Causes eye irritation
H330 - Fatal if inhaled
H332 - Harmful if inhaled
H335 - May cause respiratory irritation
H373 - May cause damage to organs through prolonged or repeated exposure if inhaled
H400 - Very toxic to aquatic life
H412 - Harmful to aquatic life with long lasting effects

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
OSHA
ECHA C&L

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-16001

Revision Date: 05-Jul-2017 **Revision Number:** 11

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-16001

Other means of Identification

Synonyms None

Hazardous Material Number: HM007655

Recommended use of the chemical and restrictions on use

Recommended Use Clay Stabilization Agent

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention	None
Response	None
Storage	None
Disposal	None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Not applicable

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool, dry location. Keep container closed when not in use. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally necessary.

Hand Protection Rubber gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	White
Odor:	Mild amine	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	7-9
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.07 - 1.091
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

Avoid contact with metals such as aluminum, tin, lead, brass, bronze, copper, and zinc.

10.5. Incompatible materials

Strong oxidizers.

10.6. Hazardous decomposition products

Oxides of nitrogen. Hydrogen chloride. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Symptoms related to exposure

Most Important Symptoms/Effects

No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation None known.

Eye Contact None known.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability
Expected to be readily biodegradable

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential
Does not bioaccumulate.

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects
Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging
Follow all applicable national or local regulations.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information
Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 05-Jul-2017

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-17001

Revision Date: 09-Nov-2017 **Revision Number:** 16

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-17001

Other means of Identification

Synonyms None

Hazardous Material Number: HM007659

Recommended use of the chemical and restrictions on use

Recommended Use Corrosion Inhibitor

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Skin Corrosion/Irritation	Category 2 - H315
Serious Eye Damage/Irritation	Category 1 - H318
Skin Sensitization	Category 1 - H317
Reproductive Toxicity	Category 1B - H360
Specific Target Organ Toxicity - (Single Exposure)	Category 1 - H370
Specific Target Organ Toxicity - (Repeated Exposure)	Category 2 - H373
Acute Aquatic Toxicity	Category 2 - H401
Flammable liquids.	Category 3 - H226

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:

H226 - Flammable liquid and vapor
H302 - Harmful if swallowed
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H360 - May damage fertility or the unborn child
H370 - Causes damage to organs
H373 - May cause damage to organs through prolonged or repeated exposure
H401 - Toxic to aquatic life

Precautionary Statements

Prevention

P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233 - Keep container tightly closed
P240 - Ground and bond container and receiving equipment.
P241 - Use explosion-proof electrical/ventilating/lighting/equipment
P242 - Use only non-sparking tools
P243 - Take action to prevent static discharges.
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P272 - Contaminated work clothing should not be allowed out of the workplace
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P281 - Use personal protective equipment as required

Response

P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash before reuse
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P307 + P311 - IF exposed: Call a POISON CENTER or doctor/physician
P314 - Get medical attention/advice if you feel unwell
P370 + P378 - In case of fire: Use water spray for extinction

Storage

P403 + P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up

Disposal P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Diethylene glycol	[redacted]
Cinnamaldehyde	[redacted]
Amine oxides, cocoalkyldimethyl	[redacted]
Methanol	[redacted]
Benzaldehyde	[redacted]
Alcohols, C12-16, ethoxylated	[redacted]
Sodium iodide	[redacted]

Other hazards which do not result in classification

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Diethylene glycol	[redacted]	30 - 60%	Acute Tox. 4 (H302) STOT RE 2 (H373)
Cinnamaldehyde	[redacted]	30 - 60%	Acute Tox. 4 (H312) Skin Irrit. 2 (H315) Skin Sens. 1 (H317) Aquatic Acute 2 (H401)
Amine oxides, cocoalkyldimethyl	[redacted]	10 - 30%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 1 (H400)
Methanol	[redacted]	10 - 30%	Acute Tox. 3 (H301) Acute Tox. 3 (H311) Acute Tox. 3 (H331) Repr. 1B (H360) STOT SE 1 (H370) Flam. Liq. 2 (H225)
Benzaldehyde	[redacted]	5 - 10%	Acute Tox. 4 (H302) Acute Tox. 4 (H332) Aquatic Acute 2 (H401) Flam. Liq. 4 (H227)
Alcohols, C12-16, ethoxylated	[redacted]	1 - 5%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 1 (H400) Aquatic Chronic 3 (H412)
Sodium iodide	[redacted]	1 - 5%	Skin Irrit. 2 (H315) Eye Irrit. 2 (H319) STOT SE 3 (H335) STOT RE 1 (H372)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Ingestion Get immediate medical attention. Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes skin irritation. May cause allergic skin reaction. Harmful if swallowed. May cause damage to internal organs. May cause damage to organs through prolonged or repeated exposure. Potential reproductive hazard. May cause birth defects.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Carbon dioxide, dry chemical, foam.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

May be ignited by heat, sparks or flames Use water spray to cool fire exposed surfaces. Closed containers may explode in fire. Decomposition in fire may produce harmful gases. Runoff to sewer may cause fire or explosion hazard.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Remove sources of ignition. Use appropriate protective equipment. Wear self-contained breathing apparatus in enclosed areas. Avoid breathing vapors. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Remove ignition sources and work with non-sparking tools. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Remove sources of ignition. Ensure adequate ventilation. Avoid breathing vapors. Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse. Ground and bond containers when transferring from one container to another. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Keep from heat, sparks, and open flames. Store in a well ventilated area. Store locked up. Keep container closed when not in use. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Diethylene glycol	[redacted]	TWA: 23 ppm TWA: 100 mg/m³	Not applicable
Cinnamaldehyde	[redacted]	Not applicable	Not applicable
Amine oxides, cocoalkyldimethyl	[redacted]	Not applicable	Not applicable
Methanol	[redacted]	TWA: 200 ppm TWA: 262 mg/m³ STEL: 250 ppm STEL: 328 mg/m³	TWA: 200 ppm STEL: 250 ppm
Benzaldehyde	[redacted]	Not applicable	Not applicable
Alcohols, C12-16, ethoxylated	[redacted]	Not applicable	Not applicable
Sodium iodide	[redacted]	Not applicable	TWA: 0.01 ppm

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Positive pressure self-contained breathing apparatus if methanol is released.

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Butyl rubber gloves. (>= 0.7 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Yellow-orange
Odor: Cinnamon **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	6.85 (10%)
Freezing Point / Range	-21 °C
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	28.9 °C / 84 °F PMCC
Evaporation rate	No data available

Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.015
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Keep away from heat, sparks and flame.
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Ammonia. Oxides of nitrogen. Hydrocarbons. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes skin irritation. May cause allergic skin reaction. Harmful if swallowed. May cause damage to internal organs. May cause damage to organs through prolonged or repeated exposure. Potential reproductive hazard. May cause birth defects.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Diethylene glycol	[redacted]	12565 - 19600 mg/kg (Rat)	11890 - 13300 mg/kg (Rabbit)	> 4.6 mg/L (Rat) 4h
Cinnamaldehyde	[redacted]	2220 mg/kg (rat)	620 mg/kg (rabbit)	No data available
Amine oxides, cocoalkyldimethyl	[redacted]	846 - 3873 mg/kg (Rat) 1000-1250 mg/kg (Rat)	4290 mg/kg (Rabbit)	No data available
Methanol	[redacted]	300 mg/kg-bw (human) < 790 to 13,000 mg/kg (rat)	1000 mg/kg-bw (human) 17,100 mg/kg (rabbit)	10 mg/L (human, 4h, vapor)
Benzaldehyde	[redacted]	1430 mg/kg (rat)	No information available	>1 <5 mg/L air (Rat, 4h, mist)
Alcohols, C12-16, ethoxylated	[redacted]	1600 mg/kg	No data available	No data available
Sodium iodide	[redacted]	4340 mg/kg (Rat) 3118 mg/kg (Rats) (Similar substance)	No data available	LCLo: 50000 mg/m^3 (Mouse) 2h

Immediate, delayed and chronic health effects from exposure
Product Information Based on the collective toxicity of product ingredients, the mixture should be considered to cause the following:

Inhalation May cause respiratory irritation. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.

Eye Contact Causes severe eye irritation which may damage tissue.

Skin Contact Causes skin irritation. May cause an allergic skin reaction.

Ingestion Harmful if swallowed. May cause central nervous system depression including headache, dizziness, drowsiness, muscular weakness, incoordination, slowed reaction time, fatigue blurred vision, slurred speech, giddiness, tremors and convulsions. May cause liver and kidney damage.

Chronic Effects/Carcinogenicity Prolonged or repeated exposure may cause reproductive system damage. Prolonged or repeated exposure may cause embryo and fetus toxicity.

Exposure Levels
No data available

Interactive effects
Skin disorders. Eye ailments.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Diethylene glycol	[redacted]	Non-irritating to the skin (Rabbit)
Cinnamaldehyde	[redacted]	Causes severe irritation and or burns (human)
Amine oxides, cocoalkyldimethyl	[redacted]	Skin, rabbit: Causes moderate skin irritation.
Methanol	[redacted]	Non-irritating to the skin (Rabbit)
Benzaldehyde	[redacted]	Non-irritating to the skin (Rabbit)
Alcohols, C12-16, ethoxylated	[redacted]	Causes skin irritation.
Sodium iodide	[redacted]	Moderate dermal irritant (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Diethylene glycol	[redacted]	Non-irritating to the eye (Rabbit)
Cinnamaldehyde	[redacted]	Mild eye irritant. (human) (8 % solution)
Amine oxides, cocoalkyldimethyl	[redacted]	Corrosive to eyes
Methanol	[redacted]	Non-irritating to the eye (Rabbit)
Benzaldehyde	[redacted]	Non-irritating to the eye (Rabbit)
Alcohols, C12-16, ethoxylated	[redacted]	Causes severe eye irritation which may damage tissue.
Sodium iodide	[redacted]	Moderately irritating to the eyes (Rabbit)

Substances	CAS Number	Skin Sensitization
Diethylene glycol	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)
Cinnamaldehyde	[redacted]	Skin sensitizer in guinea pig.
Amine oxides, cocoalkyldimethyl	[redacted]	No information available
Methanol	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)
Benzaldehyde	[redacted]	Not sensitizing in Guinea Pigs (Guinea Pig Maximisation Test and Open Epicutaneous Test, Sensitizing in Draize Test and Freund's Complete Adjuvant Test)
Alcohols, C12-16, ethoxylated	[redacted]	Did not cause sensitization on laboratory animals
Sodium iodide	[redacted]	Patch test on human volunteers did not demonstrate sensitization properties

Substances	CAS Number	Respiratory Sensitization
Diethylene glycol	[redacted]	No information available
Cinnamaldehyde	[redacted]	No information available
Amine oxides, cocoalkyldimethyl	[redacted]	No information available
Methanol	[redacted]	No information available
Benzaldehyde	[redacted]	No information available
Alcohols, C12-16, ethoxylated	[redacted]	No information available

Sodium iodide	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Diethylene glycol	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects.
Cinnamaldehyde	[redacted]	In vitro tests did not show mutagenic effects.
Amine oxides, cocoalkyldimethyl	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)
Methanol	[redacted]	The weight of evidence from available in vitro and in vivo studies indicates that this substance is not expected to be mutagenic.
Benzaldehyde	[redacted]	Not mutagenic in AMES Test. Negative in the chromosomal aberration assay In vitro tests have shown mutagenic effects In vivo tests did not show mutagenic effects.
Alcohols, C12-16, ethoxylated	[redacted]	Not regarded as mutagenic.
Sodium iodide	[redacted]	In vitro tests did not show mutagenic effects. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Diethylene glycol	[redacted]	Did not show carcinogenic effects in animal experiments (Rat)
Cinnamaldehyde	[redacted]	No information available
Amine oxides, cocoalkyldimethyl	[redacted]	No information available
Methanol	[redacted]	No data of sufficient quality are available.
Benzaldehyde	[redacted]	Did not show carcinogenic effects in animal experiments (Rat) There was some evidence of carcinogenic activity in the forestomachs of mice.
Alcohols, C12-16, ethoxylated	[redacted]	Not regarded as carcinogenic.
Sodium iodide	[redacted]	No information available

Substances	CAS Number	Reproductive toxicity
Diethylene glycol	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.
Cinnamaldehyde	[redacted]	Did not show teratogenic effects in animal experiments.
Amine oxides, cocoalkyldimethyl	[redacted]	Did not show teratogenic effects in animal experiments. When tested at maternally toxic doses, no adverse effects on teratogenicity or development were observed.
Methanol	[redacted]	Experiments have shown reproductive toxicity effects on laboratory animals
Benzaldehyde	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)
Alcohols, C12-16, ethoxylated	[redacted]	Not regarded as a reproductive and developmental toxicant.
Sodium iodide	[redacted]	Animal testing did not show any effects on fertility.

Substances	CAS Number	STOT - single exposure
Diethylene glycol	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Cinnamaldehyde	[redacted]	No information available
Amine oxides, cocoalkyldimethyl	[redacted]	May cause respiratory irritation.
Methanol	[redacted]	May cause disorder and damage to the Central Nervous System (CNS)
Benzaldehyde	[redacted]	May cause respiratory irritation.
Alcohols, C12-16, ethoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Sodium iodide	[redacted]	No information available

Substances	CAS Number	STOT - repeated exposure
Diethylene glycol	[redacted]	Causes damage to organs through prolonged or repeated exposure: Kidney
Cinnamaldehyde	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Amine oxides, cocoalkyldimethyl	[redacted]	No data of sufficient quality are available.
Methanol	[redacted]	No data of sufficient quality are available.
Benzaldehyde	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Alcohols, C12-16, ethoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Sodium iodide	[redacted]	Causes damage to organs through prolonged or repeated exposure: (Thyroid)

Substances	CAS Number	Aspiration hazard
Diethylene glycol	[redacted]	No information available
Cinnamaldehyde	[redacted]	Not applicable
Amine oxides, cocoalkyldimethyl	[redacted]	No information available

Methanol	[redacted]	Not applicable
Benzaldehyde	[redacted]	Not applicable
Alcohols, C12-16, ethoxylated	[redacted]	Not applicable
Sodium iodide	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	**Toxicity to Algae**	**Toxicity to Fish**	**Toxicity to Microorganisms**	**Toxicity to Invertebrates**
Diethylene glycol	[redacted]	TGK (8d) 2700 mg/L (Scenedesmus quadricauda)	LC50 75200 mg/L (Pimephales promelas)	EC20 (30m) > 1995 mg/L (domestic activated sludge)	EC50 84000 mg/L (Daphnia magna) EC50 >10000 mg/L (Daphnia magna)
Cinnamaldehyde	[redacted]	EC50 (72 h) 2.1 mg/L (Skeletonema costatum)	LC50 (96 h) 2.38 mg/L (Scophthalmus maximus)	IC50 (48h) 131.2 mg/L (Tetrahymena pyriformis)	LC50 (48 h) 1.4 mg/L (Acartia tonsa)
Amine oxides, cocoalkyldimethyl	[redacted]	ErC50 (72h) 0.29 mg/L (Selenastrum capricornutum) ErC50 (72h) 0.0235 mg/L (Scendesmus subspicatus) (similar substance)	LC50 (96h) 1.0–3.4 mg/L (Brachydanio rerio) LC50 (96h) 13.0 (Salmo gairdneri) LC50 (96h) 0.1-1 mg/L (Brachydanio rerio)	EC50 (3h) 240 mg/L (Pseudomonas putida) EC50 (3h) 13 mg/L (Activated sludge)	EC50 (48h) 2.9 mg/L (Daphnia magna) EC50 (48h) 0.083 mg/L (Daphnia magna) (similar substance)
Methanol	[redacted]	EC50 (96 h) =22000 mg/L (Pseudokirchnerella subcapitata) NOEC (8 d) =8000 mg/L (Scenedesmus quadricauda)	LC50 (96 h) =15400 mg/L (Lepomis macrochirus) EC50 (200 h) =14536 mg/L (Oryzias latipes)	IC50 (3h) > 1000 mg/L (activated sludge)	EC50 (96 h) =18260 mg/L (Dapnia magna) NOEC (21 d) =208 mg/L (Dapnia magna)
Benzaldehyde	[redacted]	NOEC (8d) 20 mg/L (Microcystis aeruginosa) NOEC (8d) 132 mg/L	LC50 (96 h) 1.07 mg/L (Lepomis macrochirus)	IC50 (3 h) 740 mg/L (Activated sludge)	EC50 (24 h) 50 mg/L (Daphnia magna)
Alcohols, C12-16, ethoxylated	[redacted]	EC50 0.7 mg/L (Selenastrum capricornutum)	No information available	No information available	0.39 mg/L (Daphnia Magna)
Sodium iodide	[redacted]	7 d Tox threshold: 2370 mg/L (Scenedesmus quadricauda, biomass) EC50(72h): 2588.7 mg/L (Skeletonema costatum)	LC50(96h): 3780 mg/L (Oncorhynchus mykiss) LC50(96h): > 100 mg/L (Scopthalmus maximus)	No information available	EC50(48h): 1.27 mg/L (Daphnia magna) EC50(48h): 575 mg/L (Acartia tonsa)

12.2. Persistence and degradability

No data is available on the product itself

Substances	**CAS Number**	**Persistence and Degradability**
Diethylene glycol	[redacted]	Readily biodegradable (90-100% @ 28d)
Cinnamaldehyde	[redacted]	Predicted to be readily biodegradable.
Amine oxides, cocoalkyldimethyl	[redacted]	Readily biodegradable (81% @ 28d)
Methanol	[redacted]	Readily biodegradable (95% @ 20d)
Benzaldehyde	[redacted]	Readily biodegradable (>=95% @ 28d)
Alcohols, C12-16, ethoxylated	[redacted]	No information available
Sodium iodide	[redacted]	Not applicable

12.3. Bioaccumulative potential

No data is available on the product itself

Substances	**CAS Number**	**Log Pow**
Diethylene glycol	[redacted]	BCF: 100 (Leuciscus idus melanotus)
Cinnamaldehyde	[redacted]	Log Pow =1.4
Amine oxides, cocoalkyldimethyl	[redacted]	Log Kow = 7.5
Methanol	[redacted]	Not Bioaccumulative; BCF=1
Benzaldehyde	[redacted]	Log Pow =1.1
Alcohols, C12-16, ethoxylated	[redacted]	No information available
Sodium iodide	[redacted]	-1.301

12.4. Mobility in soil

Substances	CAS Number	Mobility
Diethylene glycol	[redacted]	No information available
Cinnamaldehyde	[redacted]	No information available
Amine oxides, cocoalkyldimethyl	[redacted]	No information available
Methanol	[redacted]	No information available
Benzaldehyde	[redacted]	No information available
Alcohols, C12-16, ethoxylated	[redacted]	No information available
Sodium iodide	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Incineration recommended in approved incinerator according to federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Methanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable

IMDG/IMO

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Methanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable
EMS: EmS F-E, S-E

IATA/ICAO

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Methanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable

Special precautions during transport

None

HazChem Code

•3Y

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product does not comply with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 09-Nov-2017

Revision Note
SDS sections updated:
14

Full text of H-Statements referred to under sections 2 and 3
H225 - Highly flammable liquid and vapor
H226 - Flammable liquid and vapor
H227 - Combustible liquid
H301 - Toxic if swallowed
H302 - Harmful if swallowed
H311 - Toxic in contact with skin
H312 - Harmful in contact with skin
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H319 - Causes serious eye irritation
H331 - Toxic if inhaled
H332 - Harmful if inhaled
H335 - May cause respiratory irritation
H370 - Causes damage to organs
H372 - Causes damage to organs through prolonged or repeated exposure
H373 - May cause damage to organs through prolonged or repeated exposure
H400 - Very toxic to aquatic life
H401 - Toxic to aquatic life
H412 - Harmful to aquatic life with long lasting effects

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-19001

Revision Date: 05-Jul-2016 **Revision Number:** 20

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-19001

Other means of Identification

Synonyms None

Hazardous Material Number: HM007662

Recommended use of the chemical and restrictions on use

Recommended Use Crosslinker

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage/Irritation	Category 2 - H319
Reproductive Toxicity	Category 2 - H361

Label elements, including precautionary statements

Hazard pictograms

Signal Word Danger

Hazard Statements:
H319 - Causes serious eye irritation
H361 - Suspected of damaging fertility or the unborn child

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear eye protection/face protection
P281 - Use personal protective equipment as required

Response
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P308 + P313 - IF exposed or concerned: Get medical advice/attention

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Disodium octaborate tetrahydrate	[redacted]

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Disodium octaborate tetrahydrate	[redacted]	60 - 100%	Eye Irrit. 2A (H319) Repr. 2 (H361)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Causes eye irritation Potential reproductive hazard. May cause birth defects.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
None anticipated

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. Evacuate all persons from the area.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid creating or inhaling dust. Ensure adequate ventilation. Avoid contact with eyes, skin, or clothing. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool, dry location. Product has a shelf life of 60 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Disodium octaborate tetrahydrate	[redacted]	Not applicable	2 mg/m^3

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection	Impervious rubber gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Dust proof goggles.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	7.3
Freezing Point / Range	No data available
Melting Point / Range	> 1000 °C
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	9.9E-17 pa @ 25°C
Vapor Density	No data available
Specific Gravity	1.7
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
None known.
10.6. Hazardous decomposition products
None known.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes eye irritation Potential reproductive hazard. May cause birth defects.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Disodium octaborate tetrahydrate	[redacted]	2550 mg/kg-bw (rat) (similar substance)	>2000 mg/kg-bw (rat) (similar substance)	>2 mg/L (dust, rat, 4 h) (similar substance)

Immediate, delayed and chronic health effects from exposure

Inhalation May cause respiratory irritation.
Eye Contact Causes eye irritation.
Skin Contact May cause mild skin irritation.
Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity Prolonged or repeated exposure may cause reproductive system damage. Prolonged or repeated exposure may cause embryo and fetus toxicity.

Exposure Levels

No data available

Interactive effects

None known.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Disodium octaborate tetrahydrate	[redacted]	Not irritating to skin in rabbits. (similar substances)

Substances	CAS Number	Serious eye damage/irritation
Disodium octaborate tetrahydrate	[redacted]	Eye, rabbit: Causes moderate eye irritation

Substances	CAS Number	Skin Sensitization
Disodium octaborate tetrahydrate	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Disodium octaborate tetrahydrate	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Disodium octaborate tetrahydrate	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Disodium octaborate tetrahydrate	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Disodium octaborate tetrahydrate	[redacted]	May impair fertility May cause birth defects (similar substances)

Substances	CAS Number	STOT - single exposure

Disodium octaborate tetrahydrate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	STOT - repeated exposure
Disodium octaborate tetrahydrate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	Aspiration hazard
Disodium octaborate tetrahydrate	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Disodium octaborate tetrahydrate	[redacted]	EC10 (3 d) 96.5 mg/L (Pseudokirchneriella subcapitata)	LC50 (96 h) 314.6 mg/L (Pimephales promelas) NOEC (34 d) 25.2 mg/L (Danio rerio)	EC50 (3 h) >39371 mg/L (activated sludge)	NOEC (21 d) 42.5 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Disodium octaborate tetrahydrate	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Disodium octaborate tetrahydrate	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Disodium octaborate tetrahydrate	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
S5

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stolkhom Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 05-Jul-2016

Revision Note
SDS sections updated: 2

Full text of H-Statements referred to under sections 2 and 3
H319 - Causes serious eye irritation

H361 - Suspected of damaging fertility or the unborn child

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
OSHA
ECHA C&L

Disclaimer Statement

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-19002

Revision Date: 05-Jul-2016 **Revision Number:** 19

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-19002

Other means of Identification

Synonyms None

Hazardous Material Number: HM007663

Recommended use of the chemical and restrictions on use

Recommended Use Crosslinker

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage/Irritation	Category 2 - H319
Reproductive Toxicity	Category 1B - H360
Specific Target Organ Toxicity - (Repeated Exposure)	Category 1 - H372

Label elements, including precautionary statements

Hazard pictograms

Signal Word Danger

Hazard Statements:
H319 - Causes serious eye irritation
H360 - May damage fertility or the unborn child
H372 - Causes damage to organs through prolonged or repeated exposure

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P280 - Wear eye protection/face protection
P281 - Use personal protective equipment as required

Response
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P314 - Get medical attention/advice if you feel unwell

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Ulexite	[redacted]
Ethylene glycol	[redacted]
Crystalline silica, quartz	[redacted]

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Ulexite	[redacted]	30 - 60%	Eye Irrit. 2A (H319) Repr. 1 (H360)
Ethylene glycol	[redacted]	10 - 30%	Acute Tox. 4 (H302) STOT RE 1 (H372)
Crystalline silica, quartz	[redacted]	1 - 5%	Carc. 2 (H351) STOT RE 1 (H372)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes	Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.
Skin	Wash off immediately with soap and plenty of water for at least 15 minutes while removing all contaminated clothing and shoes.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes eye irritation Potential reproductive hazard. May cause birth defects. Prolonged or repeated exposure may cause damage to organs. Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation. Evacuate all persons from the area.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas. Consult local authorities.

6.3. Methods and material for containment and cleaning up

Contain spill with sand or other inert materials. Scoop up and remove. Isolate spill and stop leak where safe.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Avoid breathing mist. This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud if this product becomes dry. Avoid breathing or creating dust. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using dried product. Ensure adequate ventilation. Material is slippery underfoot. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store in a cool well ventilated area. Keep container closed when not in use.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Ulexite	[redacted]	Not applicable	Not applicable
Ethylene glycol	[redacted]	TWA: 10 mg/m³ TWA: 20 ppm TWA: 52 mg/m³ STEL: 40 ppm STEL: 104 mg/m³	Ceiling: 100 mg/m³ (aerosol only)
Crystalline silica, quartz	[redacted]	TWA: 0.1 mg/m³	TWA: 0.025 mg/m³

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Organic vapor respirator.

Hand Protection Rubber gloves.
Skin Protection Rubber apron.
Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Milky white
Odor: Odorless **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	6.5 - 7.5
Freezing Point / Range	-34 °C
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.45
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Strong oxidizers.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes eye irritation Potential reproductive hazard. May cause birth defects. Prolonged or repeated exposure may cause damage to organs. Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ulexite	[redacted]	3493-6080 mg/kg (Rat) (similar substance) 3450 mg/kg (Male Rat) (similar substance)	> 2000 mg/kg (Rabbit) (similar substance)	> 2 mg/L (Rat) 4h (similar substance) > 2.12 mg/L (Rat) 4h (similar substance) > 2.04 mg/L (Rat) 4h (similar substance)
Ethylene glycol	[redacted]	4000 mg/kg (Rat) 7712 mg/kg (Rat) > 10000 mg/kg (Rat) 1670 mg/kg (Cat) 1400 – 1600 mg/kg (Human)	9530 µL/kg (Rabbit) > 3500 mg/kg (Mouse)	> 2.5 mg/L (Rat) 6h (saturated concentration)
Crystalline silica, quartz	[redacted]	> 15000 mg/kg (human)	No information available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause respiratory irritation. In high air concentrations: May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness. Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact Causes eye irritation.

Skin Contact May cause mild skin irritation.

Ingestion May be harmful if swallowed. In large amounts: May cause abdominal pain, vomiting,

nausea, and diarrhea. May cause heart, kidney and brain disorders.

Chronic Effects/Carcinogenicity Prolonged or repeated exposure may cause embryo and fetus toxicity. Prolonged or repeated exposure may cause reproductive system damage. Repeated overexposure may cause liver and kidney effects. Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

See "Inhalation" subsection above with respect to silicosis, cancer status and other data with possible relevance to human health. There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Exposure Levels
No data available

Interactive effects
Eye ailments. Skin disorders. Liver and kidney disorders. Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Ulexite	[redacted]	Non-irritating to the skin (Rabbit) (similar substances)
Ethylene glycol	[redacted]	Non-irritating to the skin (Rabbit)
Crystalline silica, quartz	[redacted]	Non-irritating to the skin

Substances	CAS Number	Serious eye damage/irritation
Ulexite	[redacted]	Causes moderate eye irritation (Rabbit) (similar substances)
Ethylene glycol	[redacted]	Non-irritating to the eye (Rabbit)
Crystalline silica, quartz	[redacted]	Mechanical irritation of the eyes is possible. No information available

Substances	CAS Number	Skin Sensitization
Ulexite	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Ethylene glycol	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) Patch test on human volunteers did not demonstrate sensitization properties
Crystalline silica, quartz	[redacted]	No information available.

Substances	CAS Number	Respiratory Sensitization
Ulexite	[redacted]	No information available
Ethylene glycol	[redacted]	No information available
Crystalline silica, quartz	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Ulexite	[redacted]	In vitro tests did not show mutagenic effects (similar substances)
Ethylene glycol	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects.
Crystalline silica, quartz	[redacted]	Not regarded as mutagenic.

Substances	CAS Number	Carcinogenic Effects
Ulexite	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)
Ethylene glycol	[redacted]	Did not show carcinogenic effects in animal experiments
Crystalline silica, quartz	[redacted]	Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure. Based on available scientific evidence, this

		substance is a threshold carcinogen with a mode of action involving indirect genotoxicity secondary to lung injury.

Substances	CAS Number	Reproductive toxicity
Ulexite	[redacted]	Experiments have shown reproductive toxicity effects on laboratory animals (similar substances)
Ethylene glycol	[redacted]	Fetotoxic and teratogenic effects observed in experimental animals at concentrations that did not produce maternal toxicity.
Crystalline silica, quartz	[redacted]	No information available

Substances	CAS Number	STOT - single exposure
Ulexite	[redacted]	None under normal use conditions
Ethylene glycol	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Crystalline silica, quartz	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Ulexite	[redacted]	None under normal use conditions
Ethylene glycol	[redacted]	Causes damage to organs through prolonged or repeated exposure: (Kidney)
Crystalline silica, quartz	[redacted]	Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs)

Substances	CAS Number	Aspiration hazard
Ulexite	[redacted]	Not applicable
Ethylene glycol	[redacted]	No information available
Crystalline silica, quartz	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Ulexite	[redacted]	EC50 (72h) 1398.64 mg/L (Skeletonema costatum)	LC50 (96h) > 320 mg/L (Scophthalmus maximus) LC50 (96h) > 1100 mg/L (Oncorhynchus mykiss) LC50 (96h) > 1021 mg/L (Lepomis macrochirus) LD50 (28d) 65 mg/L (Oncorhynchus mykiss)	No information available	EC50 (48h) 7341.67 mg/L (Acartia tonsa) EC50 (48h) 133 mg/L (Daphnia magna)
Ethylene glycol	[redacted]	EC50 6500 - 13000 mg/L (Pseudokirchneriella subcapitata) TGK (8d) > 10000 mg/L (Scenedesmus quadricauda)	LC50 41000 mg/L (Oncorhynchus mykiss) LC50 (96h) 72860 mg/L (Pimephales promelas) NOEC (7d) 15380 mg/L (mortality) (Pimephales promelas)	TTC (16h) > 10000 mg/L (Pseudomonas putida) EC20 (30 m) > 1995 mg/L (activated sludge, domestic) (similar substance)	EC50 46300 mg/L (Daphnia magna) EC50 (48h) >100 mg/L (Daphnia magna) NOEC (7d) 8590 mg/L (reproduction) (Ceriodaphnia dubia)
Crystalline silica, quartz	[redacted]	EC50 (72 h) =440 mg/L (Selenastrum capricornutum)	LL0 (96 h) =10000 mg/L (Danio rerio)	No information available	LL50 (24 h) >10000 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Ulexite	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.
Ethylene glycol	[redacted]	Readily biodegradable (100% @ 10d)
Crystalline silica, quartz	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow

Ulexite	[redacted]	0.175
Ethylene glycol	[redacted]	-1.36
Crystalline silica, quartz	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Ulexite	[redacted]	No information available
Ethylene glycol	[redacted]	No information available
Crystalline silica, quartz	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stolkhom Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 05-Jul-2016

Revision Note

SDS sections updated: 2

Full text of H-Statements referred to under sections 2 and 3

H302 - Harmful if swallowed
H319 - Causes serious eye irritation
H351 - Suspected of causing cancer if inhaled
H360 - May damage fertility or the unborn child
H372 - Causes damage to organs through prolonged or repeated exposure if swallowed
H372 - Causes damage to organs through prolonged or repeated exposure if inhaled

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter

mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
OSHA
ECHA C&L

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-21003

Revision Date: 30-Sep-2015 **Revision Number:** 9

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-21003

Other means of Identification

Synonyms: None

Product Code: HM007806

Recommended use of the chemical and restrictions on use

Recommended Use Fluid Loss Additive

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: + 61 1 800 686 951
Papua New Guinea: + 61 1 800 686 951
NewZealand: +64 800 451719

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

E-Mail address: fdunexchem@halliburton.com

Emergency phone number
+ 61 1 800 686 951

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous

Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements Not Classified

Precautionary Statements

Prevention None

Response None

Storage None

Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

None known

Australia Classification

For the full text of the H-phrases mentioned in this Section, see Section 16

Classification Not Classified
Risk Phrases None

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion If swallowed, induce vomiting immediately by giving two glasses of water and sticking fingers down throat; never give anything to an unconscious person. Get medical attention.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special Exposure Hazards
Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters
Special Protective Equipment for Fire-Fighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Spills of this product are very slippery.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for Safe Handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Avoid dust accumulations.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Store between 40.5 F (4.7 C) and 120.5 F (49 C). Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Powder	**Color:**	White to off white
Odor:	Sweet	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point/Range	No data available
Melting Point/Range	No data available
Boiling Point/Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.24
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	388 °C / 730 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
Temperature over 440 F (240 C).
10.5. Incompatible Materials
Strong oxidizers. Strong alkalis.
10.6. Hazardous Decomposition Products
Toxic fumes. Aldehydes. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure

Most Important Symptoms/Effects

No significant hazards expected.

Numerical measures of toxicity

LD50 Oral: > 5000 mg/kg; (Rat)

LD50 Dermal: > 2000 mg/kg; (Rabbit)

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact May cause mild eye irritation.

Skin Contact Prolonged or repeated contact may cause slight skin irritation.

Ingestion Irritation of the mouth, throat, and stomach. Large doses may cause nausea, vomiting and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

None known.

Data limitations

No data available

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances	NA	No information available	No information available	No information available	No information available

in concentrations above cut-off values according to the competent authority					

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Does not bioaccumulate

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number: Not restricted
UN Proper Shipping Name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

16. Other information

Date of preparation or review

Revision Date: 30-Sep-2015

Revision Note
SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
None

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight CAS – Chemical Abstracts Service EC50 – Effective Concentration 50% LC50 – Lethal Concentration 50% LD50 – Lethal Dose 50% LL50 – Lethal Loading 50% mg/kg – milligram/kilogram mg/L – milligram/liter NOEC – No Observed Effect Concentration OEL – Occupational Exposure Limit PBT – Persistent Bioaccumulative and Toxic ppm – parts per million STEL – Short Term Exposure Limit TWA – Time-Weighted Average vPvB – very Persistent and very Bioaccumulative h - hour mg/m^3 - milligram/cubic meter mm - millimeter mmHg - millimeter mercury w/w - weight/weight d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-2120875

Revision Date: 25-Jun-2015 **Revision Number:** 3

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-2120875

Other means of Identification

Synonyms: None

Product Code: HM008041

Recommended use of the chemical and restrictions on use

Recommended Use Diverter

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: + 61 1 800 686 951
Papua New Guinea: + 61 1 800 686 951
NewZealand: +64 800 451719

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

E-Mail address: fdunexchem@halliburton.com

Emergency phone number
+ 61 1 800 686 951

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word	Not Hazardous
Hazard Statements	Not Classified
Precautionary Statements	
Prevention	None
Response	None
Storage	None
Disposal	None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

None known

Australia Classification

For the full text of the H-phrases mentioned in this Section, see Section 16

Classification	Not Classified
Risk Phrases	None

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special Exposure Hazards

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special Protective Equipment for Fire-Fighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Slippery when wet.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for Safe Handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Avoid dust accumulations.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Store between 40.5 F (4.7 C) and 120.5 F (49 C). Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 12 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator

	is recommended:
	Dust/mist respirator. (N95, P2/P3)
Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Beads	**Color:**	Green
Odor:	Odorless - Acidic	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	6-8
Freezing Point/Range	150-230 °C
Melting Point/Range	No data available
Boiling Point/Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.16 - 1.20
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	300 °C / 572 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
Temperature over 440 F (240 C).
10.5. Incompatible Materials
Strong oxidizers. Strong alkalis.
10.6. Hazardous Decomposition Products
Toxic fumes. Aldehydes. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Numerical measures of toxicity

LD50 Oral: No information available.
LD50 Dermal: No information available.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation None known.
Eye Contact None known.
Skin Contact None known.
Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability
Expected to be biodegradable

Substances	CAS Number	Persistence and Degradability

Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Does not bioaccumulate

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

16. Other information

Date of preparation or review

Revision Date: 25-Jun-2015

Revision Note
SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
None

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-23001

Revision Date: 30-Sep-2015 **Revision Number:** 10

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-23001

Other means of Identification

Synonyms: None

Product Code: HM007701

Recommended use of the chemical and restrictions on use

Recommended Use Friction Reducer

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-Mail address: fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements Not Classified

Precautionary Statements

Prevention None

Response None

Storage None

Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

Australia Classification

For the full text of the H-phrases mentioned in this Section, see Section 16

Classification Not Classified
Risk Phrases None

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical
Special Exposure Hazards
Not applicable.

Special protective equipment and precautions for fire fighters
Special Protective Equipment for Fire-Fighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for Safe Handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Ground and bond containers when transferring from one container to another. Slippery when wet. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool, dry location. Keep container closed when not in use. Keep from heat, sparks, and open flames. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.

Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Powder	**Color:**	White
Odor:	Slight	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	9
Freezing Point/Range	No data available
Melting Point/Range	No data available
Boiling Point/Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
None anticipated
10.5. Incompatible Materials
Strong oxidizers.
10.6. Hazardous Decomposition Products
Carbon monoxide and carbon dioxide. Ammonia.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mild eye irritation.
Skin Contact May cause mild skin irritation.
Ingestion Large doses may cause nausea, vomiting and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Respiratory disorders. Skin disorders.

Data limitations
No data available

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

16. Other information

Date of preparation or review

Revision Date: 30-Sep-2015

Revision Note
SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
None

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight CAS – Chemical Abstracts Service EC50 – Effective Concentration 50% LC50 – Lethal Concentration 50% LD50 – Lethal Dose 50% LL50 – Lethal Loading 50% mg/kg – milligram/kilogram mg/L – milligram/liter NOEC – No Observed Effect Concentration OEL – Occupational Exposure Limit PBT – Persistent Bioaccumulative and Toxic ppm – parts per million STEL – Short Term Exposure Limit TWA – Time-Weighted Average vPvB – very Persistent and very Bioaccumulative h - hour mg/m^3 - milligram/cubic meter mm - millimeter mmHg - millimeter mercury w/w - weight/weight d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-23003

Revision Date: 31-Jul-2018 **Revision Number:** 8

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-23003

Other means of Identification

Synonyms None

Hazardous Material Number: HM008080

Recommended use of the chemical and restrictions on use

Recommended Use Friction Reducer

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention	None
Response	None
Storage	None
Disposal	None

Contains

Substances	**CAS Number**
Hydrotreated light petroleum distillate	[redacted]
Ethoxylated branched C13 alcohol	[redacted]
Sodium diacetate	[redacted]

Other hazards which do not result in classification

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Hydrotreated light petroleum distillate	[redacted]	10 - 30%	Asp. Tox. 1 (H304)
Ethoxylated branched C13 alcohol	[redacted]	1 - 5%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 2 (H401) Aquatic Chronic 3 (H412)
Sodium diacetate	[redacted]	1 - 5%	Eye Corr. 1 (H318)

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, move victim to fresh air and seek medical attention.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire
Product is not expected to burn unless all the water is boiled away. Decomposition in fire may produce harmful gases. Use water spray to cool fire exposed surfaces.

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Spills of this product are very slippery. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove. Do NOT spread spilled product with water.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Use appropriate protective equipment. Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Avoid breathing mist. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Store in a cool well ventilated area. Keep container closed when not in use. Store at temperatures between 40 and 90 F (5 and 35 C). Keep from freezing. Product has a shelf life of 6 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Hydrotreated light petroleum distillate	[redacted]	Not applicable	Not applicable
Ethoxylated branched C13 alcohol	[redacted]	Not applicable	Not applicable
Sodium diacetate	[redacted]	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Organic vapor respirator with a dust/mist filter. (A2P2/P3)
Hand Protection Impervious rubber gloves. Polyvinylchloride gloves.
Skin Protection Normal work coveralls.
Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid
Odor: Hydrocarbon
Color Off white
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	5 - 8
Freezing Point / Range	No data available
Melting Point / Range	< 5 °C / < 41 °F
Boiling Point / Range	> 100 °C / 212 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	17.25 mmHg
Vapor Density	No data available
Specific Gravity	1.0 - 1.1
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	> 20.5 mm2/s
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Freezing conditions.
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide. Oxides of nitrogen. Hydrogen cyanide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrotreated light	[redacted]	>5000 mg/kg-bw (rat) (similar	>2000 mg/kg-bw (rabbit) (similar	>5.2 mg/L (rat, 4 h, vapor)

petroleum distillate		substance)	substance)	(similar substance)
Ethoxylated branched C13 alcohol	[redacted]	1600 mg/kg-bw (rat) (similar substance)	>2000 mg/kg-bw (rabbit) (similar substance)	>0.22 mg/L (rat, 4h, aerosol, saturated) (similar substance)
Sodium diacetate	[redacted]	5600 mg/kg (rat)	> 2000 mg/kg (rat)	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation If heated: May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.

Eye Contact In vitro tests indicate that the product is not an eye irritant.

Skin Contact Prolonged or repeated contact may cause skin irritation.

Ingestion May act as obstruction if swallowed. Aspiration can be a hazard if this material is swallowed.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

Eye ailments. Skin disorders.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Hydrotreated light petroleum distillate	[redacted]	Non-irritating to the skin (similar substances)
Ethoxylated branched C13 alcohol	[redacted]	Skin, rabbit: Causes moderate skin irritation. (similar substances)

Substances	CAS Number	Serious eye damage/irritation
Hydrotreated light petroleum distillate	[redacted]	Non-irritating to rabbit's eye (similar substances)
Ethoxylated branched C13 alcohol	[redacted]	Eye, rabbit: Causes severe eye irritation which may damage tissue. (similar substances)

Substances	CAS Number	Skin Sensitization
Hydrotreated light petroleum distillate	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Ethoxylated branched C13 alcohol	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Sodium diacetate	[redacted]	Not regarded as a sensitizer.

Substances	CAS Number	Respiratory Sensitization
Hydrotreated light petroleum distillate	[redacted]	Based on available data, the classification criteria are not met.
Ethoxylated branched C13 alcohol	[redacted]	Based on available data, the classification criteria are not met.
Sodium diacetate	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Hydrotreated light petroleum distillate	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)
Ethoxylated branched C13 alcohol	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Hydrotreated light petroleum distillate	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)
Ethoxylated branched C13 alcohol	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Hydrotreated light petroleum distillate	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)
Ethoxylated branched C13 alcohol	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)
Sodium diacetate	[redacted]	(similar substances)

Substances	CAS Number	STOT - single exposure
Hydrotreated light petroleum distillate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Ethoxylated branched C13 alcohol	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Sodium diacetate	[redacted]	No information available

Substances	CAS Number	STOT - repeated exposure
Hydrotreated light petroleum distillate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Ethoxylated branched C13 alcohol	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	Aspiration hazard
Hydrotreated light petroleum distillate	[redacted]	Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.
Ethoxylated branched C13 alcohol	[redacted]	Based on available data, the classification criteria are not met.

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Hydrotreated light petroleum distillate	[redacted]	ErL50(72 h)>10000 mg/L (Skeletonema costatum)	LC50(96 h)>10000 mg/L (Scophthalmus maximus) NOELR(28 d)>1000 mg/L (fish)	No information available	LC50(48 h)>10000 mg/L (Acartia tonsa) NOELR(21 d)=1000 mg/L (Daphnia magna)
Ethoxylated branched C13 alcohol	[redacted]	IC50(72 h)=1-10 mg/L (Desmodesmus subspicatus)	LC50(96 h)=1-10 mg/L (Cyprinus carpio)	No information available	EC50(48 h)=1-10 mg/L (Daphnia magna) NOAEC (21d) 0.77 mg/L (Daphnia magna)
Sodium diacetate	[redacted]	EC50 (72 h) >1000 mg/L (Skeletonema costatum)	LC0 (96 h) >100 mg/L (Danio rerio) LC50 (96 h) 273 mg/L (Oreochromis mossambicus)	No information available	EC50 (48 h) >1000 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Hydrotreated light petroleum distillate	[redacted]	Readily biodegradable (68.1% @ 28d)
Ethoxylated branched C13 alcohol	[redacted]	Readily biodegradable (> 60% @ 28d)
Sodium diacetate	[redacted]	No information available

12.3. Bioaccumulative potential

Bioaccumulation is unlikely

Substances	CAS Number	Log Pow
Hydrotreated light petroleum distillate	[redacted]	No information available
Ethoxylated branched C13 alcohol	[redacted]	Not Bioaccumulative; BCF = 12.7 - 237 L/Kg
Sodium diacetate	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility

Hydrotreated light petroleum distillate	[redacted]	No information available
Ethoxylated branched C13 alcohol	[redacted]	No information available
Sodium diacetate	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS

US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 31-Jul-2018

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed
H304 - May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H318 - Causes serious eye damage
H412 - Harmful to aquatic life with long lasting effects

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
OSHA

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-24001

Revision Date: 11-Jan-2017 **Revision Number:** 15

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-24001

Other means of Identification

Synonyms None

Hazardous Material Number: HM007732

Recommended use of the chemical and restrictions on use

Recommended Use Stabilizer

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin Wash with soap and water. Get medical attention if irritation persists.
Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid breathing vapors.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Clear to hazy
Odor:	Mild sulfur	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	8
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	106 °C / 224 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.29
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Strong oxidizers. Hydrochloric acid

10.6. Hazardous decomposition products

Oxides of sulfur.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation None known.
Eye Contact May cause mild eye irritation.
Skin Contact Not irritating to skin in rabbits.
Ingestion Large doses may cause nausea, vomiting and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential
Does not bioaccumulate.

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List	All components listed on inventory or are exempt.

(DSL)

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 11-Jan-2017

Revision Note
SDS sections updated: 2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-25003

Revision Date: 30-Sep-2015 **Revision Number:** 13

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-25003

Other means of Identification

Synonyms: None

Product Code: HM007670

Recommended use of the chemical and restrictions on use

Recommended Use Gelling Agent

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-Mail address: fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements Not Classified

Precautionary Statements

Prevention None

Response None

Storage None

Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

Dust can form an explosive mixture in air
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

Australia Classification

For the full text of the H-phrases mentioned in this Section, see Section 16

Classification Not Classified
Risk Phrases None

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin Wash with soap and water.
Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special Exposure Hazards

Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special Protective Equipment for Fire-Fighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for Safe Handling

Handling Precautions

Avoid creating or inhaling dust. Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Dust/mist respirator. (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Solid
Odor: Bean
Color: White to light straw
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	10.1
Freezing Point/Range	No data available
Melting Point/Range	No data available
Boiling Point/Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.3
Water Solubility	Hydrolyzes
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	510 °C / 950 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
None anticipated
10.5. Incompatible Materials
Strong oxidizers.
10.6. Hazardous Decomposition Products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mild eye irritation.
Skin Contact May cause mild skin irritation.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Follow all applicable community, national or regional regulations regarding waste management methods.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

16. Other information

Date of preparation or review

Revision Date: 30-Sep-2015

Revision Note
SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
None

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight CAS – Chemical Abstracts Service EC50 – Effective Concentration 50% LC50 – Lethal Concentration 50% LD50 – Lethal Dose 50% LL50 – Lethal Loading 50% mg/kg – milligram/kilogram mg/L – milligram/liter NOEC – No Observed Effect Concentration OEL – Occupational Exposure Limit PBT – Persistent Bioaccumulative and Toxic ppm – parts per million STEL – Short Term Exposure Limit TWA – Time-Weighted Average vPvB – very Persistent and very Bioaccumulative h - hour mg/m^3 - milligram/cubic meter mm - millimeter mmHg - millimeter mercury w/w - weight/weight d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-25005

Revision Date: 30-Sep-2015 **Revision Number:** 10

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-25005

Other means of Identification

Synonyms: None

Product Code: HM007672

Recommended use of the chemical and restrictions on use

Recommended Use Gelling Agent

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-Mail address: fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements Not Classified

Precautionary Statements

Prevention None

Response None

Storage None

Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

Australia Classification
For the full text of the H-phrases mentioned in this Section, see Section 16

Classification Not Classified
Risk Phrases None

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical

Special Exposure Hazards

Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special Protective Equipment for Fire-Fighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for Safe Handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Solid
Odor: Bean
Color: Off white
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	6.5-7.5
Freezing Point/Range	No data available
Melting Point/Range	No data available
Boiling Point/Range	No data available
Flash Point	> 93 °C / > 200 °F Cleveland Open Cup (COC)
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.42 - 1.47
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
None anticipated
10.5. Incompatible Materials
Strong oxidizers.
10.6. Hazardous Decomposition Products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above	NA	No data available	No data available	No data available

cut-off values according to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mild eye irritation.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

16. Other information

Date of preparation or review

Revision Date: 30-Sep-2015

Revision Note

SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
None

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight CAS – Chemical Abstracts Service EC50 – Effective Concentration 50% LC50 – Lethal Concentration 50% LD50 – Lethal Dose 50% LL50 – Lethal Loading 50% mg/kg – milligram/kilogram mg/L – milligram/liter NOEC – No Observed Effect Concentration OEL – Occupational Exposure Limit PBT – Persistent Bioaccumulative and Toxic ppm – parts per million STEL – Short Term Exposure Limit TWA – Time-Weighted Average vPvB – very Persistent and very Bioaccumulative h - hour mg/m^3 - milligram/cubic meter mm - millimeter mmHg - millimeter mercury w/w - weight/weight d - day

Key literature references and sources for data
www.ChemADVISOR.com/

Disclaimer Statement
This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-30001

Revision Date: 05-Jul-2016 **Revision Number:** 11

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-30001

Other means of Identification

Synonyms None

Hazardous Material Number: HM007676

Recommended use of the chemical and restrictions on use

Recommended Use Scale Inhibitor

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: + 61 1 800 686 951
Papua New Guinea: + 61 1 800 686 951
NewZealand: +64 800 451719

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

E-mail Address fdunexchem@halliburton.com

Emergency phone number
+ 61 1 800 686 951

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Not applicable

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing mist. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Product has a shelf life of 12 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN

149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

Hand Protection	Butyl rubber gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Clear to slightly hazy amber
Odor:	Mild	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	6.49 - 7.49
Freezing Point / Range	-1.1 °C
Melting Point / Range	No data available
Boiling Point / Range	100 °C
Flash Point	> 95 °C / PMCC
Evaporation rate	< 1
Vapor Pressure	18 mmHg
Vapor Density	> 1
Specific Gravity	1.24
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	1.2
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide. Toxic monomer fumes.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye and skin contact.

Symptoms related to exposure
Most Important Symptoms/Effects

No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mild eye irritation.
Skin Contact Prolonged or repeated contact may cause slight skin irritation.
Ingestion In large amounts: Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Skin disorders. Eye ailments. Respiratory disorders.

Data limitations
No data available

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability
Biodegradable.

Substances	CAS Number	Persistence and Degradability

Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Does not bioaccumulate.

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stolkhom Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 05-Jul-2016

Revision Note
SDS sections updated: 2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour

mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-32002

Revision Date: 07-Feb-2018 **Revision Number:** 19

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-32002

Other means of Identification

Synonyms None

Hazardous Material Number: HM007683

Recommended use of the chemical and restrictions on use

Recommended Use Surfactant

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Skin Corrosion/Irritation	Category 2 - H315
Serious Eye Damage/Irritation	Category 1 - H318
Acute Aquatic Toxicity	Category 2 - H401

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H302 - Harmful if swallowed
H315 - Causes skin irritation
H318 - Causes serious eye damage
H401 - Toxic to aquatic life

Precautionary Statements

Prevention
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P273 - Avoid release to the environment
P280 - Wear protective gloves/eye protection/face protection

Response
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash before reuse
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician

Storage None

Disposal P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	60 - 100%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 2 (H401)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	10 - 30%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 2 (H401)

4. First aid measures

Description of necessary first aid measures

Inhalation	Under normal conditions, first aid procedures are not required.
Eyes	Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes skin irritation. Harmful if swallowed.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Wash hands after use. Avoid breathing vapors. Ensure adequate ventilation. Slippery when wet. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Keep container closed when not in use. Keep from heat, sparks, and open flames. Product has a shelf life of 24 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Not applicable	Not applicable
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls None known.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

Hand Protection Impervious rubber gloves. Polyvinylchloride gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Yellow
Odor: Mild **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	6.5 (1%)
Freezing Point / Range	-3 °C
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	240 °C / 464 °F PMCC
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	> 10
Specific Gravity	0.98
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Strong oxidizers. Strong acids. Strong alkalis.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes severe eye irritation which may damage tissue. Causes skin irritation. Harmful if swallowed.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	600 mg/kg (Rat) (similar substance)	> 5200 mg/kg (Rabbit) (similar substance)	> 0.22 mg/L (saturated concentration) (Rat) (similar substance)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	600 mg/kg (Rat) (similar substance)	> 5200 mg/kg (Rabbit) (similar substance)	>0.22 mg/L (saturated concentration) (Rat) (similar substance)

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact Causes severe eye irritation which may damage tissue.

Skin Contact Causes skin irritation.

Ingestion Harmful if swallowed. Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

Skin disorders.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Causes skin irritation. (Rabbit) (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Causes skin irritation. (Rabbit) (similar substances)

Substances	CAS Number	Serious eye damage/irritation
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Causes severe eye irritation (Rabbit) (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Causes severe eye irritation (Rabbit) (similar substances)

Substances	CAS Number	Skin Sensitization

Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)

Substances	CAS Number	Respiratory Sensitization
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	No information available
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Did not show carcinogenic or teratogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Animal testing did not show any effects on fertility.
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Animal testing did not show any effects on fertility.

Substances	CAS Number	STOT - single exposure
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	STOT - repeated exposure
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	Aspiration hazard
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	No adverse health effects are expected from swallowing.
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	No adverse health effects are expected from swallowing.

12. Ecological Information

Ecotoxicity

Algae Toxicity ErC50 (72h): 2.58 - 3.44 mg/L (Desmodesmus subspicatus)

Acute Crustaceans Toxicity: EC50(48h): 1.45 - 1.79 mg/L (Daphnia magna)

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	EC50 (72h) 0.75 mg/L (Pseudokirchnerella subcapitata) (similar substance) EC50 (96h) 0.7 mg/L (Pseudokirchneriella subapitata) (similar substance) CD10 8 mg/L	LC50 (96h) 0.59 mg/L (Pleuronectes platessa) (similar substance) LC50 (96) 1.4 mg/L (Pimephales promelas) (similar substance) NOEC 4.4 mg/L (Pimephales promelas, juvenile)	ErC50 (16.9h) > 10 g/L (growth inhibition) (Pseudomonas putida) (similar substance)	EC50 (48h) 0.14 mg/L (Daphnia magna) (similar substance) EC50 (48h) 0.39 mg/L (Cerodaphnia dubia) (similar substance)

		(Pseudokirchneriella subapitata) EC10 2 mg/L (Brachionus calyciflorus)			
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	EC50 (72h) 0.75 mg/L (Pseudokirchnerella subcapitata) (similar substance) ErC50 (48h) 0.7 mg/L (Skeletonema costatum) EC10 9.79 mg/L (Selenastrum capricornutum) (similar substance) ErC50 1.1 mg/L (Scenedesmus subspicatus) (similar substance)	LC50 (96h) 0.59 mg/L (Pleuronectes platessa) (similar substance) LC50 (96h) 1.6 mg/L (Pimephales promelas) (similar substace) LC50 (96h) 3 mg/L (Brachydanio rerio) (similar substance)	ErC50 (16.9h) > 10 g/L (Pseudomonas putida) (similar substance)	EC50 (48h) 0.14 mg/L (Daphnia magna) (similar substance) EC50 (48h) 02 mg/L (Daphnia magna) (similar substance)

12.2. Persistence and degradability

Readily biodegradable

Substances	CAS Number	Persistence and Degradability
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Readily biodegradable (60% @ 28d) (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Readily biodegradable (84% @ 28d) (similar substances)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Log Pow: 4.3 - 5.36 (estimated) BCF: 1.1 - 1.8 (fish, estimated)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Log Pow: 4.3 - 5.36 (estimated) BCF: 1.1 - 1.8 (fish, estimated)

12.4. Mobility in soil

Substances	CAS Number	Mobility
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	KOC = >4
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	KOC = >4

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number Not restricted

UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
•3Z

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 07-Feb-2018

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed

H315 - Causes skin irritation
H318 - Causes serious eye damage

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
NZ CCID

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-32014

Revision Date: 31-Aug-2017 **Revision Number:** 3

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-32014

Other means of Identification

Synonyms None

Hazardous Material Number: HM008547

Recommended use of the chemical and restrictions on use

Recommended Use Surfactant

Uses advised against Consumer use

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Aspiration Toxicity	Category 1 - H304
Skin Corrosion/Irritation	Category 2 - H315
Serious Eye Damage/Irritation	Category 1 - H318
Reproductive Toxicity	Category 1B - H360
Acute Aquatic Toxicity	Category 2 - H401
Flammable liquids.	Category 3 - H226

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:

H226 - Flammable liquid and vapor
H304 - May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H318 - Causes serious eye damage
H360 - May damage fertility or the unborn child
H401 - Toxic to aquatic life

Precautionary Statements

Prevention

P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233 - Keep container tightly closed
P240 - Ground and bond container and receiving equipment.
P241 - Use explosion-proof electrical/ventilating/lighting/equipment
P242 - Use only non-sparking tools
P243 - Take action to prevent static discharges.
P264 - Wash face, hands and any exposed skin thoroughly after handling
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P281 - Use personal protective equipment as required

Response

P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P331 - Do NOT induce vomiting
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash before reuse
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P370 + P378 - In case of fire: Use water spray for extinction

Storage

P403 + P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up

Disposal

P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Hydrotreated light petroleum distillate	[redacted]
Ethanol	[redacted]
Fatty acids, tall-oil, ethoxylated	[redacted]
C12-C15 Ethoxylated alcohols	[redacted]
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]
Butyl alcohol	[redacted]

Methanol [redacted]

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Hydrotreated light petroleum distillate	[redacted]	10 - 30%	Asp. Tox. 1 (H304)
Ethanol	[redacted]	10 - 30%	Eye Irrit. 2A (H319) Flam. Liq. 2 (H225)
Fatty acids, tall-oil, ethoxylated	[redacted]	10 - 30%	Skin Irrit. 2 (H315) Eye Irrit. 2A (H319)
C12-C15 Ethoxylated alcohols	[redacted]	10 - 30%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 1 (H400) Aquatic Chronic 3 (H412)
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	10 - 30%	Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 2 (H401) Aquatic Chronic 3 (H412)
Butyl alcohol	[redacted]	5 - 10%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) STOT SE 3 (H335) Flam. Liq. 3 (H226)
Methanol	[redacted]	0.1 - 1%	Acute Tox. 3 (H301) Acute Tox. 3 (H311) Acute Tox. 3 (H331) Repr. 1B (H360) STOT SE 1 (H370) Flam. Liq. 2 (H225)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Seek immediate medical attention/advice. Suitable emergency eye wash facility should be immediately available

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention.

Ingestion Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration. Rinse mouth. Never give anything by mouth to an unconscious person. Following ingestion, onset of symptoms may be delayed by 12 to 24 hours. Admission to hospital should be the first priority even if symptoms are absent.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes skin irritation. Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal. Potential reproductive hazard. May cause birth defects.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

Do NOT spray pool fires directly with water. A solid stream of water directed into hot burning liquid can cause splattering.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation. Use appropriate protective equipment. Remove sources of ignition. Take precautionary measures against static discharges All equipment used when handling the product must be grounded Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Dike far ahead of liquid spill for later disposal. Soak up with inert absorbent material. Pick up and transfer to properly labeled containers. Remove ignition sources and work with non-sparking tools.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Ensure adequate ventilation. Use appropriate protective equipment. Remove sources of ignition. Ground and bond containers when transferring from one container to another. Avoid contact with eyes, skin, or clothing.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a cool well ventilated area. Keep from heat, sparks, and open flames.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Hydrotreated light petroleum distillate	[redacted]	Not applicable	Not applicable
Ethanol	[redacted]	TWA: 1000 ppm TWA: 1880 mg/m^3	STEL: 1000 ppm
Fatty acids, tall-oil, ethoxylated	[redacted]	Not applicable	Not applicable
C12-C15 Ethoxylated alcohols	[redacted]	Not applicable	Not applicable
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	Not applicable	Not applicable
Butyl alcohol	[redacted]	50 ppm	TWA: 20 ppm

Methanol	[redacted]	TWA: 200 ppm TWA: 262 mg/m^3 STEL: 250 ppm STEL: 328 mg/m^3	TWA: 200 ppm STEL: 250 ppm

Appropriate engineering controls

Engineering Controls Ensure adequate ventilation, especially in confined areas

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Organic vapor respirator.

Hand Protection Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.

Skin Protection Wear impervious protective clothing, including boots, gloves, lab coat, apron, rain jacket, pants or coverall, as appropriate, to prevent skin contact.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Colorless to Light Amber
Odor: Mild hydrocarbon **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	-44.2 °C
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	34 °C / 93.2 °F
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	0.918
Water Solubility	No data available
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Keep away from heat, sparks and flame.
10.5. Incompatible materials
Strong oxidizers. Strong acids. Strong alkalis.
10.6. Hazardous decomposition products
Carbon oxides. Oxides of nitrogen.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Skin contact. Eye contact. Inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes skin irritation. Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal. Potential reproductive hazard. May cause birth defects.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrotreated light petroleum distillate	[redacted]	>5000 mg/kg-bw (rat) (similar substance)	>2000 mg/kg-bw (rabbit) (similar substance)	>5.2 mg/L (rat, 4 h, vapor) (similar substance)
Ethanol	[redacted]	7060 mg/kg (Rat) 10,470 mg/kg (Rat)	> 15,800 mg/kg (Rabbit) 17,100 mg/kg (Rabbit)	124.7 mg/L (Rat) 4h
Fatty acids, tall-oil, ethoxylated	[redacted]	> 6400 mg/kg (Rat)	No data available	No data available
C12-C15 Ethoxylated alcohols	[redacted]	2 g/kg (Rat) 1600 mg/kg (Rat) > 5000 mg/kg (Rat)	> 2000 mg/kg (Rat) 2500 mg/kg (Rabbit)	No data available
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	3500 mg/kg (Rat) > 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 0.219 mg/L (Mouse) 4h (similar substance)
Butyl alcohol	[redacted]	790 mg/kg (Rat)	3400 mg/kg (Rabbit)	> 17.6 mg/L (Rat) 4h
Methanol	[redacted]	300 mg/kg-bw (human) < 790 to 13,000 mg/kg (rat)	1000 mg/kg-bw (human) 17,100 mg/kg (rabbit)	10 mg/L (human, 4h, vapor)

Immediate, delayed and chronic health effects from exposure
Inhalation May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.
Eye Contact Causes severe eye irritation which may damage tissue.
Skin Contact Causes skin irritation.
Ingestion Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal. Ingestion of this product may cause blindness due to the presence of methanol.

Chronic Effects/Carcinogenicity Prolonged or repeated exposure may cause reproductive system damage. May cause birth defects.

Exposure Levels
No data available

Interactive effects
No data available

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Hydrotreated light petroleum distillate	[redacted]	Non-irritating to the skin (similar substances)
Ethanol	[redacted]	Not irritating to skin in rabbits.
Fatty acids, tall-oil, ethoxylated	[redacted]	Irritating to skin.
C12-C15 Ethoxylated alcohols	[redacted]	May cause moderate skin irritation. (Rabbit)
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	Skin, rabbit: Causes moderate skin irritation. (similar substances)
Butyl alcohol	[redacted]	Causes moderate skin irritation.
Methanol	[redacted]	Non-irritating to the skin (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Hydrotreated light petroleum distillate	[redacted]	Non-irritating to rabbit's eye (similar substances)
Ethanol	[redacted]	Causes moderate eye irritation (Rabbit)
Fatty acids, tall-oil, ethoxylated	[redacted]	Irritating to eyes
C12-C15 Ethoxylated alcohols	[redacted]	Risk of serious damage to eyes (Rabbit) (similar substances)
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	Causes severe eye irritation (similar substances)
Butyl alcohol	[redacted]	Causes severe eye irritation
Methanol	[redacted]	Non-irritating to the eye (Rabbit)

Substances	CAS Number	Skin Sensitization
Hydrotreated light petroleum distillate	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Ethanol	[redacted]	Did not cause sensitization on laboratory animals
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	Did not cause sensitization on laboratory animals (similar substances)
Butyl alcohol	[redacted]	Not confirmed to cause skin or respiratory sensitization.
Methanol	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Hydrotreated light petroleum distillate	[redacted]	No information available
Ethanol	[redacted]	Did not cause sensitization on laboratory animals
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	No information available
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	No information available
Butyl alcohol	[redacted]	No information available
Methanol	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Hydrotreated light petroleum distillate	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)
Ethanol	[redacted]	Not regarded as mutagenic.
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	In vivo tests did not show mutagenic effects. In vitro tests did not show mutagenic effects.
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)
Butyl alcohol	[redacted]	In vitro tests did not show mutagenic effects.
Methanol	[redacted]	The weight of evidence from available in vitro and in vivo studies indicates that this substance is not expected to be mutagenic.

Substances	CAS Number	Carcinogenic Effects

Hydrotreated light petroleum distillate	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)
Ethanol	[redacted]	Did not show carcinogenic effects in animal experiments
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	Did not show carcinogenic effects in animal experiments
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	Not regarded as carcinogenic.
Butyl alcohol	[redacted]	No information available
Methanol	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	**Reproductive toxicity**
Hydrotreated light petroleum distillate	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)
Ethanol	[redacted]	Animal testing did not show any effects on fertility.
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	Not a confirmed teratogen or embryotoxin.
Butyl alcohol	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.
Methanol	[redacted]	Experiments have shown reproductive toxicity effects on laboratory animals

Substances	CAS Number	**STOT - single exposure**
Hydrotreated light petroleum distillate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Ethanol	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Butyl alcohol	[redacted]	May cause respiratory irritation.
Methanol	[redacted]	May cause disorder and damage to the Central Nervous System (CNS)

Substances	CAS Number	**STOT - repeated exposure**
Hydrotreated light petroleum distillate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Ethanol	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Butyl alcohol	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Methanol	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	**Aspiration hazard**
Hydrotreated light petroleum distillate	[redacted]	Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.
Ethanol	[redacted]	Not applicable
Fatty acids, tall-oil, ethoxylated	[redacted]	Not applicable
C12-C15 Ethoxylated alcohols	[redacted]	No adverse health effects are expected from swallowing.
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	No information available
Butyl alcohol	[redacted]	Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.
Methanol	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

Product is not classified as hazardous to the environment.

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Hydrotreated light petroleum distillate	[redacted]	ErL50(72 h)>10000 mg/L (Skeletonema costatum)	LC50(96 h)>10000 mg/L (Scophthalmus maximus) NOELC(28 d)>1000 mg/L (fish)	No information available	LC50(48 h)>10000 mg/L (Acartia tonsa) NOEC(21 d)=1000 mg/L (Daphnia magna)
Ethanol	[redacted]	No information available	LC50 > 100 mg/L (Pimephales promelas)	No information available	LC50 9268 - 14,221 mg/L (Daphnia magna) LC50 5012 mg/L (Ceridaphnia dubia) NOEC 9.6 mg/L (Daphnia magna)
Fatty acids, tall-oil, ethoxylated	[redacted]	EC50 (72h) > 44 mg/L EC50 (72h) 2.5 mg/L (Skeletonema costatum)	LC50 (95h) 7.8 mg/L (Brachydanio rerio) LC50 (96h) 45 mg/L (Cyprinodon variegatus)	EC20 (180m) >1000 mg/L	EC50 (48h) 16 mg/L (Daphnia magna) EC50 (48h) 26.8 mg/L (Acartia tonsa)
C12-C15 Ethoxylated alcohols	[redacted]	No information available	EC50 (48h) 0.39 mg/L (Ceriodaphnia dubia) NOEC (30d) 0.28 mg/L (Pimephales promelas) NOEC (16d) 0.16 mg/L(Lepomis macrochirus)	No information available	No information available
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	EC50 (72h) 2.2 mg/L (Scendesmus subspicatus) (similar substance)	LC50 (96h) 6.7 mg/L (Danio rerio) (similar substance)	No information available	LC50 (21d) = 0.1 mg/L (Daphnia magna) LC50 (48h) = 2.15 mg/L
Butyl alcohol	[redacted]	EC50 (96h) 225 mg/L (Pseudokirchnerella subcapitata)	LC50 (96h) 1376 mg/L (Pimephales promelas)	No information available	EC50 (48h) 1328 mg/L (Daphnia magna) NOEC (21d) 4.1 mg/L (Daphnia magna) EC50 (21d) 18 mg/L (Daphnia magna)
Methanol	[redacted]	EC50 (96 h) =22000 mg/L (Pseudokirchnerella subcapitata) NOEC (8 d) =8000 mg/L (Scenedesmus quadricauda)	LC50 (96 h) =15400 mg/L (Lepomis macrochirus) EC50 (200 h) =14536 mg/L (Oryzias latipes)	IC50 (3h) > 1000 mg/L (activated sludge)	EC50 (96 h) =18260 mg/L (Dapnia magna) NOEC (21 d) =208 mg/L (Dapnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Hydrotreated light petroleum distillate	[redacted]	Readily biodegradable (68.1% @ 28d)
Ethanol	[redacted]	No information available
Fatty acids, tall-oil, ethoxylated	[redacted]	Readily biodegradable (74% @ 28d)
C12-C15 Ethoxylated alcohols	[redacted]	Readily biodegradable
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	Readily biodegradable (77% @ 28d)
Butyl alcohol	[redacted]	Biodegradable. (92% @ 20d)
Methanol	[redacted]	Readily biodegradable (95% @ 20d)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Hydrotreated light petroleum distillate	[redacted]	No information available
Ethanol	[redacted]	-0.32
Fatty acids, tall-oil, ethoxylated	[redacted]	MW > 700
C12-C15 Ethoxylated alcohols	[redacted]	3
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	3.2 (estimated)

Butyl alcohol	[redacted]	1
Methanol	[redacted]	Not Bioaccumulative; BCF=1

12.4. Mobility in soil

Substances	CAS Number	Mobility
Hydrotreated light petroleum distillate	[redacted]	No information available
Ethanol	[redacted]	No information available
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	No information available
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	No information available
Butyl alcohol	[redacted]	KOC = 72
Methanol	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Ethanol, Butanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable

IMDG/IMO

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Ethanol, Butanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable

IATA/ICAO

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Ethanol, Butanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable

Special precautions during transport

None

HazChem Code

•3Y

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product does not comply with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 31-Aug-2017

Revision Note

SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3

H225 - Highly flammable liquid and vapor
H226 - Flammable liquid and vapor
H301 - Toxic if swallowed
H302 - Harmful if swallowed
H304 - May be fatal if swallowed and enters airways
H311 - Toxic in contact with skin
H315 - Causes skin irritation
H318 - Causes serious eye damage
H319 - Causes serious eye irritation
H331 - Toxic if inhaled
H335 - May cause respiratory irritation
H360 - May damage fertility or the unborn child
H370 - Causes damage to organs
H400 - Very toxic to aquatic life
H401 - Toxic to aquatic life
H412 - Harmful to aquatic life with long lasting effects

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%

LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

FE-2

Revision Date: 16-Apr-2015 **Revision Number:** 28

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name FE-2

Other means of Identification

Synonyms: None

Product Code: HM000682

Recommended use of the chemical and restrictions on use

Recommended Use Iron Control Agent

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-Mail address: fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage / Eye Irritation	Category 2 - H319

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Warning

Hazard Statements H319 - Causes serious eye irritation

Precautionary Statements

Prevention P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear eye protection/face protection

Response P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention

Storage None

Disposal None

Contains

Substances	**CAS Number**
Citric acid	[redacted]

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

Australia Classification
For the full text of the H-phrases mentioned in this Section, see Section 16

Classification Xi - Irritant.

Risk Phrases R36 Irritating to eyes.

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Citric acid	[redacted]	60 - 100%	Eye Irrit. 2A (H319)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Causes eye irritation.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special Exposure Hazards
Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters
Special Protective Equipment for Fire-Fighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for Safe Handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from alkalis. Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 60 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Citric acid	[redacted]	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls	Use in a well ventilated area.

Personal protective equipment (PPE)

Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection	Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Nitrile gloves. (>= 0.35 mm thickness) This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.
Skin Protection	Normal work coveralls.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color:**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	2 - 2.2
Freezing Point/Range	No data available
Melting Point/Range	No data available
Boiling Point/Range	No data available
Flash Point	No data available
upper flammability limit	65
lower flammability limit	8
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.665
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	1000 °C / 1832 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	192.13
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical Stability

Stable

10.3. Possibility of Hazardous Reactions

Will Not Occur

10.4. Conditions to Avoid

None anticipated

10.5. Incompatible Materials

Strong alkalis. Strong oxidizers.

10.6. Hazardous Decomposition Products

Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure

Most Important Symptoms/Effects

Causes eye irritation.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Citric acid	[redacted]	5400 mg/kg (Rat) 5790 mg/kg (Mouse) 11,700 mg/kg (Rat)	> 2000 mg/kg	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact Causes eye irritation.

Skin Contact May cause mild skin irritation.

Ingestion Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

None known.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Citric acid	[redacted]	Not irritating to skin in rabbits.

Substances	CAS Number	Eye damage/irritation
Citric acid	[redacted]	Causes severe eye irritation.

Substances	CAS Number	Skin Sensitization
Citric acid	[redacted]	Patch test on human volunteers did not demonstrate sensitization properties

Substances	CAS Number	Respiratory Sensitization
Citric acid	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Citric acid	[redacted]	Did not show mutagenic effects in animal experiments

Substances	CAS Number	Carcinogenic Effects
Citric acid	[redacted]	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Citric acid	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Citric acid	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	STOT - repeated exposure
Citric acid	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Citric acid	[redacted]	No adverse health effects are expected from swallowing.

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Citric acid	[redacted]	NOEC (8d) 425 mg/L (cell density) (Scenedesmus quadricauda) LOEC (8d) >80 mg/L (Microcystis aeruginosa)	LC50 (96h) 1516 mg/L (Lepomis macrochirus) LC50 (48h) 440 mg/L (Leuciscus idus melanotus) LC50 (96h) >100 mg/L (Pimephales promelas)	TT (72h) 485 mg/L (Entosiphon sulcatum)	TLM96 100-330 ppm (Crangon crangon) EC50 (24h) 1535 mg/L (Daphnia magna) LC50 (48h) 160 mg/L (Daphnia magna) EC50 (48h) >50 mg/L (Daphnia magna)

12.2. Persistence and degradability

Biodegradable.

Substances	CAS Number	Persistence and Degradability
Citric acid	[redacted]	Readily biodegradable (97% @ 28d)

12.3. Bioaccumulative potential

Does not bioaccumulate

Substances	CAS Number	Log Pow
Citric acid	[redacted]	-1.61 to -1.80

12.4. Mobility in soil

Substances	CAS Number	Mobility
Citric acid	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual

contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

16. Other information

Date of preparation or review

Revision Date: 16-Apr-2015

Revision Note Revision Note
SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
R36 - Irritating to eyes

Full text of H-Statements referred to under sections 2 and 3
H319 - Causes serious eye irritation

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight CAS – Chemical Abstracts Service EC50 – Effective Concentration 50% LC50 – Lethal Concentration 50% LD50

– Lethal Dose 50% LL50 – Lethal Loading 50% mg/kg – milligram/kilogram mg/L – milligram/liter NOEC – No Observed Effect Concentration OEL – Occupational Exposure Limit PBT – Persistent Bioaccumulative and Toxic ppm – parts per million STEL – Short Term Exposure Limit TWA – Time-Weighted Average vPvB – very Persistent and very Bioaccumulative h - hour mg/m^3 - milligram/cubic meter mm - millimeter mmHg - millimeter mercury w/w - weight/weight d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

HC-2A

Revision Date: 12-Jun-2018 **Revision Number:** 2

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name HC-2A

Other means of Identification

Synonyms None

Hazardous Material Number: HM008835

Recommended use of the chemical and restrictions on use

Recommended Use Surfactant

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage/Irritation	Category 1 - H318
Acute Aquatic Toxicity	Category 2 - H401
Chronic Aquatic Toxicity	Category 2 - H411

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H318 - Causes serious eye damage
H401 - Toxic to aquatic life
H411 - Toxic to aquatic life with long lasting effects

Precautionary Statements

Prevention
P273 - Avoid release to the environment
P280 - Wear eye protection/face protection

Response
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P391 - Collect spillage

Storage None

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	CAS Number
Inner salt of alkyl amines	Proprietary

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Inner salt of alkyl amines	Proprietary	10 - 30%	Eye Corr. 1 (H318) Aquatic Acute 2 (H401) Aquatic Chronic 2 (H411)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Rinse mouth with water many times. Get medical attention if symptoms occur

Symptoms caused by exposure
Causes severe eye irritation which may damage tissue.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Use water spray to cool fire exposed surfaces. Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Inner salt of alkyl amines	Proprietary	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection	Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.
Skin Protection	Wear protective clothing appropriate for the work environment.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Clear light amber
Odor:	Surfactant	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	6.5-7.5
Freezing Point / Range	0 °C
Melting Point / Range	No data available
Boiling Point / Range	100 °C / 212 °F
Flash Point	> 100 °C / > 212 °F PMCC
Evaporation rate	No data available
Vapor Pressure	< 17.5 mmHg
Vapor Density	No data available
Specific Gravity	1.12
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Keep away from heat, sparks and flame.
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Oxides of nitrogen. Carbon monoxide and carbon dioxide. Hydrogen chloride.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure	Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes severe eye irritation which may damage tissue.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Inner salt of alkyl amines	Proprietary	>5000 mg/kg-bw (rat)	>2000 mg/kg-bw (rat)	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact Causes severe eye irritation which may damage tissue. May cause corneal injury.

Skin Contact May cause mild skin irritation.

Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

None known.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Inner salt of alkyl amines		Not irritating to skin in rabbits.

Substances	CAS Number	Serious eye damage/irritation
Inner salt of alkyl amines		Causes severe eye irritation (Rabbit)

Substances	CAS Number	Skin Sensitization
Inner salt of alkyl amines		Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Inner salt of alkyl amines		No information available

Substances	CAS Number	Mutagenic Effects
Inner salt of alkyl amines		In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Inner salt of alkyl amines		Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Inner salt of alkyl amines		Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Inner salt of alkyl amines		No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Inner salt of alkyl amines		No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Inner salt of alkyl amines		Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Inner salt of alkyl amines	Proprietary	EC50 (96 h) 0.55 mg/L (Desmodesmus subspicatus) EC50 (72 h) 17.2 mg/L (Scenedesmus subspicatus) EC50 (72 h) 9.86 mg/L (Scenedesmus subspicatus) EC50 (72 h) 30 mg/L (Scenedesmus subspicatus)	LC50 (96 h) 2 mg/L (Brachydanio rerio) NOEC (28 d) 16 mg/L (Oncorhynchus mykiss)	No information available	EC50 (48 h) 6.5 mg/L (Daphnia magna) NOEC (21 d) 0.9 mg/L (Daphnia magna) NOEC (21 d) 0.932 mg/L (Daphnia magna) NOEC (21 d) 2.98 mg/L (Daphnia magna) NOEC (21 d) 0.03 mg/L (Daphnia magna) NOEC (21 d) 0.065 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Inner salt of alkyl amines	Proprietary	Readily biodegradable (>90% @ 28d)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Inner salt of alkyl amines	Proprietary	Log Pow =0.9

12.4. Mobility in soil

Substances	CAS Number	Mobility
Inner salt of alkyl amines	Proprietary	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Follow all applicable community, national or regional regulations regarding waste management methods.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number UN3082
UN proper shipping name: Environmentally Hazardous Substance, Liquid, N.O.S. (Contains Inner salt of alkyl amines)
Transport Hazard Class(es): 9
Packing Group: III
Environmental Hazards: Marine Pollutant

IMDG/IMO

UN Number	UN3082
UN proper shipping name:	Environmentally Hazardous Substance, Liquid, N.O.S. (Contains Inner salt of alkyl amines)
Transport Hazard Class(es):	9
Packing Group:	III
Environmental Hazards:	Marine Pollutant
EMS:	EmS F-A, S-F

IATA/ICAO

UN Number	UN3082
UN proper shipping name:	Environmentally Hazardous Substance, Liquid, N.O.S. (Contains Inner salt of alkyl amines)
Transport Hazard Class(es):	9
Packing Group:	III
Environmental Hazards:	Marine Pollutant

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product does not comply with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 12-Jun-2018

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H318 - Causes serious eye damage
H401 - Toxic to aquatic life
H411 - Toxic to aquatic life with long lasting effects

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

HYDROCHLORIC ACID

Revision Date: 20-Jun-2016 **Revision Number:** 40

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name HYDROCHLORIC ACID

Other means of Identification

Synonyms None

Hazardous Material Number: HM000911

Recommended use of the chemical and restrictions on use

Recommended Use Solvent

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute inhalation toxicity - vapor	Category 3 - H331
Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Substances/mixtures corrosive to metal	Category 1 - H290

Label elements, including precautionary statements

Hazard pictograms

Signal Word Danger

Hazard Statements:
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H331 - Toxic if inhaled
H335 - May cause respiratory irritation

Precautionary Statements

Prevention
P103 - Read label before use
P234 - Keep only in original container
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P390 - Absorb spillage to prevent material damage

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P406 - Store in corrosive resistant container with a resistant inner liner.

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Hydrochloric acid	[redacted]

Other hazards which do not result in classification
Chronic exposure to corrosive fumes/gases may cause erosion of the teeth followed by jaw necrosis. Bronchial irritation with chronic cough and frequent attacks of pneumonia are common. Gastrointestinal disturbances may also be seen
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Hydrochloric acid	[redacted]	30 - 60%	Acute Tox. 3 (H331) Skin Corr. 1A (H314) Eye Corr. 1 (H318)

			STOT SE 3 (H335) Met. Corr. 1 (H290)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation. Harmful if inhaled.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

May form explosive mixtures with strong alkalis. Decomposition in fire may produce harmful gases. Reaction with steel and certain other metals generates flammable hydrogen gas. Do not allow runoff to enter waterways.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Evacuate all persons from the area.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas. Consult local authorities.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Neutralize to pH of 6-8. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from alkalis. Store in a cool well ventilated area. Keep container closed when not in use. Store locked up. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Hydrochloric acid	[redacted]	5 ppm	TWA: 2 ppm (Ceiling)

Appropriate engineering controls
Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Acid gas respirator.

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Butyl rubber gloves. (>= 0.7 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.
Skin Protection Full protective chemical resistant clothing. Rubber boots
Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties
Physical State: Liquid **Color** Clear colorless
Odor: Pungent acrid **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	0.8
Freezing Point / Range	-46 °C
Melting Point / Range	No data available
Boiling Point / Range	110 °C / 230 °F
Flash Point	No data available

Evaporation rate	No data available
Vapor Pressure	26
Vapor Density	No data available
Specific Gravity	1.18
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	36.5
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong alkalis.
10.6. Hazardous decomposition products
Flammable hydrogen gas. Chlorine. Hydrogen sulfide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation. Harmful if inhaled.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrochloric acid	[redacted]	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation	Harmful if inhaled. Causes severe respiratory irritation.
Eye Contact	Causes eye burns
Skin Contact	Causes severe burns. Did not cause sensitization on laboratory animals (guinea pig)
Ingestion	Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Prolonged, excessive exposure may cause erosion of the teeth.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Hydrochloric acid	[redacted]	Causes severe burns Causes severe skin irritation with tissue destruction.

Substances	CAS Number	Serious eye damage/irritation
Hydrochloric acid	[redacted]	Causes severe burns Causes severe eye irritation. Will damage tissue.

Substances	CAS Number	Skin Sensitization
Hydrochloric acid	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Hydrochloric acid	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Hydrochloric acid	[redacted]	Not regarded as mutagenic. In vitro tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Hydrochloric acid	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	Reproductive toxicity
Hydrochloric acid	[redacted]	Embryo and fetotoxicity has been observed in female rats exposed to maternally toxic levels of hydrogen chloride (450 mg/m^3, 1hr.). When tested at maternally toxic doses, no adverse effects on fertility, teratogenicity, or development were observed.

Substances	CAS Number	STOT - single exposure
Hydrochloric acid	[redacted]	May cause respiratory irritation. No information available

Substances	CAS Number	STOT - repeated exposure
Hydrochloric acid	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Hydrochloric acid	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Hydrochloric acid	[redacted]	No information available	LC50 282 mg/L (Gambusia affinis) LC50 20.5 mg/L (Lepomis macrochirus) LC50 (96h) 3.25 – 3.5 (pH) (Lepomis macrochirus)	EC50 (3h) >= 5 and <= 5.5 (pH) (Activated sludge, domestic)	EC50 (48 h) 4.92 mg/L (Daphnia magna)

12.2. Persistence and degradability
The methods for determining biodegradability are not applicable to inorganic substances.

Substances	CAS Number	Persistence and Degradability
Hydrochloric acid	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential
Does not bioaccumulate.

Substances	CAS Number	Log Pow

Hydrochloric acid	[redacted]	LogKow -2.65

12.4. Mobility in soil

Substances	CAS Number	Mobility
Hydrochloric acid	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number	UN1789
UN proper shipping name:	Hydrochloric Acid Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

2R

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

S6

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stolkhom Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply

Basel Convention - Hazardous Waste: Does not apply

16. Other information

Date of preparation or review

Revision Date: 20-Jun-2016

Revision Note
SDS sections updated: 2

Full text of H-Statements referred to under sections 2 and 3
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation
H331 - Toxic if inhaled
H332 - Harmful if inhaled

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

NITROGEN LIQUEFIED

Revision Date: 29-Aug-2017 **Revision Number:** 30

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name NITROGEN LIQUEFIED

Other means of Identification

Synonyms None

Hazardous Material Number: HM001654

Recommended use of the chemical and restrictions on use

Recommended Use Fluid

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Gases under pressure.	Refrigerated liquefied gas - H281

Label elements, including precautionary statements

Hazard Pictograms

Signal Word WARNING

Hazard Statements: H281 - Contains refrigerated gas; may cause cryogenic burns or injury

Precautionary Statements

Prevention	P282 - Wear cold insulating gloves and either face shield or eye protection.
Response	P336 - Thaw frosted parts with lukewarm water. Do no rub affected area P315 - Get immediate medical advice/attention
Storage	P403 - Store in a well-ventilated place
Disposal	None

Contains

Substances	**CAS Number**
Nitrogen	[redacted]

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Nitrogen	[redacted]	60 - 100%	Refrigerated Liquefied Gas Compressed gas (H280)

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, move victim to fresh air and seek medical attention.
Eyes	In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.
Skin	For exposure to liquid, immediately warm frostbite area with warm water (not to exceed 105 F or 41 C). In case of massive exposure, remove clothing while showering with warm water. Get medical attention.
Ingestion	Get immediate medical attention.

Symptoms caused by exposure
Reduces oxygen available for breathing. May cause freeze burns.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Containers may explode (due to the build-up of pressure) when exposed to extreme heat

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions
None known.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool, dry location. Keep container closed when not in use.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Nitrogen	[redacted]	1000 ppm	:

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
In high concentrations, supplied air respirator or a self-contained breathing apparatus.
Hand Protection Substantial leather work gloves.
Skin Protection Normal work coveralls.
Eye Protection None known.
Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Clear colorless
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	-210 °C
Melting Point / Range	No data available
Boiling Point / Range	-195 °C / -319 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	608
Vapor Density	0.97
Specific Gravity	0.8
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	28
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
None known.
10.6. Hazardous decomposition products
None known.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Reduces oxygen available for breathing. May cause freeze burns.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Nitrogen	[redacted]	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation	Reduces oxygen available for breathing.
Eye Contact	Contact with liquid causes frostbite.
Skin Contact	Contact of material on skin may result in frostbite.
Ingestion	Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Nitrogen	[redacted]	Contact with liquid causes frostbite.

Substances	CAS Number	Serious eye damage/irritation
Nitrogen	[redacted]	Non-irritating to the eye

Substances	CAS Number	Skin Sensitization
Nitrogen	[redacted]	No information available

Substances	CAS Number	Respiratory Sensitization
Nitrogen	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Nitrogen	[redacted]	Not regarded as mutagenic.

Substances	CAS Number	Carcinogenic Effects
Nitrogen	[redacted]	No information available

Substances	CAS Number	Reproductive toxicity
Nitrogen	[redacted]	No information available

Substances	CAS Number	STOT - single exposure
Nitrogen	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Nitrogen	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Nitrogen	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Nitrogen	[redacted]	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Nitrogen	[redacted]	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow

Nitrogen	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Nitrogen	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	UN1977
UN proper shipping name:	Nitrogen, Refrigerated Liquid
Transport Hazard Class(es):	2.2
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	UN1977
UN proper shipping name:	Nitrogen, Refrigerated Liquid
Transport Hazard Class(es):	2.2
Packing Group:	Not applicable
Environmental Hazards:	Not applicable
EMS:	EmS F-C, S-V

IATA/ICAO

UN Number	UN1977
UN proper shipping name:	Nitrogen, Refrigerated Liquid
Transport Hazard Class(es):	2.2
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

2T

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.

New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 29-Aug-2017

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H281 - Contains refrigerated gas; may cause cryogenic burns or injury

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

POTASSIUM CHLORIDE

Revision Date: 04-Sep-2015 **Revision Number:** 22

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name POTASSIUM CHLORIDE

Other means of Identification

Synonyms: None

Product Code: HM001200

Recommended use of the chemical and restrictions on use

Recommended Use Brine

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-Mail address: fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements Not Classified

Precautionary Statements

Prevention None

Response None

Storage None

Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

Australia Classification
For the full text of the H-phrases mentioned in this Section, see Section 16

Classification Not Classified
Risk Phrases None

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical
Special Exposure Hazards
Not applicable.

Special protective equipment and precautions for fire fighters
Special Protective Equipment for Fire-Fighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for Safe Handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool, dry location. Product has a shelf life of 60 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Respiratory Protection Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Dust proof goggles.
Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color:**	White to gray
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	~7
Freezing Point/Range	771 °C
Melting Point/Range	No data available
Boiling Point/Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.99
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	74.55
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
None anticipated
10.5. Incompatible Materials
None known.
10.6. Hazardous Decomposition Products
None known.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according	NA	No data available	No data available	No data available

to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mild eye irritation.
Skin Contact May cause mild skin irritation.
Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea. Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable.

Substances	CAS Number	Eye damage/irritation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable.

Substances	CAS Number	Skin Sensitization
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

Substances	CAS Number	Respiratory Sensitization
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

Substances	CAS Number	Mutagenic Effects
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

Substances	CAS Number	Carcinogenic Effects
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

Substances	CAS Number	Reproductive toxicity

Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

Substances	CAS Number	STOT - single exposure
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

Substances	CAS Number	STOT - repeated exposure
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

Substances	CAS Number	Aspiration hazard
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information
This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Bury in a licensed landfill according to federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging
Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

16. Other information

Date of preparation or review

Revision Date: 04-Sep-2015

Revision Note
SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
None

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight CAS – Chemical Abstracts Service EC50 – Effective Concentration 50% LC50 – Lethal Concentration 50% LD50 – Lethal Dose 50% LL50 – Lethal Loading 50% mg/kg – milligram/kilogram mg/L – milligram/liter NOEC – No Observed Effect Concentration OEL – Occupational Exposure Limit PBT – Persistent Bioaccumulative and Toxic ppm – parts per million STEL – Short Term Exposure Limit TWA – Time-Weighted Average vPvB – very Persistent and very Bioaccumulative h - hour mg/m^3 - milligram/cubic meter mm - millimeter mmHg - millimeter mercury w/w - weight/weight d - day

Key literature references and sources for data

www.ChemADVISOR.com/
NZ CCID

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This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

SAND - LOCAL

Revision Date: 01-Feb-2019 **Revision Number:** 2

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name SAND - LOCAL

Other means of Identification

Synonyms None

Hazardous Material Number: HM008704

Recommended use of the chemical and restrictions on use

Recommended Use Proppant

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Carcinogenicity	Category 1A - H350
Specific Target Organ Toxicity - (Repeated Exposure)	Category 1 - H372

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H350 - May cause cancer by inhalation
H372 - Causes damage to organs through prolonged or repeated exposure if inhaled

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P281 - Use personal protective equipment as required

Response
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P314 - Get medical attention/advice if you feel unwell

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Crystalline silica, quartz	[redacted]

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Crystalline silica, quartz	[redacted]	60 - 100%	Carc. 1A (H350) STOT RE 1 (H372)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Skin Flush skin with large amounts of water. If irritation persists, get medical attention.

Ingestion Rinse mouth with water many times. Get medical attention, if symptoms occur

Symptoms caused by exposure
This product contains a suspected carcinogen. Causes damage to organs through prolonged or repeated exposure. Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

None - does not burn.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

None anticipated

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions

None known.

6.3. Methods and material for containment and cleaning up

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Product has a shelf life of 36 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Crystalline silica, quartz	[redacted]	TWA: 0.1 mg/m^3	TWA: 0.025 mg/m^3

Appropriate engineering controls

Engineering Controls A well ventilated area to control dust levels.

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Wear a NIOSH certified, European Standard EN 149 (FFP2/FFP3), AS/NZS 1715, or equivalent respirator when using this product.
Hand Protection	Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White to tan
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2.63 - 2.67
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	65 g/mole
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Hydrofluoric acid.

10.6. Hazardous decomposition products
Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
This product contains a suspected carcinogen. Causes damage to organs through prolonged or repeated exposure. Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica, quartz	[redacted]	> 15000 mg/kg (human)	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact May cause mild eye irritation.
Skin Contact May cause mild skin irritation.
Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity This product contains a suspected carcinogen. Causes damage to organs through prolonged or repeated exposure. Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Exposure Levels
No data available

Interactive effects
Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Crystalline silica, quartz	[redacted]	Non-irritating to the skin

Substances	CAS Number	Serious eye damage/irritation
Crystalline silica, quartz	[redacted]	Non-irritating to the eye No information available

Substances	CAS Number	Skin Sensitization
Crystalline silica, quartz	[redacted]	No information available.

Substances	CAS Number	Respiratory Sensitization

Crystalline silica, quartz	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Crystalline silica, quartz	[redacted]	Not regarded as mutagenic.

Substances	CAS Number	Carcinogenic Effects
Crystalline silica, quartz	[redacted]	Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure.

Substances	CAS Number	Reproductive toxicity
Crystalline silica, quartz	[redacted]	No information available

Substances	CAS Number	STOT - single exposure
Crystalline silica, quartz	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Crystalline silica, quartz	[redacted]	Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs)

Substances	CAS Number	Aspiration hazard
Crystalline silica, quartz	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Crystalline silica, quartz	[redacted]	EC50(72 h)=440 mg/L (Pseudokirchneriella subcapitata)	LL0(96 h)=10000 mg/L (Danio rerio)	No information available	LL50(24 h)>10000 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Crystalline silica, quartz	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Crystalline silica, quartz	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Crystalline silica, quartz	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information
Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 01-Feb-2019

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H350 - May cause cancer by inhalation
H372 - Causes damage to organs through prolonged or repeated exposure if inhaled

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

Disclaimer Statement
This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

CERAMIC PROP

Revision Date: 07-Jun-2018 **Revision Number:** 12

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name CERAMIC PROP

Other means of Identification

Synonyms None

Hazardous Material Number: HM004805

Recommended use of the chemical and restrictions on use

Recommended Use Proppant

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Carcinogenicity	Category 1A - H350
Specific Target Organ Toxicity - (Repeated Exposure)	Category 1 - H372

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H350 - May cause cancer by inhalation
H372 - Causes damage to organs through prolonged or repeated exposure if inhaled

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P281 - Use personal protective equipment as required

Response
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P314 - Get medical attention/advice if you feel unwell

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Crystalline silica, cristobalite	[redacted]

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Crystalline silica, cristobalite	[redacted]	10 - 30%	Carc. 1A (H350) STOT RE 1 (H372)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

None - does not burn.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Not applicable

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions

None known.

6.3. Methods and material for containment and cleaning up

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a cool well ventilated area. Store locked up. Store in a cool, dry location. Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Crystalline silica, cristobalite	[redacted]	TWA: 0.1 mg/m^3	TWA: 0.025 mg/m^3

Appropriate engineering controls

Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Wear a NIOSH certified, European Standard EN 149 (FFP2/FFP3), AS/NZS 1715, or equivalent respirator when using this product.
Hand Protection	Normal work gloves.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	Gray to tan
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	3.1
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Hydrofluoric acid.

10.6. Hazardous decomposition products

Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica, cristobalite	[redacted]	> 15000 mg/kg (human) (similar substance)	No information available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact May cause mechanical irritation to eye.

Skin Contact None known.

Ingestion None known.

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2). There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

Exposure Levels

No data available

Interactive effects

Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Crystalline silica, cristobalite	[redacted]	Non-irritating to the skin

Substances	CAS Number	Serious eye damage/irritation
Crystalline silica, cristobalite	[redacted]	Mechanical irritation of the eyes is possible.

Substances	CAS Number	Skin Sensitization
Crystalline silica, cristobalite	[redacted]	No information available

Substances	CAS Number	Respiratory Sensitization
Crystalline silica, cristobalite	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Crystalline silica, cristobalite	[redacted]	Not regarded as mutagenic.

Substances	CAS Number	Carcinogenic Effects
Crystalline silica, cristobalite	[redacted]	Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure. Based on available scientific evidence, this substance is a threshold carcinogen with a mode of action involving indirect genotoxicity secondary to lung injury.

Substances	CAS Number	Reproductive toxicity
Crystalline silica, cristobalite	[redacted]	No information available

Substances	CAS Number	STOT - single exposure
Crystalline silica, cristobalite	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Crystalline silica, cristobalite	[redacted]	Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs)

Substances	CAS Number	Aspiration hazard
Crystalline silica, cristobalite	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
Product is not classified as hazardous to the environment.

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Crystalline silica, cristobalite	[redacted]	No information available	LL0(96 h)=10000 mg/L (Danio rerio)	No information available	LL50(24 h)>10000 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Crystalline silica, cristobalite	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation

Crystalline silica, cristobalite	[redacted]	Not bioaccumulative

12.4. Mobility in soil

Substances	CAS Number	Mobility
Crystalline silica, cristobalite	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or

Chemicals	assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 07-Jun-2018

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H350 - May cause cancer by inhalation
H372 - Causes damage to organs through prolonged or repeated exposure if inhaled

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

Coil Tubing Hydraulic Fracturing System SDS

HALLIBURTON

SAFETY DATA SHEET

ACETIC ACID 60%

Revision Date: 19-Mar-2015 **Revision Number:** 9

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name ACETIC ACID 60%

Other means of Identification

Synonyms: None

Product Code: HM004481

Recommended use of the chemical and restrictions on use

Recommended Use Solvent

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-Mail address: fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion / irritation	Category 1 - H314
Serious Eye Damage / Eye Irritation	Category 1 - H318
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Flammable liquids.	Category 3 - H226

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Danger

Hazard Statements
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation
H226 - Flammable liquid and vapor

Precautionary Statements

Prevention
P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P233 - Keep container tightly closed
P240 - Ground/Bond container and receiving equipment
P241 - Use explosion-proof electrical/ventilating/lighting/equipment
P242 - Use only non-sparking tools
P243 - Take precautionary measures against static discharge
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response
P301+ P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
P312 - Call a POISON CENTER or doctor/physician if you feel unwell
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P370 + P378 - In case of fire: Use water spray for extinction

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P403 + P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Acetic acid	[redacted]

Other hazards which do not result in classification
None known

Australia Classification
For the full text of the H-phrases mentioned in this Section, see Section 16

Classification C - Corrosive.

Risk Phrases
R10 Flammable.
R34 Causes burns.
R37 Irritating to respiratory system.

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Acetic acid	[redacted]	60 - 100%	Skin Corr. 1A (H314) Eye Corr. 1 (H318) STOT SE 3 (H335) Flam. Liq. 3 (H226)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special Exposure Hazards

Use water spray to cool fire exposed surfaces. Decomposition in fire may produce harmful gases. Do not allow runoff to enter waterways.

Special protective equipment and precautions for fire fighters

Special Protective Equipment for Fire-Fighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Neutralize to pH of 6-8. Scoop up and

remove.

7. Handling and storage

7.1. Precautions for Safe Handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 24 months. Store locked up.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Acetic acid	[redacted]	TWA: 10 ppm TWA: 25 mg/m³ STEL: 15 ppm STEL: 37 mg/m³	TWA: 10 ppm STEL: 15 ppm

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Respiratory Protection Organic vapor/acid gas respirator.
Hand Protection Impervious rubber gloves.
Skin Protection Full protective chemical resistant clothing.
Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color:** Clear
Odor: Acrid **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	1.38
Freezing Point/Range	16 °C
Melting Point/Range	No data available
Boiling Point/Range	117 °C / 244 °F
Flash Point	55 °C / 131 °F PMCC
upper flammability limit	16%
lower flammability limit	5.4%
Evaporation rate	No data available
Vapor Pressure	11.7 mmHg @ 20 C
Vapor Density	No data available
Specific Gravity	1.05
Water Solubility	Soluble in water
Solubility in other solvents	No data available

Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	60.6 (g/mole)
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
Keep away from heat, sparks and flame.
10.5. Incompatible Materials
Strong alkalis.
10.6. Hazardous Decomposition Products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Acetic acid	[redacted]	3310 mg/kg (Rat) 600 mg/kg (Rabbit) 4960 mg/kg (Mouse)	1060 mg/kg (Rabbit)	11.4 mg/L (Rat) 4h

Immediate, delayed and chronic health effects from exposure

Inhalation	Causes severe respiratory irritation.
Eye Contact	Causes eye burns.
Skin Contact	Causes skin burns which may not be immediately painful or visible.
Ingestion	Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Prolonged, excessive exposure may cause erosion of the teeth.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Acetic acid	[redacted]	Corrosive to skin

Substances	CAS Number	Eye damage/irritation
Acetic acid	[redacted]	Corrosive to eyes

Substances	CAS Number	Skin Sensitization
Acetic acid	[redacted]	Not regarded as a sensitizer.

Substances	CAS Number	Respiratory Sensitization
Acetic acid	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Acetic acid	[redacted]	In vivo tests did not show mutagenic effects. In vitro tests did not show mutagenic effects

Substances	CAS Number	Carcinogenic Effects
Acetic acid	[redacted]	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Acetic acid	[redacted]	Did not show teratogenic effects in animal experiments. Animal testing did not show any effects on fertility.

Substances	CAS Number	STOT - single exposure
Acetic acid	[redacted]	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Acetic acid	[redacted]	Not applicable due to corrosivity of the substance.

Substances	CAS Number	Aspiration hazard
Acetic acid	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Acetic acid	[redacted]	EC50 90 mg/L (Microcystis aeruginosa) EC50 (72h) > 1000 mg/L (>300.82 mg/L – acetate ion) (Skeletonema costatum)	LC50 79 mg/L (Pimephales promelas) LC50 75 mg/L (Pimephales promelas) LC50 (96h) > 1000 mg/L (>300.82 mg/L – acetate ion) (Oncorhynchus mykiss)	NOEC (16h) 1150 mg/L (Pseudomonas putida)	EC50 47 mg/L (Daphnia magna) LC50 32 mg/L (Artemia salina) EC50 (48h) > 1000 mg/L (>300.82 mg/L – acetate ion) (Daphnia magna) NOEC (21d) 31.4 - 37.9 mg/L (Daphnia magna) (reproduction)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Acetic acid	[redacted]	Readily biodegradable (99% @ 7d)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Acetic acid	[redacted]	-0.17 BCF = 3.16 (Calculated)

12.4. Mobility in soil

Substances	CAS Number	Mobility
Acetic acid	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number: UN2790
UN Proper Shipping Name: Acetic Acid Solution
Transport Hazard Class(es): 8
Packing Group: II
Environmental Hazards: Not applicable

Special precautions during transport

None

HazChem Code

2R

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals All components listed on inventory or are exempt.
EINECS Inventory This product, and all its components, complies with EINECS
US TSCA Inventory All components listed on inventory or are exempt.
Canadian DSL Inventory All components listed on inventory or are exempt.

Poisons Schedule number

S6

16. Other information

Date of preparation or review

Revision Date: 19-Mar-2015

Revision Note Revision Note
SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
R10 Flammable.
R34 Causes burns.
R35 Causes severe burns.
R37 Irritating to respiratory system.

Full text of H-Statements referred to under sections 2 and 3
H226 - Flammable liquid and vapor
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight CAS – Chemical Abstracts Service EC50 – Effective Concentration 50% LC50 – Lethal Concentration 50% LD50 – Lethal Dose 50% LL50 – Lethal Loading 50% mg/kg – milligram/kilogram mg/L – milligram/liter NOEC – No Observed Effect Concentration OEL – Occupational Exposure Limit PBT – Persistent Bioaccumulative and Toxic ppm – parts per million STEL – Short Term Exposure Limit TWA – Time-Weighted Average vPvB – very Persistent and very Bioaccumulative h - hour mg/m^3 - milligram/cubic meter mm - millimeter mmHg - millimeter mercury w/w - weight/weight d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

BE-9

Revision Date: 13-Oct-2017 **Revision Number:** 20

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BE-9

Other means of Identification

Synonyms None

Hazardous Material Number: HB006583

Recommended use of the chemical and restrictions on use

Recommended Use Biocide

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Acute Aquatic Toxicity	Category 1 - H400
Chronic Aquatic Toxicity	Category 2 - H411

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H400 - Very toxic to aquatic life
H411 - Toxic to aquatic life with long lasting effects

Precautionary Statements

Prevention
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P391 - Collect spillage

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Tributyl tetradecyl phosphonium chloride	[redacted]

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Tributyl tetradecyl phosphonium chloride	[redacted]	5 - 10%	Acute Tox. 4 (H302) Acute Tox. 2 (H330) Skin Corr. 1B (H314) Eye Corr. 1 (H318) Aquatic Acute 1 (H400) Aquatic Chronic 1 (H410)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin	In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases. Do not allow runoff to enter waterways. Use water spray to cool fire exposed surfaces.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse. Do NOT consume food, drink, or tobacco in contaminated areas.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a cool well ventilated area. Keep container closed when not in use. Store away from direct sunlight. Store in a dry location. Store in a manner to prevent commingling with incompatible materials. Store away from alkalis. Store away from reducing agents. Store locked up.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Tributyl tetradecyl phosphonium chloride	[redacted]	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Dust/mist respirator. (N95, P2/P3)

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Neoprene gloves. (>= 0.75 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Wear impervious protective clothing, including boots, gloves, lab coat, apron, rain jacket, pants or coverall, as appropriate, to prevent skin contact.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Clear colorless
Odor: Slight **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	6-8
Freezing Point / Range	-8 - -10 °C
Melting Point / Range	No data available
Boiling Point / Range	100 °C / 212 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	0.95 - 1.0
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Reducing agents. Strong alkalis.

10.6. Hazardous decomposition products

Chlorine. Phosphorus acids. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tributyl tetradecyl phosphonium chloride	[redacted]	= 611 mg/kg (rat)	No data of sufficient quality are available	> 0.908 mg/L (rat, 4hr, mist)

Immediate, delayed and chronic health effects from exposure

Inhalation May cause respiratory irritation.

Eye Contact Causes severe eye irritation which may damage tissue. May cause eye burns.

Skin Contact Causes severe skin irritation with tissue destruction.

Ingestion Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

Lung disorders. Skin disorders.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Tributyl tetradecyl phosphonium chloride	[redacted]	Causes burns (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Tributyl tetradecyl phosphonium chloride	[redacted]	Causes severe eye irritation which may damage tissue. (Rabbit)

Substances	CAS Number	Skin Sensitization
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	Respiratory Sensitization
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Tributyl tetradecyl phosphonium chloride	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	Carcinogenic Effects
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	Reproductive toxicity
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	STOT - single exposure
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	STOT - repeated exposure
Tributyl tetradecyl phosphonium chloride	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	Aspiration hazard
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available	LC50 (96 h) 0.46 mg/L (Oncorhynchus mykiss) LC50 (96 h) 0.06 mg/L (Lepomis macrochirus)	No information available	EC50 (48 h) 0.025 mg/L (Daphnia sp.)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Tributyl tetradecyl phosphonium chloride	[redacted]	(0% @ 28d)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Tributyl tetradecyl phosphonium chloride	[redacted]	< 3

12.4. Mobility in soil

Substances	CAS Number	Mobility
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Disposal should be made in accordance with federal, state, and local regulations. Incineration recommended in approved incinerator according to federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging
Follow all applicable national or local regulations.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information
Australia ADG

UN Number	UN2922
UN proper shipping name:	Corrosive Liquid, Toxic, N.O.S. (contains Tributyl Tetradecyl Phosphonium Chloride)
Transport Hazard Class(es):	8, (6.1)
Packing Group:	II
Environmental Hazards:	Marine Pollutant

IMDG/IMO

UN Number	UN2922
UN proper shipping name:	Corrosive Liquid, Toxic, N.O.S. (contains Tributyl Tetradecyl Phosphonium Chloride)
Transport Hazard Class(es):	8, (6.1)
Packing Group:	II
Environmental Hazards:	Marine Pollutant
EMS:	EmS F-A, S-B

IATA/ICAO

UN Number	UN2922
UN proper shipping name:	Corrosive Liquid, Toxic, N.O.S. (contains Tributyl Tetradecyl Phosphonium Chloride)
Transport Hazard Class(es):	8, (6.1)
Packing Group:	II
Environmental Hazards:	Marine Pollutant

Special precautions during transport
None

HazChem Code
2X

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 13-Oct-2017

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H330 - Fatal if inhaled
H400 - Very toxic to aquatic life
H401 - Toxic to aquatic life
H410 - Very toxic to aquatic life with long lasting effects
H411 - Toxic to aquatic life with long lasting effects

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

CAUSTIC SODA LIQUID

Revision Date: 16-Apr-2015 **Revision Number:** 8

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name CAUSTIC SODA LIQUID

Other means of Identification

Synonyms None

Hazardous Material Number: HM005652

Recommended use of the chemical and restrictions on use

Recommended Use pH Control

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Substances/mixtures corrosive to metal.	Category 1 - H290

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Precautionary Statements

Prevention
P234 - Keep only in original packaging.
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/eye protection/face protection

Response
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P363 - Wash contaminated clothing before reuse
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P390 - Absorb spillage to prevent material damage
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Sodium hydroxide	[redacted]

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Sodium hydroxide	[redacted]	30 - 60%	Skin Corr. 1A (H314) Eye Corr. 1 (H318) STOT SE 3 (H335) Met. Corr. 1 (H290)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes	Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.
Skin	Remove contaminated clothing and launder before reuse. Destroy or properly dispose of contaminated shoes. In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

May cause eye and skin burns. May cause respiratory irritation. Causes severe skin irritation with tissue destruction. Causes severe eye irritation which may damage tissue.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

May form explosive mixtures with strong acids. Reaction with steel and certain other metals generates flammable hydrogen gas.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Contain spill with sand or other inert materials. Neutralize to pH of 6-8. Scoop up and remove. Isolate spill and stop leak where safe.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from acids. Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 12 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Sodium hydroxide	[redacted]	2 mg/m³	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Dust/mist respirator. (N95, P2/P3)

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Butyl rubber gloves. (>= 0.7 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Full protective chemical resistant clothing.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Clear colorless
Odor: Odorless **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	14
Freezing Point / Range	12 °C
Melting Point / Range	No data available
Boiling Point / Range	144 °C / 291 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	13 mmHg
Vapor Density	No data available
Specific Gravity	1.52
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available

Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	40
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong acids. Peroxides. Halogenated compounds. Amphoteric metals such as aluminum, magnesium, lead, tin, or zinc.
10.6. Hazardous decomposition products
None known.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
May cause eye and skin burns. May cause respiratory irritation. Causes severe skin irritation with tissue destruction. Causes severe eye irritation which may damage tissue.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium hydroxide	[redacted]	Not applicable due to corrosivity of the substance.	Not applicable due to corrosivity of the substance.	Not applicable due to corrosivity of the substance.

Immediate, delayed and chronic health effects from exposure

Inhalation	Causes severe respiratory burns.
Eye Contact	Causes severe eye burns.
Skin Contact	Causes severe burns.
Ingestion	Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Prolonged, excessive exposure may cause erosion of the teeth.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Sodium hydroxide	[redacted]	Causes severe burns

Substances	CAS Number	Serious eye damage/irritation
Sodium hydroxide	[redacted]	Causes severe eye burns (Rabbit)

Substances	CAS Number	Skin Sensitization
Sodium hydroxide	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Sodium hydroxide	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Sodium hydroxide	[redacted]	Did not show mutagenic effects in animal experiments In vitro tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Sodium hydroxide	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	Reproductive toxicity
Sodium hydroxide	[redacted]	No information available

Substances	CAS Number	STOT - single exposure
Sodium hydroxide	[redacted]	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Sodium hydroxide	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. Not applicable due to corrosivity of the substance.

Substances	CAS Number	Aspiration hazard
Sodium hydroxide	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium hydroxide	[redacted]	No information available	LC50(48h) 189 mg/L (Leuciscus idus melanotus) LLC50(48h) 189 mg/L (Leuciscus melanotus) LC50(24h) 145 mg/L (Poecilia reticulate) LC50(96h) 125 mg/L (Gambusia affinis) LOEL(150 d) = 25 mg/L (Lebistes reticulatus)	No information available	EC50 (48h) 40.4 mg/L (Ceriodaphnia sp.)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Sodium hydroxide	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Sodium hydroxide	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Sodium hydroxide	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging
Follow all applicable national or local regulations.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information
Australia ADG

UN Number	UN1824
UN proper shipping name:	Sodium Hydroxide Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	UN1824
UN proper shipping name:	Sodium Hydroxide Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable
EMS:	EmS F-A, S-B

IATA/ICAO

UN Number	UN1824
UN proper shipping name:	Sodium Hydroxide Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
2R

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 16-Apr-2015

Revision Note

Full text of H-Statements referred to under sections 2 and 3
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-14003

Revision Date: 27-Sep-2016 **Revision Number:** 11

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-14003

Other means of Identification

Synonyms None

Hazardous Material Number: HM007651

Recommended use of the chemical and restrictions on use

Recommended Use Buffer

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention	None
Response	None
Storage	None
Disposal	None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Ingestion	Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

None anticipated

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid creating or inhaling dust. Ensure adequate ventilation. Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from acids. Store in a dry location.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls	A well ventilated area to control dust levels. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Not normally needed. But if significant exposures are possible then the following respirator is recommended: Dust/mist respirator. (N95, P2/P3)
Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	8
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.87
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong acids.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure
Inhalation May cause mild respiratory irritation.

Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 27-Sep-2016

Revision Note
SDS sections updated: 2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-14004

Revision Date: 30-May-2017 **Revision Number:** 6

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-14004

Other means of Identification

Synonyms None

Hazardous Material Number: HM007652

Recommended use of the chemical and restrictions on use

Recommended Use Additive

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage/Irritation	Category 2 - H319

Label elements, including precautionary statements

Hazard Pictograms

Signal Word WARNING

Hazard Statements: H319 - Causes serious eye irritation

Precautionary Statements

Prevention P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear eye protection/face protection

Response P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention

Storage None

Disposal None

Contains

Substances	**CAS Number**
Sodium carbonate	[redacted]

Other hazards which do not result in classification

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Sodium carbonate	[redacted]	60 - 100%	Eye Irrit. 2 (H319)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes eye irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from acids. Store in a cool, dry location. Product has a shelf life of 24 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Sodium carbonate	[redacted]	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Localized ventilation should be used to control dust levels.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Dust/mist respirator. (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Dust proof goggles.

Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Powder **Color** White
Odor: Odorless **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	11.4
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2.5
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	105.99 g/mol
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong acids.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes eye irritation.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium carbonate	[redacted]	4090 mg/kg (Rat) 2800 mg/kg (Rat)	2210 mg/kg (Mouse) > 2000 mg/kg (Rabbit)	2.3 mg/L (Rat) 2h

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact Causes eye irritation.
Skin Contact Not irritating to skin in rabbits.
Ingestion Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Sodium carbonate	[redacted]	Non-irritating to the skin

Substances	CAS Number	Serious eye damage/irritation
Sodium carbonate	[redacted]	Irritating to eyes

Substances	CAS Number	Skin Sensitization
Sodium carbonate	[redacted]	Not classified

Substances	CAS Number	Respiratory Sensitization
Sodium carbonate	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Sodium carbonate	[redacted]	In vivo tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Sodium carbonate	[redacted]	No information available

Substances	CAS Number	Reproductive toxicity
Sodium carbonate	[redacted]	Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Sodium carbonate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Sodium carbonate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Sodium carbonate	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium carbonate	[redacted]	EC50 242 mg/L (Nitzschia)	TLM24 385 mg/L (Lepomis macrochirus)	No information available	EC50 265 mg/L (Daphnia magna)

			LC50 310-1220 mg/L (Pimephales promelas) LC50 (96h) 300 mg/L (Lepomis macrochirus)		EC50 (48h) 200 – 227 mg/L (Ceriodaphnia sp.)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Sodium carbonate	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Sodium carbonate	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Sodium carbonate	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IMDG/IMO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IATA/ICAO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 30-May-2017

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H319 - Causes serious eye irritation

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration

OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

Disclaimer Statement
This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-16001

Revision Date: 05-Jul-2017 **Revision Number:** 11

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-16001

Other means of Identification

Synonyms None

Hazardous Material Number: HM007655

Recommended use of the chemical and restrictions on use

Recommended Use Clay Stabilization Agent

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention	None
Response	None
Storage	None
Disposal	None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Not applicable

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool, dry location. Keep container closed when not in use. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally necessary.

Hand Protection Rubber gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	White
Odor:	Mild amine	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	7-9
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.07 - 1.091
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

Avoid contact with metals such as aluminum, tin, lead, brass, bronze, copper, and zinc.

10.5. Incompatible materials

Strong oxidizers.

10.6. Hazardous decomposition products

Oxides of nitrogen. Hydrogen chloride. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Symptoms related to exposure

Most Important Symptoms/Effects

No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation None known.

Eye Contact None known.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability
Expected to be readily biodegradable

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential
Does not bioaccumulate.

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects
Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging
Follow all applicable national or local regulations.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information
Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 05-Jul-2017

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

Disclaimer Statement
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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-17001

Revision Date: 09-Nov-2017 **Revision Number:** 16

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-17001

Other means of Identification

Synonyms None

Hazardous Material Number: HM007659

Recommended use of the chemical and restrictions on use

Recommended Use Corrosion Inhibitor

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Skin Corrosion/Irritation	Category 2 - H315
Serious Eye Damage/Irritation	Category 1 - H318
Skin Sensitization	Category 1 - H317
Reproductive Toxicity	Category 1B - H360
Specific Target Organ Toxicity - (Single Exposure)	Category 1 - H370
Specific Target Organ Toxicity - (Repeated Exposure)	Category 2 - H373
Acute Aquatic Toxicity	Category 2 - H401
Flammable liquids.	Category 3 - H226

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:

H226 - Flammable liquid and vapor
H302 - Harmful if swallowed
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H360 - May damage fertility or the unborn child
H370 - Causes damage to organs
H373 - May cause damage to organs through prolonged or repeated exposure
H401 - Toxic to aquatic life

Precautionary Statements

Prevention

P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233 - Keep container tightly closed
P240 - Ground and bond container and receiving equipment.
P241 - Use explosion-proof electrical/ventilating/lighting/equipment
P242 - Use only non-sparking tools
P243 - Take action to prevent static discharges.
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P272 - Contaminated work clothing should not be allowed out of the workplace
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P281 - Use personal protective equipment as required

Response

P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash before reuse
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P307 + P311 - IF exposed: Call a POISON CENTER or doctor/physician
P314 - Get medical attention/advice if you feel unwell
P370 + P378 - In case of fire: Use water spray for extinction

Storage

P403 + P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up

Disposal P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Diethylene glycol	[redacted]
Cinnamaldehyde	[redacted]
Amine oxides, cocoalkyldimethyl	[redacted]
Methanol	[redacted]
Benzaldehyde	[redacted]
Alcohols, C12-16, ethoxylated	[redacted]
Sodium iodide	[redacted]

Other hazards which do not result in classification

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Diethylene glycol	[redacted]	30 - 60%	Acute Tox. 4 (H302) STOT RE 2 (H373)
Cinnamaldehyde	[redacted]	30 - 60%	Acute Tox. 4 (H312) Skin Irrit. 2 (H315) Skin Sens. 1 (H317) Aquatic Acute 2 (H401)
Amine oxides, cocoalkyldimethyl	[redacted]	10 - 30%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 1 (H400)
Methanol	[redacted]	10 - 30%	Acute Tox. 3 (H301) Acute Tox. 3 (H311) Acute Tox. 3 (H331) Repr. 1B (H360) STOT SE 1 (H370) Flam. Liq. 2 (H225)
Benzaldehyde	[redacted]	5 - 10%	Acute Tox. 4 (H302) Acute Tox. 4 (H332) Aquatic Acute 2 (H401) Flam. Liq. 4 (H227)
Alcohols, C12-16, ethoxylated	[redacted]	1 - 5%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 1 (H400) Aquatic Chronic 3 (H412)
Sodium iodide	[redacted]	1 - 5%	Skin Irrit. 2 (H315) Eye Irrit. 2 (H319) STOT SE 3 (H335) STOT RE 1 (H372)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Ingestion Get immediate medical attention. Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes skin irritation. May cause allergic skin reaction. Harmful if swallowed. May cause damage to internal organs. May cause damage to organs through prolonged or repeated exposure. Potential reproductive hazard. May cause birth defects.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Carbon dioxide, dry chemical, foam.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

May be ignited by heat, sparks or flames Use water spray to cool fire exposed surfaces. Closed containers may explode in fire. Decomposition in fire may produce harmful gases. Runoff to sewer may cause fire or explosion hazard.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Remove sources of ignition. Use appropriate protective equipment. Wear self-contained breathing apparatus in enclosed areas. Avoid breathing vapors. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Remove ignition sources and work with non-sparking tools. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Remove sources of ignition. Ensure adequate ventilation. Avoid breathing vapors. Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse. Ground and bond containers when transferring from one container to another. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Keep from heat, sparks, and open flames. Store in a well ventilated area. Store locked up. Keep container closed when not in use. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Diethylene glycol	[redacted]	TWA: 23 ppm TWA: 100 mg/m³	Not applicable
Cinnamaldehyde	[redacted]	Not applicable	Not applicable
Amine oxides, cocoalkyldimethyl	[redacted]	Not applicable	Not applicable
Methanol	[redacted]	TWA: 200 ppm TWA: 262 mg/m³ STEL: 250 ppm STEL: 328 mg/m³	TWA: 200 ppm STEL: 250 ppm
Benzaldehyde	[redacted]	Not applicable	Not applicable
Alcohols, C12-16, ethoxylated	[redacted]	Not applicable	Not applicable
Sodium iodide	[redacted]	Not applicable	TWA: 0.01 ppm

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Positive pressure self-contained breathing apparatus if methanol is released.

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Butyl rubber gloves. (>= 0.7 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Yellow-orange
Odor: Cinnamon **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	6.85 (10%)
Freezing Point / Range	-21 °C
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	28.9 °C / 84 °F PMCC
Evaporation rate	No data available

Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.015
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Keep away from heat, sparks and flame.
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Ammonia. Oxides of nitrogen. Hydrocarbons. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes skin irritation. May cause allergic skin reaction. Harmful if swallowed. May cause damage to internal organs. May cause damage to organs through prolonged or repeated exposure. Potential reproductive hazard. May cause birth defects.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Diethylene glycol	[redacted]	12565 - 19600 mg/kg (Rat)	11890 - 13300 mg/kg (Rabbit)	> 4.6 mg/L (Rat) 4h
Cinnamaldehyde	[redacted]	2220 mg/kg (rat)	620 mg/kg (rabbit)	No data available
Amine oxides, cocoalkyldimethyl	[redacted]	846 - 3873 mg/kg (Rat) 1000-1250 mg/kg (Rat)	4290 mg/kg (Rabbit)	No data available
Methanol	[redacted]	300 mg/kg-bw (human) < 790 to 13,000 mg/kg (rat)	1000 mg/kg-bw (human) 17,100 mg/kg (rabbit)	10 mg/L (human, 4h, vapor)
Benzaldehyde	[redacted]	1430 mg/kg (rat)	No information available	>1 <5 mg/L air (Rat, 4h, mist)
Alcohols, C12-16, ethoxylated	[redacted]	1600 mg/kg	No data available	No data available
Sodium iodide	[redacted]	4340 mg/kg (Rat) 3118 mg/kg (Rats) (Similar substance)	No data available	LCLo: 50000 mg/m^3 (Mouse) 2h

Immediate, delayed and chronic health effects from exposure
Product Information Based on the collective toxicity of product ingredients, the mixture should be considered to cause the following:

Inhalation May cause respiratory irritation. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.

Eye Contact Causes severe eye irritation which may damage tissue.

Skin Contact Causes skin irritation. May cause an allergic skin reaction.

Ingestion Harmful if swallowed. May cause central nervous system depression including headache, dizziness, drowsiness, muscular weakness, incoordination, slowed reaction time, fatigue blurred vision, slurred speech, giddiness, tremors and convulsions. May cause liver and kidney damage.

Chronic Effects/Carcinogenicity Prolonged or repeated exposure may cause reproductive system damage. Prolonged or repeated exposure may cause embryo and fetus toxicity.

Exposure Levels
No data available

Interactive effects
Skin disorders. Eye ailments.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Diethylene glycol	[redacted]	Non-irritating to the skin (Rabbit)
Cinnamaldehyde	[redacted]	Causes severe irritation and or burns (human)
Amine oxides, cocoalkyldimethyl	[redacted]	Skin, rabbit: Causes moderate skin irritation.
Methanol	[redacted]	Non-irritating to the skin (Rabbit)
Benzaldehyde	[redacted]	Non-irritating to the skin (Rabbit)
Alcohols, C12-16, ethoxylated	[redacted]	Causes skin irritation.
Sodium iodide	[redacted]	Moderate dermal irritant (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Diethylene glycol	[redacted]	Non-irritating to the eye (Rabbit)
Cinnamaldehyde	[redacted]	Mild eye irritant. (human) (8 % solution)
Amine oxides, cocoalkyldimethyl	[redacted]	Corrosive to eyes
Methanol	[redacted]	Non-irritating to the eye (Rabbit)
Benzaldehyde	[redacted]	Non-irritating to the eye (Rabbit)
Alcohols, C12-16, ethoxylated	[redacted]	Causes severe eye irritation which may damage tissue.
Sodium iodide	[redacted]	Moderately irritating to the eyes (Rabbit)

Substances	CAS Number	Skin Sensitization
Diethylene glycol	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)
Cinnamaldehyde	[redacted]	Skin sensitizer in guinea pig.
Amine oxides, cocoalkyldimethyl	[redacted]	No information available
Methanol	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)
Benzaldehyde	[redacted]	Not sensitizing in Guinea Pigs (Guinea Pig Maximisation Test and Open Epicutaneous Test, Sensitizing in Draize Test and Freund's Complete Adjuvant Test)
Alcohols, C12-16, ethoxylated	[redacted]	Did not cause sensitization on laboratory animals
Sodium iodide	[redacted]	Patch test on human volunteers did not demonstrate sensitization properties

Substances	CAS Number	Respiratory Sensitization
Diethylene glycol	[redacted]	No information available
Cinnamaldehyde	[redacted]	No information available
Amine oxides, cocoalkyldimethyl	[redacted]	No information available
Methanol	[redacted]	No information available
Benzaldehyde	[redacted]	No information available
Alcohols, C12-16, ethoxylated	[redacted]	No information available

Sodium iodide	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Diethylene glycol	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects.
Cinnamaldehyde	[redacted]	In vitro tests did not show mutagenic effects.
Amine oxides, cocoalkyldimethyl	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)
Methanol	[redacted]	The weight of evidence from available in vitro and in vivo studies indicates that this substance is not expected to be mutagenic.
Benzaldehyde	[redacted]	Not mutagenic in AMES Test. Negative in the chromosomal aberration assay In vitro tests have shown mutagenic effects In vivo tests did not show mutagenic effects.
Alcohols, C12-16, ethoxylated	[redacted]	Not regarded as mutagenic.
Sodium iodide	[redacted]	In vitro tests did not show mutagenic effects. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Diethylene glycol	[redacted]	Did not show carcinogenic effects in animal experiments (Rat)
Cinnamaldehyde	[redacted]	No information available
Amine oxides, cocoalkyldimethyl	[redacted]	No information available
Methanol	[redacted]	No data of sufficient quality are available.
Benzaldehyde	[redacted]	Did not show carcinogenic effects in animal experiments (Rat) There was some evidence of carcinogenic activity in the forestomachs of mice.
Alcohols, C12-16, ethoxylated	[redacted]	Not regarded as carcinogenic.
Sodium iodide	[redacted]	No information available

Substances	CAS Number	Reproductive toxicity
Diethylene glycol	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.
Cinnamaldehyde	[redacted]	Did not show teratogenic effects in animal experiments.
Amine oxides, cocoalkyldimethyl	[redacted]	Did not show teratogenic effects in animal experiments. When tested at maternally toxic doses, no adverse effects on teratogenicity or development were observed.
Methanol	[redacted]	Experiments have shown reproductive toxicity effects on laboratory animals
Benzaldehyde	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)
Alcohols, C12-16, ethoxylated	[redacted]	Not regarded as a reproductive and developmental toxicant.
Sodium iodide	[redacted]	Animal testing did not show any effects on fertility.

Substances	CAS Number	STOT - single exposure
Diethylene glycol	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Cinnamaldehyde	[redacted]	No information available
Amine oxides, cocoalkyldimethyl	[redacted]	May cause respiratory irritation.
Methanol	[redacted]	May cause disorder and damage to the Central Nervous System (CNS)
Benzaldehyde	[redacted]	May cause respiratory irritation.
Alcohols, C12-16, ethoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Sodium iodide	[redacted]	No information available

Substances	CAS Number	STOT - repeated exposure
Diethylene glycol	[redacted]	Causes damage to organs through prolonged or repeated exposure: Kidney
Cinnamaldehyde	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Amine oxides, cocoalkyldimethyl	[redacted]	No data of sufficient quality are available.
Methanol	[redacted]	No data of sufficient quality are available.
Benzaldehyde	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Alcohols, C12-16, ethoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Sodium iodide	[redacted]	Causes damage to organs through prolonged or repeated exposure: (Thyroid)

Substances	CAS Number	Aspiration hazard
Diethylene glycol	[redacted]	No information available
Cinnamaldehyde	[redacted]	Not applicable
Amine oxides, cocoalkyldimethyl	[redacted]	No information available

Methanol	[redacted]	Not applicable
Benzaldehyde	[redacted]	Not applicable
Alcohols, C12-16, ethoxylated	[redacted]	Not applicable
Sodium iodide	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	**Toxicity to Algae**	**Toxicity to Fish**	**Toxicity to Microorganisms**	**Toxicity to Invertebrates**
Diethylene glycol	[redacted]	TGK (8d) 2700 mg/L (Scenedesmus quadricauda)	LC50 75200 mg/L (Pimephales promelas)	EC20 (30m) > 1995 mg/L (domestic activated sludge)	EC50 84000 mg/L (Daphnia magna) EC50 >10000 mg/L (Daphnia magna)
Cinnamaldehyde	[redacted]	EC50 (72 h) 2.1 mg/L (Skeletonema costatum)	LC50 (96 h) 2.38 mg/L (Scophthalmus maximus)	IC50 (48h) 131.2 mg/L (Tetrahymena pyriformis)	LC50 (48 h) 1.4 mg/L (Acartia tonsa)
Amine oxides, cocoalkyldimethyl	[redacted]	ErC50 (72h) 0.29 mg/L (Selenastrum capricornutum) ErC50 (72h) 0.0235 mg/L (Scendesmus subspicatus) (similar substance)	LC50 (96h) 1.0–3.4 mg/L (Brachydanio rerio) LC50 (96h) 13.0 (Salmo gairdneri) LC50 (96h) 0.1-1 mg/L (Brachydanio rerio)	EC50 (3h) 240 mg/L (Pseudomonas putida) EC50 (3h) 13 mg/L (Activated sludge)	EC50 (48h) 2.9 mg/L (Daphnia magna) EC50 (48h) 0.083 mg/L (Daphnia magna) (similar substance)
Methanol	[redacted]	EC50 (96 h) =22000 mg/L (Pseudokirchnerella subcapitata) NOEC (8 d) =8000 mg/L (Scenedesmus quadricauda)	LC50 (96 h) =15400 mg/L (Lepomis macrochirus) EC50 (200 h) =14536 mg/L (Oryzias latipes)	IC50 (3h) > 1000 mg/L (activated sludge)	EC50 (96 h) =18260 mg/L (Dapnia magna) NOEC (21 d) =208 mg/L (Dapnia magna)
Benzaldehyde	[redacted]	NOEC (8d) 20 mg/L (Microcystis aeruginosa) NOEC (8d) 132 mg/L	LC50 (96 h) 1.07 mg/L (Lepomis macrochirus)	IC50 (3 h) 740 mg/L (Activated sludge)	EC50 (24 h) 50 mg/L (Daphnia magna)
Alcohols, C12-16, ethoxylated	[redacted]	EC50 0.7 mg/L (Selenastrum capricornutum)	No information available	No information available	0.39 mg/L (Daphnia Magna)
Sodium iodide	[redacted]	7 d Tox threshold: 2370 mg/L (Scenedesmus quadricauda, biomass) EC50(72h): 2588.7 mg/L (Skeletonema costatum)	LC50(96h): 3780 mg/L (Oncorhynchus mykiss) LC50(96h): > 100 mg/L (Scopthalmus maximus)	No information available	EC50(48h): 1.27 mg/L (Daphnia magna) EC50(48h): 575 mg/L (Acartia tonsa)

12.2. Persistence and degradability

No data is available on the product itself

Substances	**CAS Number**	**Persistence and Degradability**
Diethylene glycol	[redacted]	Readily biodegradable (90-100% @ 28d)
Cinnamaldehyde	[redacted]	Predicted to be readily biodegradable.
Amine oxides, cocoalkyldimethyl	[redacted]	Readily biodegradable (81% @ 28d)
Methanol	[redacted]	Readily biodegradable (95% @ 20d)
Benzaldehyde	[redacted]	Readily biodegradable (>=95% @ 28d)
Alcohols, C12-16, ethoxylated	[redacted]	No information available
Sodium iodide	[redacted]	Not applicable

12.3. Bioaccumulative potential

No data is available on the product itself

Substances	**CAS Number**	**Log Pow**
Diethylene glycol	[redacted]	BCF: 100 (Leuciscus idus melanotus)
Cinnamaldehyde	[redacted]	Log Pow =1.4
Amine oxides, cocoalkyldimethyl	[redacted]	Log Kow = 7.5
Methanol	[redacted]	Not Bioaccumulative; BCF=1
Benzaldehyde	[redacted]	Log Pow =1.1
Alcohols, C12-16, ethoxylated	[redacted]	No information available
Sodium iodide	[redacted]	-1.301

12.4. Mobility in soil

Substances	CAS Number	Mobility
Diethylene glycol	[redacted]	No information available
Cinnamaldehyde	[redacted]	No information available
Amine oxides, cocoalkyldimethyl	[redacted]	No information available
Methanol	[redacted]	No information available
Benzaldehyde	[redacted]	No information available
Alcohols, C12-16, ethoxylated	[redacted]	No information available
Sodium iodide	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Incineration recommended in approved incinerator according to federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Methanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable

IMDG/IMO

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Methanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable
EMS: EmS F-E, S-E

IATA/ICAO

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Methanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable

Special precautions during transport

None

HazChem Code

•3Y

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product does not comply with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 09-Nov-2017

Revision Note
SDS sections updated:
14

Full text of H-Statements referred to under sections 2 and 3
H225 - Highly flammable liquid and vapor
H226 - Flammable liquid and vapor
H227 - Combustible liquid
H301 - Toxic if swallowed
H302 - Harmful if swallowed
H311 - Toxic in contact with skin
H312 - Harmful in contact with skin
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H319 - Causes serious eye irritation
H331 - Toxic if inhaled
H332 - Harmful if inhaled
H335 - May cause respiratory irritation
H370 - Causes damage to organs
H372 - Causes damage to organs through prolonged or repeated exposure
H373 - May cause damage to organs through prolonged or repeated exposure
H400 - Very toxic to aquatic life
H401 - Toxic to aquatic life
H412 - Harmful to aquatic life with long lasting effects

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
NZ CCID

Disclaimer Statement

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-17003

Revision Date: 30-Apr-2019 **Revision Number:** 10

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-17003

Other means of Identification

Synonyms None

Hazardous Material Number: HM007699

Recommended use of the chemical and restrictions on use

Recommended Use Inhibitor

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute toxicity - Dermal	Category 3 - H311
Serious Eye Damage/Irritation	Category 2 - H319
Germ Cell Mutagenicity	Category 2 - H341
Carcinogenicity	Category 2 - H351
Specific Target Organ Toxicity - (Repeated Exposure)	Category 2 - H373
Acute Aquatic Toxicity	Category 3 - H402
Flammable liquids.	Category 2 - H225

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:

H225 - Highly flammable liquid and vapor
H311 - Toxic in contact with skin
H319 - Causes serious eye irritation
H341 - Suspected of causing genetic defects
H351 - Suspected of causing cancer
H373 - May cause damage to organs through prolonged or repeated exposure
H402 - Harmful to aquatic life

Precautionary Statements

Prevention

P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233 - Keep container tightly closed
P240 - Ground and bond container and receiving equipment.
P241 - Use explosion-proof electrical/ventilating/lighting/equipment
P242 - Use only non-sparking tools
P243 - Take action to prevent static discharges.
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P273 - Avoid release to the environment
P280 - Wear protective gloves/eye protection/face protection
P281 - Use personal protective equipment as required

Response

P302 + P352 - IF ON SKIN: Wash with plenty of water.
P312 - Call a POISON CENTER/doctor/physician if you feel unwell
P361 - Take off immediately all contaminated clothing.
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P314 - Get medical attention/advice if you feel unwell
P370 + P378 - In case of fire: Use water spray for extinction

Storage

P403 + P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up

Disposal

P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Aldol	[redacted]
Crotonaldehyde	[redacted]
Acetaldehyde	[redacted]

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Aldol	[redacted]	30 - 60%	Acute Tox. 2 (H310) Eye Irrit. 2A (H319) Flam. Liq. 4 (H227)
Crotonaldehyde	[redacted]	1 - 5%	Acute Tox. 3 (H301) Acute Tox. 2 (H310) Acute Tox. 2 (H330) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Muta. 2 (H341) STOT SE 3 (H335) STOT RE 1 (H372) Aquatic Acute 1 (H400) Flam. Liq. 2 (H225)
Acetaldehyde	[redacted]	1 - 5%	Acute Tox. 4 (H302) Acute Tox. 4 (H332) Eye Irrit. 2 (H319) Muta. 2 (H341) Carc. 2 (H351) STOT SE 3 (H335) Aquatic Acute 3 (H402) Flam. Liq. 1 (H224)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Causes eye irritation. Toxic in contact with skin. May cause heritable genetic damage. Potential carcinogen. May cause damage to organs through prolonged or repeated exposure.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

May be ignited by heat, sparks or flames Use water spray to cool fire exposed surfaces. Closed containers may explode in fire. Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Remove sources of ignition. Use appropriate protective equipment. Wear self-contained breathing apparatus in enclosed areas. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Evacuate all persons from the area.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas. Consult local authorities.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Remove ignition sources and work with non-sparking tools. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Use appropriate protective equipment. Remove sources of ignition. Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Ground and bond containers when transferring from one container to another.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Keep from heat, sparks, and open flames. Keep container closed when not in use. Product has a shelf life of 36 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Aldol	[redacted]	Not applicable	Not applicable
Crotonaldehyde	[redacted]	Not applicable	Not applicable
Acetaldehyde	[redacted]	TWA: 20 ppm TWA: 36 mg/m^3 STEL: 50 ppm STEL: 91 mg/m^3	Ceiling: 25 ppm

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this

	product.
Respiratory Protection	Organic vapor respirator.
Hand Protection	Impervious rubber gloves.
Skin Protection	Rubber apron.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Clear colorless to pale yellow
Odor:	Pungent	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	5-7
Freezing Point / Range	-30 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	100 °C / 212 °F
Flash Point	18 °C / 65 °F (PMCC)
Evaporation rate	No data available
Vapor Pressure	0.1
Vapor Density	3.04
Specific Gravity	1.053
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Keep away from heat, sparks and flame.
10.5. Incompatible materials
Strong oxidizers. Strong alkalis. Strong acids.
10.6. Hazardous decomposition products
Oxides of nitrogen. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects

Causes eye irritation. Toxic in contact with skin. May cause heritable genetic damage. Potential carcinogen. May cause damage to organs through prolonged or repeated exposure.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Aldol	[redacted]	2180 mg/kg (Rat)	140 mg/kg (Rabbit)	No data available
Crotonaldehyde	[redacted]	206 mg/kg-bw (rat)	128 mg/kg-bw (rabbit)	0.2 mg/L (rat, 4h, assuming mist)
Acetaldehyde	[redacted]	660 mg/kg bw (rat)	No information available	13 mg/L (rat, vapor, 4 hr)

Immediate, delayed and chronic health effects from exposure

Inhalation May cause respiratory irritation.
Eye Contact Causes eye irritation.
Skin Contact Toxic in contact with skin. May cause skin defatting with prolonged exposure.
Ingestion Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity This product contains a potential carcinogen. May cause heritable genetic damage. Prolonged or repeated exposure may cause liver damage.

Exposure Levels
No data available

Interactive effects
Skin disorders. Eye ailments.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Aldol	[redacted]	May cause mild skin irritation. (Rabbit)
Crotonaldehyde	[redacted]	Causes moderate skin irritation. (Rabbit) Causes skin irritation. Skin, rabbit:
Acetaldehyde	[redacted]	Non-irritating to the skin (Rabbit) Not irritating to skin in rabbits.

Substances	CAS Number	Serious eye damage/irritation
Aldol	[redacted]	Causes moderate eye irritation (Rabbit)
Crotonaldehyde	[redacted]	Causes severe eye irritation which may damage tissue. (Rabbit) Eye, rabbit: Causes severe eye irritation
Acetaldehyde	[redacted]	Causes moderate eye irritation (Rabbit) Eye, rabbit:

Substances	CAS Number	Skin Sensitization
Aldol	[redacted]	No information available
Crotonaldehyde	[redacted]	Not regarded as a sensitizer. No data of sufficient quality are available.
Acetaldehyde	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) Patch test on human volunteers did not demonstrate sensitization properties

Substances	CAS Number	Respiratory Sensitization
Aldol	[redacted]	No information available
Crotonaldehyde	[redacted]	No information available
Acetaldehyde	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Aldol	[redacted]	No information available
Crotonaldehyde	[redacted]	Some in vivo tests have shown mutagenic effects.
Acetaldehyde	[redacted]	Some in vitro tests have shown mutagenic effects. Some in vivo tests have shown mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Aldol	[redacted]	No information available
Crotonaldehyde	[redacted]	No data of sufficient quality are available. Substances which cause concern for man owing to possible carcinogenic effects but for which the available information is not adequate for making a satisfactory assessment
Acetaldehyde	[redacted]	This substance is a potential carcinogen. Substances which should be regarded as if they are

		carcinogenic to man

Substances	CAS Number	Reproductive toxicity
Aldol	[redacted]	No information available
Crotonaldehyde	[redacted]	No data of sufficient quality are available.
Acetaldehyde	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	STOT - single exposure
Aldol	[redacted]	No information available
Crotonaldehyde	[redacted]	May cause respiratory irritation.
Acetaldehyde	[redacted]	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Aldol	[redacted]	No information available
Crotonaldehyde	[redacted]	Causes damage to organs through prolonged or repeated exposure if swallowed: (Liver)
Acetaldehyde	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Aldol	[redacted]	No information available
Crotonaldehyde	[redacted]	No information available
Acetaldehyde	[redacted]	No information available Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Aldol	[redacted]	EC50 (5d) >237 mg/L (Nitzscheria linearis)	No information available	No information available	No information available
Crotonaldehyde	[redacted]	EC50 (96h) 0.881 mg/L	LC50 (96 h) =0.71 mg/L (Trout) LOEC (NR) =0.22 mg/L (Fathead minnow)	No information available	EC50 (28 d) >1.5 mg/L (Daphnia magna)
Acetaldehyde	[redacted]	EC50 (5 d) >237 mg/L (Nitzscheria linearis)	LC50 (96 h) =30.8 mg/L (Pimephales promelas)	No information available	EC50 (48 h) =48.25 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Aldol	[redacted]	No information available
Crotonaldehyde	[redacted]	(55% @ 28d)
Acetaldehyde	[redacted]	Readily biodegradable (80% @ 14d)

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Aldol	[redacted]	-0.72
Crotonaldehyde	[redacted]	Log Kow =0.68
Acetaldehyde	[redacted]	Log Pow =0.63

12.4. Mobility in soil

Substances	CAS Number	Mobility
Aldol	[redacted]	No information available
Crotonaldehyde	[redacted]	No information available
Acetaldehyde	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging
Follow all applicable national or local regulations.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	UN1992
UN proper shipping name:	Flammable Liquid, Toxic, N.O.S. (Contains Acetaldehyde, Aldol)
Transport Hazard Class(es):	3 (6.1)
Packing Group:	II
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	UN1992
UN proper shipping name:	Flammable Liquid, Toxic, N.O.S. (Contains Acetaldehyde, Aldol)
Transport Hazard Class(es):	3 (6.1)
Packing Group:	II
Environmental Hazards:	Not applicable
EMS:	EmS F-E, S-D

IATA/ICAO

UN Number	UN1992
UN proper shipping name:	Flammable Liquid, Toxic, N.O.S. (Contains Acetaldehyde, Aldol)
Transport Hazard Class(es):	3 (6.1)
Packing Group:	II
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
2WE

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances: Does not apply.

Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 30-Apr-2019

Revision Note

Full text of H-Statements referred to under sections 2 and 3
H224 - Extremely flammable liquid and vapor
H225 - Highly flammable liquid and vapor
H301 - Toxic if swallowed
H302 - Harmful if swallowed
H310 - Fatal in contact with skin
H311 - Toxic in contact with skin
H315 - Causes skin irritation
H318 - Causes serious eye damage
H319 - Causes serious eye irritation
H330 - Fatal if inhaled
H332 - Harmful if inhaled
H335 - May cause respiratory irritation
H341 - Suspected of causing genetic defects
H351 - Suspected of causing cancer
H372 - Causes damage to organs through prolonged or repeated exposure if swallowed
H373 - May cause damage to organs through prolonged or repeated exposure
H400 - Very toxic to aquatic life

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

Disclaimer Statement

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-18003

Revision Date: 10-May-2016 **Revision Number:** 3

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-18003

Other means of Identification

Synonyms None

Hazardous Material Number: HM007695

Recommended use of the chemical and restrictions on use

Recommended Use Corrosion Inhibitor; Intensifier

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Substances/mixtures corrosive to metal. Flammable liquids.	Category 1 Category 4 - H227
Substances/mixtures corrosive to metal	Category 1 - H290

Label elements, including precautionary statements

Hazard pictograms

Signal Word Danger

Hazard Statements:
H227 - Combustible liquid
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage

Precautionary Statements

Prevention
P103 - Read label before use
P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P234 - Keep only in original container
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P370 + P378 - In case of fire: Use water spray for extinction
P390 - Absorb spillage to prevent material damage

Storage
P403 + P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up
P406 - Store in corrosive resistant container with a resistant inner liner.

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Glycol ether	Proprietary
Hydrochloric acid	[redacted]

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Glycol ether	Proprietary	10 - 30%	Eye Irrit. 2A (H319) Flam. Liq. 3 (H226)
Hydrochloric acid	[redacted]	10 - 30%	Skin Corr. 1B (H314) Eye Corr. 1 (H318) STOT SE 3 (H335)

			Met. Corr. 1 (H290)

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, move victim to fresh air and seek medical attention.
Eyes	In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.
Skin	In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

May form explosive mixtures with strong alkalis. Decomposition in fire may produce harmful gases. Reaction with steel and certain other metals generates flammable hydrogen gas. Do not allow runoff to enter waterways. Vapors are heavier than air and may accumulate in low areas. Vapors may travel along the ground to be ignited at distant locations.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Isolate area and remove sources of friction, impact, heat, low level electrical current, and RF energy. Contain spill with sand or other inert materials. Remove ignition sources and work with non-sparking tools. Neutralize to pH of 6-8. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from alkalis. Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Glycol ether	Proprietary	Not applicable	Not applicable
Hydrochloric acid	[redacted]	5 ppm	TWA: 2 ppm (Ceiling)

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Organic vapor/acid gas respirator.

Hand Protection Impervious rubber gloves.

Skin Protection Full protective chemical resistant clothing. Rubber boots

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Clear colorless to pale yellow

Odor: Odorless **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	0.61 (10%)
Freezing Point / Range	-27 °C
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	63.3 °C / 146 °F PMCC
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.372
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong alkalis.
10.6. Hazardous decomposition products
Flammable hydrogen gas. Chlorine. Hydrogen sulfide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Glycol ether	Proprietary	No data available	3550 mg/kg (Rabbit) 4 mL/kg (Rabbit)	No data available
Hydrochloric acid	[redacted]	No data available	5010 mg/kg (Rabbit) > 5010 mg/kg (Rabbit) 1449 mg/kg (Mouse)	3124 mg/L (Rat) 1h 3.2 mg/L (Mouse) 8.3 mg/L (Rat) 1405 mg/L (Rat) 554 mg/L (Mouse)

Immediate, delayed and chronic health effects from exposure
Inhalation May cause respiratory irritation.
Eye Contact Causes severe eye irritation which may damage tissue.
Skin Contact Causes severe skin irritation with tissue destruction.
Ingestion Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Prolonged, excessive exposure may cause erosion of the teeth.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Glycol ether	Proprietary	Not irritating to skin in rabbits.
Hydrochloric acid	[redacted]	Causes severe burns

Substances	CAS Number	Serious eye damage/irritation
Glycol ether	Proprietary	Causes moderate eye irritation (Rabbit)

Hydrochloric acid	[redacted]	Causes severe burns

Substances	CAS Number	Skin Sensitization
Glycol ether	Proprietary	Did not cause sensitization on laboratory animals
Hydrochloric acid	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Glycol ether	Proprietary	No information available
Hydrochloric acid	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Glycol ether	Proprietary	In vitro tests did not show mutagenic effects.
Hydrochloric acid	[redacted]	Not regarded as mutagenic.

Substances	CAS Number	Carcinogenic Effects
Glycol ether	Proprietary	No information available
Hydrochloric acid	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	Reproductive toxicity
Glycol ether	Proprietary	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Hydrochloric acid	[redacted]	Embryo and fetotoxicity has been observed in female rats exposed to maternally toxic levels of hydrogen chloride (450 mg/m^3, 1hr.).

Substances	CAS Number	STOT - single exposure
Glycol ether	Proprietary	No significant toxicity observed in animal studies at concentration requiring classification.
Hydrochloric acid	[redacted]	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Glycol ether	Proprietary	No significant toxicity observed in animal studies at concentration requiring classification.
Hydrochloric acid	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Glycol ether	Proprietary	Not applicable
Hydrochloric acid	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Glycol ether	Proprietary	EC50 (96h) 1466 mg/L (cell number) (Pseudokirchnerella subcapitata) EC50 (48h) 3440 mg/L (Pseudokirchnerella subcapitata)	LC50 (96h) 3,400 mg/L (Pimephales promelas) LC50 (96h) > 100 mg/L (Oncorhynchus mykiss)	EC50 (16h) 3800 mg/L (Bacteria)	LC50 3,600 mg/L EC50 (48h) > 100 mg/L (Daphnia magna)
Hydrochloric acid	[redacted]	No information available	LC50 282 mg/L (Gambusia affinis) LC50 20.5 mg/L (Lepomis macrochirus) LC50 (96h) 3.25 – 3.5 (pH) (Lepomis macrochirus)	EC50 (3h) >= 5 and <= 5.5 (pH) (Activated sludge, domestic)	EC50 (48h) 4.9 (pH) (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Glycol ether	Proprietary	Readily biodegradable (91.5% @ 28d)

Hydrochloric acid	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Glycol ether	Proprietary	0.621
Hydrochloric acid	[redacted]	0.25

12.4. Mobility in soil

Substances	CAS Number	Mobility
Glycol ether	Proprietary	No information available
Hydrochloric acid	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number	UN1789
UN proper shipping name:	Hydrochloric Acid Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

2R

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
S6

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stolkhom Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 10-May-2016

Revision Note
SDS sections updated: 2

Full text of H-Statements referred to under sections 2 and 3
H226 - Flammable liquid and vapor
H227 - Combustible liquid
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

Disclaimer Statement
This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all

conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-23001

Revision Date: 30-Sep-2015 **Revision Number:** 10

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-23001

Other means of Identification

Synonyms: None

Product Code: HM007701

Recommended use of the chemical and restrictions on use

Recommended Use Friction Reducer

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-Mail address: fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements Not Classified

Precautionary Statements

Prevention None

Response None

Storage None

Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

Australia Classification

For the full text of the H-phrases mentioned in this Section, see Section 16

Classification Not Classified
Risk Phrases None

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical
Special Exposure Hazards
Not applicable.

Special protective equipment and precautions for fire fighters
Special Protective Equipment for Fire-Fighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for Safe Handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Ground and bond containers when transferring from one container to another. Slippery when wet. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool, dry location. Keep container closed when not in use. Keep from heat, sparks, and open flames. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.

Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Powder	**Color:**	White
Odor:	Slight	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	9
Freezing Point/Range	No data available
Melting Point/Range	No data available
Boiling Point/Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
None anticipated
10.5. Incompatible Materials
Strong oxidizers.
10.6. Hazardous Decomposition Products
Carbon monoxide and carbon dioxide. Ammonia.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mild eye irritation.
Skin Contact May cause mild skin irritation.
Ingestion Large doses may cause nausea, vomiting and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Respiratory disorders. Skin disorders.

Data limitations
No data available

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

16. Other information

Date of preparation or review

Revision Date: 30-Sep-2015

Revision Note
SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
None

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight CAS – Chemical Abstracts Service EC50 – Effective Concentration 50% LC50 – Lethal Concentration 50% LD50 – Lethal Dose 50% LL50 – Lethal Loading 50% mg/kg – milligram/kilogram mg/L – milligram/liter NOEC – No Observed Effect Concentration OEL – Occupational Exposure Limit PBT – Persistent Bioaccumulative and Toxic ppm – parts per million STEL – Short Term Exposure Limit TWA – Time-Weighted Average vPvB – very Persistent and very Bioaccumulative h - hour mg/m^3 - milligram/cubic meter mm - millimeter mmHg - millimeter mercury w/w - weight/weight d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-23003

Revision Date: 31-Jul-2018 **Revision Number:** 8

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-23003

Other means of Identification

Synonyms None

Hazardous Material Number: HM008080

Recommended use of the chemical and restrictions on use

Recommended Use Friction Reducer

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention	None
Response	None
Storage	None
Disposal	None

Contains

Substances	**CAS Number**
Hydrotreated light petroleum distillate	[redacted]
Ethoxylated branched C13 alcohol	[redacted]
Sodium diacetate	[redacted]

Other hazards which do not result in classification

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Hydrotreated light petroleum distillate	[redacted]	10 - 30%	Asp. Tox. 1 (H304)
Ethoxylated branched C13 alcohol	[redacted]	1 - 5%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 2 (H401) Aquatic Chronic 3 (H412)
Sodium diacetate	[redacted]	1 - 5%	Eye Corr. 1 (H318)

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, move victim to fresh air and seek medical attention.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire
Product is not expected to burn unless all the water is boiled away. Decomposition in fire may produce harmful gases. Use water spray to cool fire exposed surfaces.

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Spills of this product are very slippery. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove. Do NOT spread spilled product with water.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Use appropriate protective equipment. Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Avoid breathing mist. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Store in a cool well ventilated area. Keep container closed when not in use. Store at temperatures between 40 and 90 F (5 and 35 C). Keep from freezing. Product has a shelf life of 6 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Hydrotreated light petroleum distillate	[redacted]	Not applicable	Not applicable
Ethoxylated branched C13 alcohol	[redacted]	Not applicable	Not applicable
Sodium diacetate	[redacted]	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Organic vapor respirator with a dust/mist filter. (A2P2/P3)
Hand Protection Impervious rubber gloves. Polyvinylchloride gloves.
Skin Protection Normal work coveralls.
Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid
Odor: Hydrocarbon
Color Off white
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	5 - 8
Freezing Point / Range	No data available
Melting Point / Range	< 5 °C / < 41 °F
Boiling Point / Range	> 100 °C / 212 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	17.25 mmHg
Vapor Density	No data available
Specific Gravity	1.0 - 1.1
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	> 20.5 mm2/s
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Freezing conditions.
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide. Oxides of nitrogen. Hydrogen cyanide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrotreated light	[redacted]	>5000 mg/kg-bw (rat) (similar	>2000 mg/kg-bw (rabbit) (similar	>5.2 mg/L (rat, 4 h, vapor)

petroleum distillate		substance)	substance)	(similar substance)
Ethoxylated branched C13 alcohol	[redacted]	1600 mg/kg-bw (rat) (similar substance)	>2000 mg/kg-bw (rabbit) (similar substance)	>0.22 mg/L (rat, 4h, aerosol, saturated) (similar substance)
Sodium diacetate	[redacted]	5600 mg/kg (rat)	> 2000 mg/kg (rat)	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation If heated: May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.

Eye Contact In vitro tests indicate that the product is not an eye irritant.

Skin Contact Prolonged or repeated contact may cause skin irritation.

Ingestion May act as obstruction if swallowed. Aspiration can be a hazard if this material is swallowed.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

Eye ailments. Skin disorders.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Hydrotreated light petroleum distillate	[redacted]	Non-irritating to the skin (similar substances)
Ethoxylated branched C13 alcohol	[redacted]	Skin, rabbit: Causes moderate skin irritation. (similar substances)

Substances	CAS Number	Serious eye damage/irritation
Hydrotreated light petroleum distillate	[redacted]	Non-irritating to rabbit's eye (similar substances)
Ethoxylated branched C13 alcohol	[redacted]	Eye, rabbit: Causes severe eye irritation which may damage tissue. (similar substances)

Substances	CAS Number	Skin Sensitization
Hydrotreated light petroleum distillate	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Ethoxylated branched C13 alcohol	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Sodium diacetate	[redacted]	Not regarded as a sensitizer.

Substances	CAS Number	Respiratory Sensitization
Hydrotreated light petroleum distillate	[redacted]	Based on available data, the classification criteria are not met.
Ethoxylated branched C13 alcohol	[redacted]	Based on available data, the classification criteria are not met.
Sodium diacetate	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Hydrotreated light petroleum distillate	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)
Ethoxylated branched C13 alcohol	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Hydrotreated light petroleum distillate	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)
Ethoxylated branched C13 alcohol	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Hydrotreated light petroleum distillate	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)
Ethoxylated branched C13 alcohol	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)
Sodium diacetate	[redacted]	(similar substances)

Substances	CAS Number	STOT - single exposure
Hydrotreated light petroleum distillate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Ethoxylated branched C13 alcohol	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Sodium diacetate	[redacted]	No information available

Substances	CAS Number	STOT - repeated exposure
Hydrotreated light petroleum distillate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Ethoxylated branched C13 alcohol	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	Aspiration hazard
Hydrotreated light petroleum distillate	[redacted]	Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.
Ethoxylated branched C13 alcohol	[redacted]	Based on available data, the classification criteria are not met.

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Hydrotreated light petroleum distillate	[redacted]	ErL50(72 h)>10000 mg/L (Skeletonema costatum)	LC50(96 h)>10000 mg/L (Scophthalmus maximus) NOELR(28 d)>1000 mg/L (fish)	No information available	LC50(48 h)>10000 mg/L (Acartia tonsa) NOELR(21 d)=1000 mg/L (Daphnia magna)
Ethoxylated branched C13 alcohol	[redacted]	IC50(72 h)=1-10 mg/L (Desmodesmus subspicatus)	LC50(96 h)=1-10 mg/L (Cyprinus carpio)	No information available	EC50(48 h)=1-10 mg/L (Daphnia magna) NOAEC (21d) 0.77 mg/L (Daphnia magna)
Sodium diacetate	[redacted]	EC50 (72 h) >1000 mg/L (Skeletonema costatum)	LC0 (96 h) >100 mg/L (Danio rerio) LC50 (96 h) 273 mg/L (Oreochromis mossambicus)	No information available	EC50 (48 h) >1000 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Hydrotreated light petroleum distillate	[redacted]	Readily biodegradable (68.1% @ 28d)
Ethoxylated branched C13 alcohol	[redacted]	Readily biodegradable (> 60% @ 28d)
Sodium diacetate	[redacted]	No information available

12.3. Bioaccumulative potential

Bioaccumulation is unlikely

Substances	CAS Number	Log Pow
Hydrotreated light petroleum distillate	[redacted]	No information available
Ethoxylated branched C13 alcohol	[redacted]	Not Bioaccumulative; BCF = 12.7 - 237 L/Kg
Sodium diacetate	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility

Hydrotreated light petroleum distillate	[redacted]	No information available
Ethoxylated branched C13 alcohol	[redacted]	No information available
Sodium diacetate	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS

US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 31-Jul-2018

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed
H304 - May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H318 - Causes serious eye damage
H412 - Harmful to aquatic life with long lasting effects

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
OSHA

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This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-23005

Revision Date: 09-Apr-2019 **Revision Number:** 1

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-23005

Other means of Identification

Synonyms None

Hazardous Material Number: HM009078

Recommended use of the chemical and restrictions on use

Recommended Use Friction Reducer

Uses advised against Consumer use

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention	None
Response	None
Storage	None
Disposal	None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

The exact percentage (concentration) of the composition has been withheld as proprietary. The specific chemical identity of the composition has been withheld as proprietary.

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Ingestion	Rinse mouth with water many times. Get medical attention, if symptoms occur

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water spray, dry chemical, or foam.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Ensure adequate ventilation. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Slippery when wet. Take precautionary measures against static discharges

6.2. Environmental precautions
None known.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Use appropriate protective equipment. Ensure adequate ventilation. Avoid dust accumulations. Avoid contact with eyes, skin, or clothing. Slippery when wet.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Avoid contact with heat, sparks, open flame, and static discharge. Store away from oxidizers. Store in a dry location. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls Ensure adequate ventilation, especially in confined areas

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Dust/mist respirator. (N95, P2/P3)
Hand Protection Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.
Skin Protection Wear protective clothing appropriate for the work environment.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Powder	**Color**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	6 - 8 (1 % solution)
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	> 100 °C / > 212 °F (Closed cup)
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.02
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available
Bulk Density	0.45 - 0.7 g/cm3

10. Stability and Reactivity

10.1. Reactivity
May form combustible dust concentrations in air.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Keep away from heat, sparks and flame.
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Oxides of nitrogen. Carbon oxides. Hydrogen cyanide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation. Ingestion.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation

Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mechanical irritation to eye.
Skin Contact May cause mild skin irritation.
Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
No data available

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to	NA	No information available

the competent authority		

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects
Endocrine Disruptor Information
This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Follow all applicable community, national or regional regulations regarding waste management methods.

Disposal of any contaminated packaging
Follow all applicable national or local regulations.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information
Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories
Australian AICS Inventory All components are listed on the AICS or are subject to a relevant exemption, permit, or

	assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 09-Apr-2019

Revision Note
Initial Release

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-25003

Revision Date: 30-Sep-2015 **Revision Number:** 13

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-25003

Other means of Identification

Synonyms: None

Product Code: HM007670

Recommended use of the chemical and restrictions on use

Recommended Use Gelling Agent

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-Mail address: fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements Not Classified

Precautionary Statements

Prevention None

Response None

Storage None

Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

Dust can form an explosive mixture in air
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

Australia Classification

For the full text of the H-phrases mentioned in this Section, see Section 16

Classification Not Classified
Risk Phrases None

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin Wash with soap and water.
Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special Exposure Hazards

Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special Protective Equipment for Fire-Fighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for Safe Handling

Handling Precautions

Avoid creating or inhaling dust. Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Dust/mist respirator. (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Solid
Odor: Bean
Color: White to light straw
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	10.1
Freezing Point/Range	No data available
Melting Point/Range	No data available
Boiling Point/Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.3
Water Solubility	Hydrolyzes
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	510 °C / 950 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
None anticipated
10.5. Incompatible Materials
Strong oxidizers.
10.6. Hazardous Decomposition Products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mild eye irritation.
Skin Contact May cause mild skin irritation.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Follow all applicable community, national or regional regulations regarding waste management methods.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

16. Other information

Date of preparation or review

Revision Date: 30-Sep-2015

Revision Note
SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
None

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight CAS – Chemical Abstracts Service EC50 – Effective Concentration 50% LC50 – Lethal Concentration 50% LD50 – Lethal Dose 50% LL50 – Lethal Loading 50% mg/kg – milligram/kilogram mg/L – milligram/liter NOEC – No Observed Effect Concentration OEL – Occupational Exposure Limit PBT – Persistent Bioaccumulative and Toxic ppm – parts per million STEL – Short Term Exposure Limit TWA – Time-Weighted Average vPvB – very Persistent and very Bioaccumulative h - hour mg/m^3 - milligram/cubic meter mm - millimeter mmHg - millimeter mercury w/w - weight/weight d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-25005

Revision Date: 30-Sep-2015 **Revision Number:** 10

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-25005

Other means of Identification

Synonyms: None

Product Code: HM007672

Recommended use of the chemical and restrictions on use

Recommended Use Gelling Agent

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-Mail address: fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements Not Classified

Precautionary Statements

Prevention None

Response None

Storage None

Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

Australia Classification
For the full text of the H-phrases mentioned in this Section, see Section 16

Classification Not Classified
Risk Phrases None

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical

Special Exposure Hazards

Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special Protective Equipment for Fire-Fighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for Safe Handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)

Hand Protection Normal work gloves.

Skin Protection Normal work coveralls.

Eye Protection Wear safety glasses or goggles to protect against exposure.

Other Precautions None known.

Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Solid
Odor: Bean
Color: Off white
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	6.5-7.5
Freezing Point/Range	No data available
Melting Point/Range	No data available
Boiling Point/Range	No data available
Flash Point	> 93 °C / > 200 °F Cleveland Open Cup (COC)
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.42 - 1.47
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
None anticipated
10.5. Incompatible Materials
Strong oxidizers.
10.6. Hazardous Decomposition Products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above	NA	No data available	No data available	No data available

cut-off values according to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mild eye irritation.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

16. Other information

Date of preparation or review

Revision Date: 30-Sep-2015

Revision Note

SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
None

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight CAS – Chemical Abstracts Service EC50 – Effective Concentration 50% LC50 – Lethal Concentration 50% LD50 – Lethal Dose 50% LL50 – Lethal Loading 50% mg/kg – milligram/kilogram mg/L – milligram/liter NOEC – No Observed Effect Concentration OEL – Occupational Exposure Limit PBT – Persistent Bioaccumulative and Toxic ppm – parts per million STEL – Short Term Exposure Limit TWA – Time-Weighted Average vPvB – very Persistent and very Bioaccumulative h - hour mg/m^3 - milligram/cubic meter mm - millimeter mmHg - millimeter mercury w/w - weight/weight d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-30001

Revision Date: 05-Jul-2016 **Revision Number:** 11

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-30001

Other means of Identification

Synonyms None

Hazardous Material Number: HM007676

Recommended use of the chemical and restrictions on use

Recommended Use Scale Inhibitor

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: + 61 1 800 686 951
Papua New Guinea: + 61 1 800 686 951
NewZealand: +64 800 451719

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

E-mail Address fdunexchem@halliburton.com

Emergency phone number
+ 61 1 800 686 951

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Not applicable

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing mist. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Product has a shelf life of 12 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN

149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

Hand Protection	Butyl rubber gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Clear to slightly hazy amber
Odor:	Mild	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	6.49 - 7.49
Freezing Point / Range	-1.1 °C
Melting Point / Range	No data available
Boiling Point / Range	100 °C
Flash Point	> 95 °C / PMCC
Evaporation rate	< 1
Vapor Pressure	18 mmHg
Vapor Density	> 1
Specific Gravity	1.24
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	1.2
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide. Toxic monomer fumes.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye and skin contact.

Symptoms related to exposure
Most Important Symptoms/Effects

No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mild eye irritation.
Skin Contact Prolonged or repeated contact may cause slight skin irritation.
Ingestion In large amounts: Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Skin disorders. Eye ailments. Respiratory disorders.

Data limitations
No data available

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability
Biodegradable.

Substances	CAS Number	Persistence and Degradability

Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Does not bioaccumulate.

Substances	CAS Number	Log Pow
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stolkhom Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 05-Jul-2016

Revision Note
SDS sections updated: 2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour

mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-32002

Revision Date: 07-Feb-2018 **Revision Number:** 19

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-32002

Other means of Identification

Synonyms None

Hazardous Material Number: HM007683

Recommended use of the chemical and restrictions on use

Recommended Use Surfactant

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Skin Corrosion/Irritation	Category 2 - H315
Serious Eye Damage/Irritation	Category 1 - H318
Acute Aquatic Toxicity	Category 2 - H401

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H302 - Harmful if swallowed
H315 - Causes skin irritation
H318 - Causes serious eye damage
H401 - Toxic to aquatic life

Precautionary Statements

Prevention
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P273 - Avoid release to the environment
P280 - Wear protective gloves/eye protection/face protection

Response
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash before reuse
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician

Storage None

Disposal P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	60 - 100%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 2 (H401)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	10 - 30%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 2 (H401)

4. First aid measures

Description of necessary first aid measures

Inhalation	Under normal conditions, first aid procedures are not required.
Eyes	Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes skin irritation. Harmful if swallowed.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Wash hands after use. Avoid breathing vapors. Ensure adequate ventilation. Slippery when wet. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Keep container closed when not in use. Keep from heat, sparks, and open flames. Product has a shelf life of 24 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Not applicable	Not applicable
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls None known.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

Hand Protection Impervious rubber gloves. Polyvinylchloride gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Yellow
Odor: Mild **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	6.5 (1%)
Freezing Point / Range	-3 °C
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	240 °C / 464 °F PMCC
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	> 10
Specific Gravity	0.98
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Strong oxidizers. Strong acids. Strong alkalis.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes severe eye irritation which may damage tissue. Causes skin irritation. Harmful if swallowed.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	600 mg/kg (Rat) (similar substance)	> 5200 mg/kg (Rabbit) (similar substance)	> 0.22 mg/L (saturated concentration) (Rat) (similar substance)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	600 mg/kg (Rat) (similar substance)	> 5200 mg/kg (Rabbit) (similar substance)	>0.22 mg/L (saturated concentration) (Rat) (similar substance)

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact Causes severe eye irritation which may damage tissue.

Skin Contact Causes skin irritation.

Ingestion Harmful if swallowed. Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

Skin disorders.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Causes skin irritation. (Rabbit) (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Causes skin irritation. (Rabbit) (similar substances)

Substances	CAS Number	Serious eye damage/irritation
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Causes severe eye irritation (Rabbit) (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Causes severe eye irritation (Rabbit) (similar substances)

Substances	CAS Number	Skin Sensitization

Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)

Substances	CAS Number	Respiratory Sensitization
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	No information available
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Did not show carcinogenic or teratogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Animal testing did not show any effects on fertility.
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Animal testing did not show any effects on fertility.

Substances	CAS Number	STOT - single exposure
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	STOT - repeated exposure
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	Aspiration hazard
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	No adverse health effects are expected from swallowing.
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	No adverse health effects are expected from swallowing.

12. Ecological Information

Ecotoxicity

Algae Toxicity ErC50 (72h): 2.58 - 3.44 mg/L (Desmodesmus subspicatus)

Acute Crustaceans Toxicity: EC50(48h): 1.45 - 1.79 mg/L (Daphnia magna)

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	EC50 (72h) 0.75 mg/L (Pseudokirchnerella subcapitata) (similar substance) EC50 (96h) 0.7 mg/L (Pseudokirchneriella subapitata) (similar substance) CD10 8 mg/L	LC50 (96h) 0.59 mg/L (Pleuronectes platessa) (similar substance) LC50 (96) 1.4 mg/L (Pimephales promelas) (similar substance) NOEC 4.4 mg/L (Pimephales promelas, juvenile)	ErC50 (16.9h) > 10 g/L (growth inhibition) (Pseudomonas putida) (similar substance)	EC50 (48h) 0.14 mg/L (Daphnia magna) (similar substance) EC50 (48h) 0.39 mg/L (Cerodaphnia dubia) (similar substance)

		(Pseudokirchneriella subapitata) EC10 2 mg/L (Brachionus calyciflorus)			
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	EC50 (72h) 0.75 mg/L (Pseudokirchnerella subcapitata) (similar substance) ErC50 (48h) 0.7 mg/L (Skeletonema costatum) EC10 9.79 mg/L (Selenastrum capricornutum) (similar substance) ErC50 1.1 mg/L (Scenedesmus subspicatus) (similar substance)	LC50 (96h) 0.59 mg/L (Pleuronectes platessa) (similar substance) LC50 (96h) 1.6 mg/L (Pimephales promelas) (similar substace) LC50 (96h) 3 mg/L (Brachydanio rerio) (similar substance)	ErC50 (16.9h) > 10 g/L (Pseudomonas putida) (similar substance)	EC50 (48h) 0.14 mg/L (Daphnia magna) (similar substance) EC50 (48h) 02 mg/L (Daphnia magna) (similar substance)

12.2. Persistence and degradability

Readily biodegradable

Substances	CAS Number	Persistence and Degradability
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Readily biodegradable (60% @ 28d) (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Readily biodegradable (84% @ 28d) (similar substances)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Log Pow: 4.3 - 5.36 (estimated) BCF: 1.1 - 1.8 (fish, estimated)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Log Pow: 4.3 - 5.36 (estimated) BCF: 1.1 - 1.8 (fish, estimated)

12.4. Mobility in soil

Substances	CAS Number	Mobility
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	KOC = >4
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	KOC = >4

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number Not restricted

UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
•3Z

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 07-Feb-2018

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed

H315 - Causes skin irritation
H318 - Causes serious eye damage

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-32014

Revision Date: 31-Aug-2017 **Revision Number:** 3

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-32014

Other means of Identification

Synonyms None

Hazardous Material Number: HM008547

Recommended use of the chemical and restrictions on use

Recommended Use Surfactant

Uses advised against Consumer use

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
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Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Aspiration Toxicity	Category 1 - H304
Skin Corrosion/Irritation	Category 2 - H315
Serious Eye Damage/Irritation	Category 1 - H318
Reproductive Toxicity	Category 1B - H360
Acute Aquatic Toxicity	Category 2 - H401
Flammable liquids.	Category 3 - H226

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:

H226 - Flammable liquid and vapor
H304 - May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H318 - Causes serious eye damage
H360 - May damage fertility or the unborn child
H401 - Toxic to aquatic life

Precautionary Statements

Prevention

P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233 - Keep container tightly closed
P240 - Ground and bond container and receiving equipment.
P241 - Use explosion-proof electrical/ventilating/lighting/equipment
P242 - Use only non-sparking tools
P243 - Take action to prevent static discharges.
P264 - Wash face, hands and any exposed skin thoroughly after handling
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P281 - Use personal protective equipment as required

Response

P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P331 - Do NOT induce vomiting
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash before reuse
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P370 + P378 - In case of fire: Use water spray for extinction

Storage

P403 + P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up

Disposal

P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Hydrotreated light petroleum distillate	[redacted]
Ethanol	[redacted]
Fatty acids, tall-oil, ethoxylated	[redacted]
C12-C15 Ethoxylated alcohols	[redacted]
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]
Butyl alcohol	[redacted]

Methanol [redacted]

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Hydrotreated light petroleum distillate	[redacted]	10 - 30%	Asp. Tox. 1 (H304)
Ethanol	[redacted]	10 - 30%	Eye Irrit. 2A (H319) Flam. Liq. 2 (H225)
Fatty acids, tall-oil, ethoxylated	[redacted]	10 - 30%	Skin Irrit. 2 (H315) Eye Irrit. 2A (H319)
C12-C15 Ethoxylated alcohols	[redacted]	10 - 30%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 1 (H400) Aquatic Chronic 3 (H412)
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	10 - 30%	Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 2 (H401) Aquatic Chronic 3 (H412)
Butyl alcohol	[redacted]	5 - 10%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) STOT SE 3 (H335) Flam. Liq. 3 (H226)
Methanol	[redacted]	0.1 - 1%	Acute Tox. 3 (H301) Acute Tox. 3 (H311) Acute Tox. 3 (H331) Repr. 1B (H360) STOT SE 1 (H370) Flam. Liq. 2 (H225)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Seek immediate medical attention/advice. Suitable emergency eye wash facility should be immediately available

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention.

Ingestion Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration. Rinse mouth. Never give anything by mouth to an unconscious person. Following ingestion, onset of symptoms may be delayed by 12 to 24 hours. Admission to hospital should be the first priority even if symptoms are absent.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes skin irritation. Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal. Potential reproductive hazard. May cause birth defects.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

Do NOT spray pool fires directly with water. A solid stream of water directed into hot burning liquid can cause splattering.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation. Use appropriate protective equipment. Remove sources of ignition. Take precautionary measures against static discharges All equipment used when handling the product must be grounded Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Dike far ahead of liquid spill for later disposal. Soak up with inert absorbent material. Pick up and transfer to properly labeled containers. Remove ignition sources and work with non-sparking tools.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Ensure adequate ventilation. Use appropriate protective equipment. Remove sources of ignition. Ground and bond containers when transferring from one container to another. Avoid contact with eyes, skin, or clothing.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a cool well ventilated area. Keep from heat, sparks, and open flames.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Hydrotreated light petroleum distillate	[redacted]	Not applicable	Not applicable
Ethanol	[redacted]	TWA: 1000 ppm TWA: 1880 mg/m^3	STEL: 1000 ppm
Fatty acids, tall-oil, ethoxylated	[redacted]	Not applicable	Not applicable
C12-C15 Ethoxylated alcohols	[redacted]	Not applicable	Not applicable
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	Not applicable	Not applicable
Butyl alcohol	[redacted]	50 ppm	TWA: 20 ppm

Methanol	[redacted]	TWA: 200 ppm TWA: 262 mg/m^3 STEL: 250 ppm STEL: 328 mg/m^3	TWA: 200 ppm STEL: 250 ppm

Appropriate engineering controls

Engineering Controls Ensure adequate ventilation, especially in confined areas

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Organic vapor respirator.

Hand Protection Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.

Skin Protection Wear impervious protective clothing, including boots, gloves, lab coat, apron, rain jacket, pants or coverall, as appropriate, to prevent skin contact.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Colorless to Light Amber
Odor: Mild hydrocarbon **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	-44.2 °C
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	34 °C / 93.2 °F
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	0.918
Water Solubility	No data available
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Keep away from heat, sparks and flame.
10.5. Incompatible materials
Strong oxidizers. Strong acids. Strong alkalis.
10.6. Hazardous decomposition products
Carbon oxides. Oxides of nitrogen.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Skin contact. Eye contact. Inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes skin irritation. Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal. Potential reproductive hazard. May cause birth defects.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrotreated light petroleum distillate	[redacted]	>5000 mg/kg-bw (rat) (similar substance)	>2000 mg/kg-bw (rabbit) (similar substance)	>5.2 mg/L (rat, 4 h, vapor) (similar substance)
Ethanol	[redacted]	7060 mg/kg (Rat) 10,470 mg/kg (Rat)	> 15,800 mg/kg (Rabbit) 17,100 mg/kg (Rabbit)	124.7 mg/L (Rat) 4h
Fatty acids, tall-oil, ethoxylated	[redacted]	> 6400 mg/kg (Rat)	No data available	No data available
C12-C15 Ethoxylated alcohols	[redacted]	2 g/kg (Rat) 1600 mg/kg (Rat) > 5000 mg/kg (Rat)	> 2000 mg/kg (Rat) 2500 mg/kg (Rabbit)	No data available
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	3500 mg/kg (Rat) > 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 0.219 mg/L (Mouse) 4h (similar substance)
Butyl alcohol	[redacted]	790 mg/kg (Rat)	3400 mg/kg (Rabbit)	> 17.6 mg/L (Rat) 4h
Methanol	[redacted]	300 mg/kg-bw (human) < 790 to 13,000 mg/kg (rat)	1000 mg/kg-bw (human) 17,100 mg/kg (rabbit)	10 mg/L (human, 4h, vapor)

Immediate, delayed and chronic health effects from exposure
Inhalation May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.
Eye Contact Causes severe eye irritation which may damage tissue.
Skin Contact Causes skin irritation.
Ingestion Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal. Ingestion of this product may cause blindness due to the presence of methanol.

Chronic Effects/Carcinogenicity Prolonged or repeated exposure may cause reproductive system damage. May cause birth defects.

Exposure Levels
No data available

Interactive effects
No data available

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Hydrotreated light petroleum distillate	[redacted]	Non-irritating to the skin (similar substances)
Ethanol	[redacted]	Not irritating to skin in rabbits.
Fatty acids, tall-oil, ethoxylated	[redacted]	Irritating to skin.
C12-C15 Ethoxylated alcohols	[redacted]	May cause moderate skin irritation. (Rabbit)
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	Skin, rabbit: Causes moderate skin irritation. (similar substances)
Butyl alcohol	[redacted]	Causes moderate skin irritation.
Methanol	[redacted]	Non-irritating to the skin (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Hydrotreated light petroleum distillate	[redacted]	Non-irritating to rabbit's eye (similar substances)
Ethanol	[redacted]	Causes moderate eye irritation (Rabbit)
Fatty acids, tall-oil, ethoxylated	[redacted]	Irritating to eyes
C12-C15 Ethoxylated alcohols	[redacted]	Risk of serious damage to eyes (Rabbit) (similar substances)
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	Causes severe eye irritation (similar substances)
Butyl alcohol	[redacted]	Causes severe eye irritation
Methanol	[redacted]	Non-irritating to the eye (Rabbit)

Substances	CAS Number	Skin Sensitization
Hydrotreated light petroleum distillate	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Ethanol	[redacted]	Did not cause sensitization on laboratory animals
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	Did not cause sensitization on laboratory animals (similar substances)
Butyl alcohol	[redacted]	Not confirmed to cause skin or respiratory sensitization.
Methanol	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Hydrotreated light petroleum distillate	[redacted]	No information available
Ethanol	[redacted]	Did not cause sensitization on laboratory animals
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	No information available
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	No information available
Butyl alcohol	[redacted]	No information available
Methanol	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Hydrotreated light petroleum distillate	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)
Ethanol	[redacted]	Not regarded as mutagenic.
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	In vivo tests did not show mutagenic effects. In vitro tests did not show mutagenic effects.
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)
Butyl alcohol	[redacted]	In vitro tests did not show mutagenic effects.
Methanol	[redacted]	The weight of evidence from available in vitro and in vivo studies indicates that this substance is not expected to be mutagenic.

Substances	CAS Number	Carcinogenic Effects

Hydrotreated light petroleum distillate	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)
Ethanol	[redacted]	Did not show carcinogenic effects in animal experiments
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	Did not show carcinogenic effects in animal experiments
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	Not regarded as carcinogenic.
Butyl alcohol	[redacted]	No information available
Methanol	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	**Reproductive toxicity**
Hydrotreated light petroleum distillate	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)
Ethanol	[redacted]	Animal testing did not show any effects on fertility.
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	Not a confirmed teratogen or embryotoxin.
Butyl alcohol	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.
Methanol	[redacted]	Experiments have shown reproductive toxicity effects on laboratory animals

Substances	CAS Number	**STOT - single exposure**
Hydrotreated light petroleum distillate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Ethanol	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Butyl alcohol	[redacted]	May cause respiratory irritation.
Methanol	[redacted]	May cause disorder and damage to the Central Nervous System (CNS)

Substances	CAS Number	**STOT - repeated exposure**
Hydrotreated light petroleum distillate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Ethanol	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Butyl alcohol	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Methanol	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	**Aspiration hazard**
Hydrotreated light petroleum distillate	[redacted]	Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.
Ethanol	[redacted]	Not applicable
Fatty acids, tall-oil, ethoxylated	[redacted]	Not applicable
C12-C15 Ethoxylated alcohols	[redacted]	No adverse health effects are expected from swallowing.
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	No information available
Butyl alcohol	[redacted]	Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.
Methanol	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

Product is not classified as hazardous to the environment.

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Hydrotreated light petroleum distillate	[redacted]	ErL50(72 h)>10000 mg/L (Skeletonema costatum)	LC50(96 h)>10000 mg/L (Scophthalmus maximus) NOELC(28 d)>1000 mg/L (fish)	No information available	LC50(48 h)>10000 mg/L (Acartia tonsa) NOEC(21 d)=1000 mg/L (Daphnia magna)
Ethanol	[redacted]	No information available	LC50 > 100 mg/L (Pimephales promelas)	No information available	LC50 9268 - 14,221 mg/L (Daphnia magna) LC50 5012 mg/L (Ceridaphnia dubia) NOEC 9.6 mg/L (Daphnia magna)
Fatty acids, tall-oil, ethoxylated	[redacted]	EC50 (72h) > 44 mg/L EC50 (72h) 2.5 mg/L (Skeletonema costatum)	LC50 (95h) 7.8 mg/L (Brachydanio rerio) LC50 (96h) 45 mg/L (Cyprinodon variegatus)	EC20 (180m) >1000 mg/L	EC50 (48h) 16 mg/L (Daphnia magna) EC50 (48h) 26.8 mg/L (Acartia tonsa)
C12-C15 Ethoxylated alcohols	[redacted]	No information available	EC50 (48h) 0.39 mg/L (Ceriodaphnia dubia) NOEC (30d) 0.28 mg/L (Pimephales promelas) NOEC (16d) 0.16 mg/L(Lepomis macrochirus)	No information available	No information available
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	EC50 (72h) 2.2 mg/L (Scendesmus subspicatus) (similar substance)	LC50 (96h) 6.7 mg/L (Danio rerio) (similar substance)	No information available	LC50 (21d) = 0.1 mg/L (Daphnia magna) LC50 (48h) = 2.15 mg/L
Butyl alcohol	[redacted]	EC50 (96h) 225 mg/L (Pseudokirchnerella subcapitata)	LC50 (96h) 1376 mg/L (Pimephales promelas)	No information available	EC50 (48h) 1328 mg/L (Daphnia magna) NOEC (21d) 4.1 mg/L (Daphnia magna) EC50 (21d) 18 mg/L (Daphnia magna)
Methanol	[redacted]	EC50 (96 h) =22000 mg/L (Pseudokirchnerella subcapitata) NOEC (8 d) =8000 mg/L (Scenedesmus quadricauda)	LC50 (96 h) =15400 mg/L (Lepomis macrochirus) EC50 (200 h) =14536 mg/L (Oryzias latipes)	IC50 (3h) > 1000 mg/L (activated sludge)	EC50 (96 h) =18260 mg/L (Dapnia magna) NOEC (21 d) =208 mg/L (Dapnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Hydrotreated light petroleum distillate	[redacted]	Readily biodegradable (68.1% @ 28d)
Ethanol	[redacted]	No information available
Fatty acids, tall-oil, ethoxylated	[redacted]	Readily biodegradable (74% @ 28d)
C12-C15 Ethoxylated alcohols	[redacted]	Readily biodegradable
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	Readily biodegradable (77% @ 28d)
Butyl alcohol	[redacted]	Biodegradable. (92% @ 20d)
Methanol	[redacted]	Readily biodegradable (95% @ 20d)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Hydrotreated light petroleum distillate	[redacted]	No information available
Ethanol	[redacted]	-0.32
Fatty acids, tall-oil, ethoxylated	[redacted]	MW > 700
C12-C15 Ethoxylated alcohols	[redacted]	3
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	3.2 (estimated)

Butyl alcohol	[redacted]	1
Methanol	[redacted]	Not Bioaccumulative; BCF=1

12.4. Mobility in soil

Substances	CAS Number	Mobility
Hydrotreated light petroleum distillate	[redacted]	No information available
Ethanol	[redacted]	No information available
Fatty acids, tall-oil, ethoxylated	[redacted]	No information available
C12-C15 Ethoxylated alcohols	[redacted]	No information available
Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	[redacted]	No information available
Butyl alcohol	[redacted]	KOC = 72
Methanol	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Ethanol, Butanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable

IMDG/IMO

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Ethanol, Butanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable

IATA/ICAO

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Ethanol, Butanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable

Special precautions during transport

None

HazChem Code

•3Y

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product does not comply with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 31-Aug-2017

Revision Note

SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3

H225 - Highly flammable liquid and vapor
H226 - Flammable liquid and vapor
H301 - Toxic if swallowed
H302 - Harmful if swallowed
H304 - May be fatal if swallowed and enters airways
H311 - Toxic in contact with skin
H315 - Causes skin irritation
H318 - Causes serious eye damage
H319 - Causes serious eye irritation
H331 - Toxic if inhaled
H335 - May cause respiratory irritation
H360 - May damage fertility or the unborn child
H370 - Causes damage to organs
H400 - Very toxic to aquatic life
H401 - Toxic to aquatic life
H412 - Harmful to aquatic life with long lasting effects

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%

LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DRIL-N-SLIDE™

Revision Date: 16-Sep-2015 **Revision Number:** 17

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DRIL-N-SLIDE™

Other means of Identification

Synonyms: None

Product Code: HM003622

Recommended use of the chemical and restrictions on use

Recommended Use Lubricant

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: 61 (08) 9455 8300
Fax Number: 61 (08) 9455 5300

Product Emergency Telephone
Australia: + 61 1 800 686 951
Papua New Guinea: + 61 1 800 686 951
NewZealand: +64 800 451719

Fire, Police & Ambulance - Emergency Telephone
Australia: 000
Papua New Guinea: 000
New Zealand: 111

E-Mail address: fdunexchem@halliburton.com

Emergency phone number
+ 61 1 800 686 951

Australian Poisons Information Centre
24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word	Not Hazardous
Hazard Statements	Not Classified
Precautionary Statements	
Prevention	None
Response	None
Storage	None
Disposal	None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

Australia Classification

For the full text of the H-phrases mentioned in this Section, see Section 16

Classification	Not Classified
Risk Phrases	None

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water.
Ingestion	Get medical attention! If vomiting occurs, keep head lower than hips to prevent aspiration. Rinse mouth. Never give anything by mouth to an unconscious person.

Symptoms caused by exposure

No significant hazards expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special Exposure Hazards

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special Protective Equipment for Fire-Fighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for Safe Handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Keep container closed when not in use. Product has a shelf life of 36 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Respiratory Protection	Not normally necessary.
Hand Protection	Impervious rubber gloves. Nitrile gloves. Neoprene gloves. Butyl rubber gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Safety glasses.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color:**	Yellowish
Odor:	Bland	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point/Range	< -30 °C
Melting Point/Range	No data available
Boiling Point/Range	240 °C / 464 °F
Flash Point	147 °C / 296 °F PMCC
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	0.86
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	1.69
Autoignition Temperature	240 °C / 464 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	0%
Liquid Density	7.18 lbs/gal
Bulk Density	53.69 lbs/ft3

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical Stability
Stable
10.3. Possibility of Hazardous Reactions
Will Not Occur
10.4. Conditions to Avoid
None anticipated
10.5. Incompatible Materials
Strong oxidizers.
10.6. Hazardous Decomposition Products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure
Most Important Symptoms/Effects

No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mild eye irritation.
Skin Contact May cause mild skin irritation.
Ingestion Not determined

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable.

Substances	CAS Number	Eye damage/irritation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable.

Substances	CAS Number	Skin Sensitization
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

Substances	CAS Number	Respiratory Sensitization
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

Substances	CAS Number	Mutagenic Effects
Contains no hazardous substances in concentrations above cut-off	NA	Not applicable

values according to the competent authority		

Substances	CAS Number	Carcinogenic Effects
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

Substances	CAS Number	Reproductive toxicity
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

Substances	CAS Number	STOT - single exposure
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

Substances	CAS Number	STOT - repeated exposure
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

Substances	CAS Number	Aspiration hazard
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow

Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

16. Other information

Date of preparation or review

Revision Date: 16-Sep-2015

Revision Note
SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
None

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight CAS – Chemical Abstracts Service EC50 – Effective Concentration 50% LC50 – Lethal Concentration 50% LD50 – Lethal Dose 50% LL50 – Lethal Loading 50% mg/kg – milligram/kilogram mg/L – milligram/liter NOEC – No Observed Effect Concentration OEL – Occupational Exposure Limit PBT – Persistent Bioaccumulative and Toxic ppm – parts per million STEL – Short Term Exposure Limit TWA – Time-Weighted Average vPvB – very Persistent and very Bioaccumulative h - hour mg/m^3 - milligram/cubic meter mm - millimeter mmHg - millimeter mercury w/w - weight/weight d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

FE-2

Revision Date: 16-Apr-2015 **Revision Number:** 28

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name FE-2

Other means of Identification

Synonyms: None

Product Code: HM000682

Recommended use of the chemical and restrictions on use

Recommended Use Iron Control Agent

Uses Advised Against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-Mail address: fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage / Eye Irritation	Category 2 - H319

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Warning

Hazard Statements H319 - Causes serious eye irritation

Precautionary Statements

Prevention P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear eye protection/face protection

Response P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention

Storage None

Disposal None

Contains

Substances	**CAS Number**
Citric acid	[redacted]

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

Australia Classification
For the full text of the H-phrases mentioned in this Section, see Section 16

Classification Xi - Irritant.

Risk Phrases R36 Irritating to eyes.

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Citric acid	[redacted]	60 - 100%	Eye Irrit. 2A (H319)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Causes eye irritation.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special Exposure Hazards
Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters
Special Protective Equipment for Fire-Fighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for Safe Handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from alkalis. Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 60 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Citric acid	[redacted]	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls	Use in a well ventilated area.

Personal protective equipment (PPE)

Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection	Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Nitrile gloves. (>= 0.35 mm thickness) This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.
Skin Protection	Normal work coveralls.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color:**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	2 - 2.2
Freezing Point/Range	No data available
Melting Point/Range	No data available
Boiling Point/Range	No data available
Flash Point	No data available
upper flammability limit	65
lower flammability limit	8
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.665
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	1000 °C / 1832 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	192.13
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical Stability

Stable

10.3. Possibility of Hazardous Reactions

Will Not Occur

10.4. Conditions to Avoid

None anticipated

10.5. Incompatible Materials

Strong alkalis. Strong oxidizers.

10.6. Hazardous Decomposition Products

Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Sympotoms related to exposure

Most Important Symptoms/Effects

Causes eye irritation.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Citric acid	[redacted]	5400 mg/kg (Rat) 5790 mg/kg (Mouse) 11,700 mg/kg (Rat)	> 2000 mg/kg	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact Causes eye irritation.

Skin Contact May cause mild skin irritation.

Ingestion Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

None known.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Citric acid	[redacted]	Not irritating to skin in rabbits.

Substances	CAS Number	Eye damage/irritation
Citric acid	[redacted]	Causes severe eye irritation.

Substances	CAS Number	Skin Sensitization
Citric acid	[redacted]	Patch test on human volunteers did not demonstrate sensitization properties

Substances	CAS Number	Respiratory Sensitization
Citric acid	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Citric acid	[redacted]	Did not show mutagenic effects in animal experiments

Substances	CAS Number	Carcinogenic Effects
Citric acid	[redacted]	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Citric acid	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Citric acid	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	STOT - repeated exposure
Citric acid	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Citric acid	[redacted]	No adverse health effects are expected from swallowing.

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Citric acid	[redacted]	NOEC (8d) 425 mg/L (cell density) (Scenedesmus quadricauda) LOEC (8d) >80 mg/L (Microcystis aeruginosa)	LC50 (96h) 1516 mg/L (Lepomis macrochirus) LC50 (48h) 440 mg/L (Leuciscus idus melanotus) LC50 (96h) >100 mg/L (Pimephales promelas)	TT (72h) 485 mg/L (Entosiphon sulcatum)	TLM96 100-330 ppm (Crangon crangon) EC50 (24h) 1535 mg/L (Daphnia magna) LC50 (48h) 160 mg/L (Daphnia magna) EC50 (48h) >50 mg/L (Daphnia magna)

12.2. Persistence and degradability

Biodegradable.

Substances	CAS Number	Persistence and Degradability
Citric acid	[redacted]	Readily biodegradable (97% @ 28d)

12.3. Bioaccumulative potential

Does not bioaccumulate

Substances	CAS Number	Log Pow
Citric acid	[redacted]	-1.61 to -1.80

12.4. Mobility in soil

Substances	CAS Number	Mobility
Citric acid	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual

contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information

UN Number:	Not restricted
UN Proper Shipping Name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components listed on inventory or are exempt.
New Zealand Inventory of Chemicals	All components listed on inventory or are exempt.
EINECS Inventory	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian DSL Inventory	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

16. Other information

Date of preparation or review

Revision Date: 16-Apr-2015

Revision Note Revision Note
SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
R36 - Irritating to eyes

Full text of H-Statements referred to under sections 2 and 3
H319 - Causes serious eye irritation

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight CAS – Chemical Abstracts Service EC50 – Effective Concentration 50% LC50 – Lethal Concentration 50% LD50

– Lethal Dose 50% LL50 – Lethal Loading 50% mg/kg – milligram/kilogram mg/L – milligram/liter NOEC – No Observed Effect Concentration OEL – Occupational Exposure Limit PBT – Persistent Bioaccumulative and Toxic ppm – parts per million STEL – Short Term Exposure Limit TWA – Time-Weighted Average vPvB – very Persistent and very Bioaccumulative h - hour mg/m^3 - milligram/cubic meter mm - millimeter mmHg - millimeter mercury w/w - weight/weight d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

HC-2A

Revision Date: 12-Jun-2018 **Revision Number:** 2

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name HC-2A

Other means of Identification

Synonyms None

Hazardous Material Number: HM008835

Recommended use of the chemical and restrictions on use

Recommended Use Surfactant

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage/Irritation	Category 1 - H318
Acute Aquatic Toxicity	Category 2 - H401
Chronic Aquatic Toxicity	Category 2 - H411

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H318 - Causes serious eye damage
H401 - Toxic to aquatic life
H411 - Toxic to aquatic life with long lasting effects

Precautionary Statements

Prevention
P273 - Avoid release to the environment
P280 - Wear eye protection/face protection

Response
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P391 - Collect spillage

Storage None

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	CAS Number
Inner salt of alkyl amines	Proprietary

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Inner salt of alkyl amines	Proprietary	10 - 30%	Eye Corr. 1 (H318) Aquatic Acute 2 (H401) Aquatic Chronic 2 (H411)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Rinse mouth with water many times. Get medical attention if symptoms occur

Symptoms caused by exposure
Causes severe eye irritation which may damage tissue.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Use water spray to cool fire exposed surfaces. Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Inner salt of alkyl amines	Proprietary	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection	Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.
Skin Protection	Wear protective clothing appropriate for the work environment.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls	No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Clear light amber
Odor:	Surfactant	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	6.5-7.5
Freezing Point / Range	0 °C
Melting Point / Range	No data available
Boiling Point / Range	100 °C / 212 °F
Flash Point	> 100 °C / > 212 °F PMCC
Evaporation rate	No data available
Vapor Pressure	< 17.5 mmHg
Vapor Density	No data available
Specific Gravity	1.12
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Keep away from heat, sparks and flame.
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Oxides of nitrogen. Carbon monoxide and carbon dioxide. Hydrogen chloride.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure	Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes severe eye irritation which may damage tissue.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Inner salt of alkyl amines	Proprietary	>5000 mg/kg-bw (rat)	>2000 mg/kg-bw (rat)	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact Causes severe eye irritation which may damage tissue. May cause corneal injury.

Skin Contact May cause mild skin irritation.

Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

None known.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Inner salt of alkyl amines		Not irritating to skin in rabbits.

Substances	CAS Number	Serious eye damage/irritation
Inner salt of alkyl amines		Causes severe eye irritation (Rabbit)

Substances	CAS Number	Skin Sensitization
Inner salt of alkyl amines		Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Inner salt of alkyl amines		No information available

Substances	CAS Number	Mutagenic Effects
Inner salt of alkyl amines		In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Inner salt of alkyl amines		Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Inner salt of alkyl amines		Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Inner salt of alkyl amines		No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Inner salt of alkyl amines		No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Inner salt of alkyl amines		Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Inner salt of alkyl amines	Proprietary	EC50 (96 h) 0.55 mg/L (Desmodesmus subspicatus) EC50 (72 h) 17.2 mg/L (Scenedesmus subspicatus) EC50 (72 h) 9.86 mg/L (Scenedesmus subspicatus) EC50 (72 h) 30 mg/L (Scenedesmus subspicatus)	LC50 (96 h) 2 mg/L (Brachydanio rerio) NOEC (28 d) 16 mg/L (Oncorhynchus mykiss)	No information available	EC50 (48 h) 6.5 mg/L (Daphnia magna) NOEC (21 d) 0.9 mg/L (Daphnia magna) NOEC (21 d) 0.932 mg/L (Daphnia magna) NOEC (21 d) 2.98 mg/L (Daphnia magna) NOEC (21 d) 0.03 mg/L (Daphnia magna) NOEC (21 d) 0.065 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Inner salt of alkyl amines	Proprietary	Readily biodegradable (>90% @ 28d)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Inner salt of alkyl amines	Proprietary	Log Pow =0.9

12.4. Mobility in soil

Substances	CAS Number	Mobility
Inner salt of alkyl amines	Proprietary	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Follow all applicable community, national or regional regulations regarding waste management methods.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number UN3082
UN proper shipping name: Environmentally Hazardous Substance, Liquid, N.O.S. (Contains Inner salt of alkyl amines)
Transport Hazard Class(es): 9
Packing Group: III
Environmental Hazards: Marine Pollutant

IMDG/IMO

UN Number	UN3082
UN proper shipping name:	Environmentally Hazardous Substance, Liquid, N.O.S. (Contains Inner salt of alkyl amines)
Transport Hazard Class(es):	9
Packing Group:	III
Environmental Hazards:	Marine Pollutant
EMS:	EmS F-A, S-F

IATA/ICAO

UN Number	UN3082
UN proper shipping name:	Environmentally Hazardous Substance, Liquid, N.O.S. (Contains Inner salt of alkyl amines)
Transport Hazard Class(es):	9
Packing Group:	III
Environmental Hazards:	Marine Pollutant

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product does not comply with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 12-Jun-2018

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H318 - Causes serious eye damage
H401 - Toxic to aquatic life
H411 - Toxic to aquatic life with long lasting effects

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

HYDROCHLORIC ACID

Revision Date: 20-Jun-2016 **Revision Number:** 40

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name HYDROCHLORIC ACID

Other means of Identification

Synonyms None

Hazardous Material Number: HM000911

Recommended use of the chemical and restrictions on use

Recommended Use Solvent

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute inhalation toxicity - vapor	Category 3 - H331
Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Substances/mixtures corrosive to metal	Category 1 - H290

Label elements, including precautionary statements

Hazard pictograms

Signal Word Danger

Hazard Statements:
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H331 - Toxic if inhaled
H335 - May cause respiratory irritation

Precautionary Statements

Prevention
P103 - Read label before use
P234 - Keep only in original container
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P390 - Absorb spillage to prevent material damage

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P406 - Store in corrosive resistant container with a resistant inner liner.

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Hydrochloric acid	[redacted]

Other hazards which do not result in classification
Chronic exposure to corrosive fumes/gases may cause erosion of the teeth followed by jaw necrosis. Bronchial irritation with chronic cough and frequent attacks of pneumonia are common. Gastrointestinal disturbances may also be seen
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Hydrochloric acid	[redacted]	30 - 60%	Acute Tox. 3 (H331) Skin Corr. 1A (H314) Eye Corr. 1 (H318)

			STOT SE 3 (H335) Met. Corr. 1 (H290)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation. Harmful if inhaled.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

May form explosive mixtures with strong alkalis. Decomposition in fire may produce harmful gases. Reaction with steel and certain other metals generates flammable hydrogen gas. Do not allow runoff to enter waterways.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Evacuate all persons from the area.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas. Consult local authorities.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Neutralize to pH of 6-8. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from alkalis. Store in a cool well ventilated area. Keep container closed when not in use. Store locked up. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Hydrochloric acid	[redacted]	5 ppm	TWA: 2 ppm (Ceiling)

Appropriate engineering controls
Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Acid gas respirator.

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Butyl rubber gloves. (>= 0.7 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.
Skin Protection Full protective chemical resistant clothing. Rubber boots
Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls Do not allow material to contaminate ground water system

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties
Physical State: Liquid **Color** Clear colorless
Odor: Pungent acrid **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	0.8
Freezing Point / Range	-46 °C
Melting Point / Range	No data available
Boiling Point / Range	110 °C / 230 °F
Flash Point	No data available

Evaporation rate	No data available
Vapor Pressure	26
Vapor Density	No data available
Specific Gravity	1.18
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	36.5
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong alkalis.
10.6. Hazardous decomposition products
Flammable hydrogen gas. Chlorine. Hydrogen sulfide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation. Harmful if inhaled.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrochloric acid	[redacted]	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation	Harmful if inhaled. Causes severe respiratory irritation.
Eye Contact	Causes eye burns
Skin Contact	Causes severe burns. Did not cause sensitization on laboratory animals (guinea pig)
Ingestion	Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Prolonged, excessive exposure may cause erosion of the teeth.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Hydrochloric acid	[redacted]	Causes severe burns Causes severe skin irritation with tissue destruction.

Substances	CAS Number	Serious eye damage/irritation
Hydrochloric acid	[redacted]	Causes severe burns Causes severe eye irritation. Will damage tissue.

Substances	CAS Number	Skin Sensitization
Hydrochloric acid	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Hydrochloric acid	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Hydrochloric acid	[redacted]	Not regarded as mutagenic. In vitro tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Hydrochloric acid	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	Reproductive toxicity
Hydrochloric acid	[redacted]	Embryo and fetotoxicity has been observed in female rats exposed to maternally toxic levels of hydrogen chloride (450 mg/m^3, 1hr.). When tested at maternally toxic doses, no adverse effects on fertility, teratogenicity, or development were observed.

Substances	CAS Number	STOT - single exposure
Hydrochloric acid	[redacted]	May cause respiratory irritation. No information available

Substances	CAS Number	STOT - repeated exposure
Hydrochloric acid	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Hydrochloric acid	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Hydrochloric acid	[redacted]	No information available	LC50 282 mg/L (Gambusia affinis) LC50 20.5 mg/L (Lepomis macrochirus) LC50 (96h) 3.25 – 3.5 (pH) (Lepomis macrochirus)	EC50 (3h) >= 5 and <= 5.5 (pH) (Activated sludge, domestic)	EC50 (48 h) 4.92 mg/L (Daphnia magna)

12.2. Persistence and degradability
The methods for determining biodegradability are not applicable to inorganic substances.

Substances	CAS Number	Persistence and Degradability
Hydrochloric acid	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential
Does not bioaccumulate.

Substances	CAS Number	Log Pow

Hydrochloric acid	[redacted]	LogKow -2.65

12.4. Mobility in soil

Substances	CAS Number	Mobility
Hydrochloric acid	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number	UN1789
UN proper shipping name:	Hydrochloric Acid Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

2R

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

S6

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stolkhom Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply

Basel Convention - Hazardous Waste: Does not apply

16. Other information

Date of preparation or review

Revision Date: 20-Jun-2016

Revision Note
SDS sections updated: 2

Full text of H-Statements referred to under sections 2 and 3
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation
H331 - Toxic if inhaled
H332 - Harmful if inhaled

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

NITROGEN LIQUEFIED

Revision Date: 29-Aug-2017 **Revision Number:** 30

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name NITROGEN LIQUEFIED

Other means of Identification

Synonyms None

Hazardous Material Number: HM001654

Recommended use of the chemical and restrictions on use

Recommended Use Fluid

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Gases under pressure.	Refrigerated liquefied gas - H281

Label elements, including precautionary statements

Hazard Pictograms

Signal Word WARNING

Hazard Statements: H281 - Contains refrigerated gas; may cause cryogenic burns or injury

Precautionary Statements

Prevention	P282 - Wear cold insulating gloves and either face shield or eye protection.
Response	P336 - Thaw frosted parts with lukewarm water. Do no rub affected area P315 - Get immediate medical advice/attention
Storage	P403 - Store in a well-ventilated place
Disposal	None

Contains

Substances	**CAS Number**
Nitrogen	[redacted]

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Nitrogen	[redacted]	60 - 100%	Refrigerated Liquefied Gas Compressed gas (H280)

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, move victim to fresh air and seek medical attention.
Eyes	In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.
Skin	For exposure to liquid, immediately warm frostbite area with warm water (not to exceed 105 F or 41 C). In case of massive exposure, remove clothing while showering with warm water. Get medical attention.
Ingestion	Get immediate medical attention.

Symptoms caused by exposure
Reduces oxygen available for breathing. May cause freeze burns.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Containers may explode (due to the build-up of pressure) when exposed to extreme heat

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions
None known.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store in a cool, dry location. Keep container closed when not in use.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Nitrogen	[redacted]	1000 ppm	:

Appropriate engineering controls
Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
In high concentrations, supplied air respirator or a self-contained breathing apparatus.
Hand Protection Substantial leather work gloves.
Skin Protection Normal work coveralls.
Eye Protection None known.
Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Clear colorless
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	-210 °C
Melting Point / Range	No data available
Boiling Point / Range	-195 °C / -319 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	608
Vapor Density	0.97
Specific Gravity	0.8
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	28
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
None known.
10.6. Hazardous decomposition products
None known.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Reduces oxygen available for breathing. May cause freeze burns.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Nitrogen	[redacted]	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation	Reduces oxygen available for breathing.
Eye Contact	Contact with liquid causes frostbite.
Skin Contact	Contact of material on skin may result in frostbite.
Ingestion	Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Nitrogen	[redacted]	Contact with liquid causes frostbite.

Substances	CAS Number	Serious eye damage/irritation
Nitrogen	[redacted]	Non-irritating to the eye

Substances	CAS Number	Skin Sensitization
Nitrogen	[redacted]	No information available

Substances	CAS Number	Respiratory Sensitization
Nitrogen	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Nitrogen	[redacted]	Not regarded as mutagenic.

Substances	CAS Number	Carcinogenic Effects
Nitrogen	[redacted]	No information available

Substances	CAS Number	Reproductive toxicity
Nitrogen	[redacted]	No information available

Substances	CAS Number	STOT - single exposure
Nitrogen	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Nitrogen	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Nitrogen	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Nitrogen	[redacted]	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Nitrogen	[redacted]	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow

Nitrogen	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Nitrogen	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	UN1977
UN proper shipping name:	Nitrogen, Refrigerated Liquid
Transport Hazard Class(es):	2.2
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	UN1977
UN proper shipping name:	Nitrogen, Refrigerated Liquid
Transport Hazard Class(es):	2.2
Packing Group:	Not applicable
Environmental Hazards:	Not applicable
EMS:	EmS F-C, S-V

IATA/ICAO

UN Number	UN1977
UN proper shipping name:	Nitrogen, Refrigerated Liquid
Transport Hazard Class(es):	2.2
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

2T

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.

New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 29-Aug-2017

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H281 - Contains refrigerated gas; may cause cryogenic burns or injury

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

SOURSCAV®

Revision Date: 04-Mar-2016 **Revision Number:** 24

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name SOURSCAV®

Other means of Identification

Synonyms None

Product Code: HM003675

Recommended use of the chemical and restrictions on use

Recommended Use Hydrogen Sulfide Scavenger

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road
Jandakot
WA 6164
Australia

ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951

Australian Poisons Information Centre

24 Hour Service: - 13 11 26

Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard pictograms

Signal Word Not Hazardous

Hazard Statements Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

Australia Classification
For the full text of the H-phrases mentioned in this Section, see Section 16

Classification Not Classified
Risk Phrases None

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not Applicable

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin Wash with soap and water. Get medical attention if irritation persists.
Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire
Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters
Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid creating and breathing dust. Ensure adequate ventilation.

6.2. Environmental precautions
None known.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid creating or inhaling dust. Avoid contact with eyes, skin, or clothing. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from acids. Store away from oxidizers. Store in a cool, dry location. Keep container closed when not in use. Store away from direct sunlight. Product has a shelf life of 36 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls
Engineering Controls A well ventilated area to control dust levels.

Personal protective equipment (PPE)
Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Dust/mist respirator. (N95, P2/P3)
Hand Protection Normal work gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	Light yellow-green
Odor:	Mild burnt sugar	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	4-5.5
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.73
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers. Strong acids.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide. Metal oxides.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous	NA	No data available	No data available	No data available

substances in concentrations above cut-off values according to the competent authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mild eye irritation.
Skin Contact May cause mild skin irritation.
Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea. May be harmful if swallowed.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity
Product Ecotoxicity Data
No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential
Does not bioaccumulate.

Substances	CAS Number	Log Pow
Contains no hazardous substances in	NA	No information available

concentrations above cut-off values according to the competent authority		

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

UN Number	Not restricted
UN proper shipping name	Not restricted
Transport Hazard Class(es)	Not applicable
Packing Group:	Not applicable
Environmental Hazards	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
EINECS (European Inventory of Existing Chemical Substances)	This product, and all its components, complies with EINECS
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply
Stolkhom Convention - Persistent Organic Pollutants:	Does not apply

Rotterdam Convention - Prior Informed Consent:	Does not apply
Basel Convention - Hazardous Waste:	Does not apply

16. Other information

Date of preparation or review

Revision Date: 04-Mar-2016

Revision Note
SDS sections updated: 2

Full text of R-phrases referred to under Sections 2 and 3
None

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

FlowProfiler Gas Tracer SDS

SAFETY DATA SHEET

Date-Issued: 05-2015
SDS Ref. No: CFT_Aus
Date-Revised: 04-Apr-2019
Revision No:003

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product Identifiers

Product name	:	Chemical Frac Tracer
Product number	:	APW 001, APW 002, APW 003, APW 004, APW 005, APW 006, APW 007, APW 008, APW 009, APW 010, APW 011, APW 012, APW 013, APW 014, APW 015, APW 016, APW 017, APW 018, APW 019, APW 020, APW 021, APW 022, APW 023, APW 024, APW 025, APW 026, APW 027, APW 028, APW 029, APW 030, APW 031, APW 032, APW 033, APW 034, APW 035, APW 036, APW 037, APW 038, APW 039, APW 040, APW 041, APW 042, APW 043, APW 044, APW 045, APW 046, APW 047, APW 048, APW 049, APW 050, APW 051
Generic name	:	APW 001, APW 002, APW 003, APW 004, APW 005, APW 006, APW 007, APW 008, APW 009, APW 010, APW 011, APW 012, APW 013, APW 014, APW 015, APW 016, APW 017, APW 018, APW 019, APW 020, APW 021, APW 022, APW 023, APW 024, APW 025, APW 026, APW 027, APW 028, APW 029, APW 030, APW 031, APW 032, APW 033, APW 034, APW 035, APW 036, APW 037, APW 038, APW 039, APW 040, APW 041, APW 042, APW 043, APW 044, APW 045, APW 046, APW 047, APW 048, APW 049, APW 050, APW 051

1.2 Relevant identified used of the substance or mixture and uses advised against

Identified uses	:	Diagnostic
Uses advised against	:	Not available

1.3 Details of the supplier of the product and safety data sheet

Company	:	ProTechnics Division of Core Laboratories 6510 W. Sam Houston Parkway N. Houston, Texas 77041
Telephone	:	+1 713 328 2320
Email	:	david.trinker@corelab.com

Australia contact information

Company	:	ProTechnics Intenational Division of Core Laboratories 31-35 George St. Thebarton, SA, Australia 5031
Telephone	:	(08) 8152 0244

1.4 Emergency telephone number(s)

Australia Emergency Contact Information

Poisons Information Centre	:	13 11 26 (24 hour)
Ambulance, Fire, Police:		000

U.S. Emergency Contact Information

Emergency phone number	:	+1 713 328 2320
Transportation emergency	:	+1 800 535 5053 (inside US)
	:	+1 352 323 3500 collect (outside US)

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2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS classification in accordance with 29 CFR 1910 (OSHA HCS)
Skin irritation (Category 2), H315
Eye irritation (Category 2), H319
Specific target organ toxicity – single exposure (Category 3), Respiratory system, H335

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word	Warning
Hazard statement(s)	
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
Precautionary statement(s)	
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P280	Wear protective gloves.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340	IF INHALED: Remove affected person into fresh air and keep at rest in a position comfortable for breathing.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

---

3. COMPOSITION / INFORMATION ON INGREDIENTS

3.1 Substances

Substance/ mixture Mixture

Ingredient	CAS/Exempt No	Percent	Hazardous
Proprietary Ingredient supplied as 10% w/v Aqueous Solution	Proprietary	10	No
Water	[redacted]	90	No

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled
Move person into fresh air. If cough or other symptoms develop, consult a physician.

In case of skin contact
Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, consult a physician. Wash contaminated clothing and shoes before reuse.

In case of eye contact
Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, consult a physician.

If swallowed
Wash out mouth with water and keep at rest. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labeling (see Section 2.2) and/or in Section 11.

4.3 Indication of any immediate medical attention and special treatment needed

No data available.

5. FIRE FIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use fire-extinguishing media appropriate for surrounding materials.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, halogenated hydrogen gas.

5.3 Advice for firefighters

As in any fire, wear full protective clothing and equipment.

5.4 Further information

No data available.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours or mist. Evacuate personnel to safe areas.

6.2 Environmental precautions

Do not let product enter drains, if safe to do so.

6.3 Methods and materials for containment and cleanup

Construct temporary dikes of dirt or any appropriate readily available material to prevent spreading of the material. Cover with appropriate absorbent and sweep or shovel into an appropriate container.

6.4 Reference to other sections

For protective clothing, see Section 8. For disposal, see Section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of aerosols. Provide adequate exhaust ventilation at places where aerosols are formed. For precautions, see Section 2.2. Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

7.2 Conditions for safe storage

Keep container tightly closed in a dry, cool, and well-ventilated place. Do not store with, or close to, strong acids.

7.3 Specific end uses(s)

Apart from the uses mentioned in Section 1.2, no other specific uses are stipulated.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
No PELs, TLVs, or OELs for this product or its ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values, nor have they been determined by the manufacturer.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of the workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN166 (EU).

Skin protection
Handle with chemical-resistant gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body protection
Impervious clothing. The type of protective equipment must be selected according to the amount of dangerous substance at the specific workplace.

Control of environmental exposure
Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form:	aqueous liquid
		Color:	translucent
b)	Odor	Odorless	
c)	Boiling point	Approximately 100°C	

d)	Freeze point	0°C
e)	Density	1.05 g/mL
f)	Flash point	Not flammable
g)	pH	Approximately 9
h)	Evaporation factor	Not determined
i)	Solubility	Soluble in water
j)	Vapor pressure	Not determined
k)	Oxidizing properties	Not determined
l)	Vapor density	Not determined
m)	Viscosity	Not determined

9.2 Other safety information

No data available.

10. STABILITY AND REACTIVITY

10.1 Reactivity

Strong acids. Oxidizing materials.

10.2 Chemical stability

The product is stable under normal ambient conditions of temperature and pressure.

10.3 Possibility of hazardous reactions

Will not polymerize.

10.4 Conditions to avoid

Extreme cold.

10.5 Incompatible materials

Strong acids. Oxidizing materials.

10.6 Hazardous decomposition products

None.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity – oral
Based on available data the classification criteria are not met.

Acute toxicity – dermal
Based on available data the classification criteria are not met.

Acute toxicity – inhalation
Based on available data the classification criteria are not met.

Skin corrosion/irritation
Skin irritant 2 – H315 Causes skin irritation.

Serious eye damage/irritation
Eye irritant 2 – H319 May cause severe eye irritation.

Respiratory sensitization
Based on available data the classification criteria are not met.

Skin sensitization
Based on available data the classification criteria are not met.

Germ cell mutagenicity

Genotoxicity – in vitro
Based on available data the classification criteria are not met.

Genotoxicity- in vivo
Based on available data the classification criteria are not met.

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible, or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

Reproductive toxicity – fertility
Based on available data the classification criteria are not met.

Reproductive toxicity – development
Based on available data the classification criteria are not met.

Specific target organ toxicity – single exposure
STOT SE 3 – H335 May cause respiratory irritation.

Specific target organ toxicity – repeated exposure
Based on available data the classification criteria are not met.

Aspiration hazard
Not anticipated to present an aspiration hazard, based on chemical structure.

Additional information
RTECS: Not available.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available.

12.2 Persistence and degradability

Presumed to be persistent.

12.3 Bio-accumulative potential

No data available.

12.4 Mobility in soil

No data available.

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment are not available as chemical safety assessment not required/ not conducted.

12.6 Other adverse effects

No data available.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

Contaminated packaging
Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods.

IMDG
Not dangerous goods.

IATA
Not dangerous goods.

15. REGULATORY INFORMATION

HSNO Regulatory Information: Not available within New Zealand.

Regulatory information is based on U.S. regulations. Globally Harmonized System (GHS) of classification and labelling of chemicals in accordance with U.S. 29 CFR 1910 (OSHA HCS).

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
SAR 311/312: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 311/312.

CERCLA (Comprehensive Response, Compensation, and Liability Act)
Not Applicable.

TSCA (Toxic Substance Control Act)
The components of this product are in compliance with the chemical notification requirements of TSCA.

German Water Endangerment Class
WGK: 1

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16. OTHER INFORMATION

HMIS Rating

Health Hazard:	1
Chronic Health Hazard:	
Flammability:	0
Physical Hazard:	0

NFPA Rating

Health Hazard:	1
Fire Hazard:	0
Reactivity Hazard:	0

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

ProTechnics Division of Core Laboratories
6510 W. Sam Houston Parkway N.
Houston, Texas 77041

Date of revision: 04-Apr-2019

Contact information: +1 713 328 2320

SAFETY DATA SHEET

Date-Issued: 01-2015
SDS Ref. No: APG_Aus
Date-Revised: 04-Apr-2019
Revision No:002

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product Identifiers

Product name	:	Gas Frac Tracer
Product number	:	APG 001, APG 002, APG 003, APG 004, APG 005, APG 006, APG 007, APG 008, APG 009, APG 010, APG 011, APG 012, APG 013, APG 014, APG 015, APG 016
Generic name	:	APG 001, APG 002, APG 003, APG 004, APG 005, APG 006, APG 007, APG 008, APG 009, APG 010, APG 011, APG 012, APG 013, APG 014, APG 015, APG 016

1.2 Relevant identified used of the substance or mixture and uses advised against

Identified uses	:	Diagnostic
Uses advised against	:	Not available

1.3 Details of the supplier of the product and safety data sheet

Company	:	ProTechnics Division of Core Laboratories 6510 W. Sam Houston Parkway N. Houston, Texas 77041
Telephone	:	+1 713 328 2320
Email	:	david.trinker@corelab.com

Australia contact information

Company	:	ProTechnics Intenational Division of Core Laboratories 31-35 George St. Thebarton, SA, Australia 5031
Telephone	:	(08) 8152 0244

1.4 Emergency telephone number(s)

Australia Emergency Contact Information

Poisons Information Centre	:	13 11 26 (24 hour)
Ambulance, Fire, Police:		000

U.S. Emergency Contact Information

Emergency phone number	:	+1 713 328 2320
Transportation emergency	:	+1 800 535 5053 (inside US)
	:	+1 352 323 3500 collect (outside US)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS classification in accordance with 29 CFR 1910 (OSHA HCS)
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Specific target organ toxicity – single exposure (Category 3), Respiratory system, H335

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word	Warning
Hazard statement(s)	
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
Precautionary statement(s)	
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P280	Wear protective gloves.
P280	Wear eye protection/ face protection.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340	IF INHALED: Remove affected person into fresh air and keep at rest in a position comfortable for breathing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION / INFORMATION ON INGREDIENTS

3.1 Substances

Substance/ mixture Substance

Ingredient	CAS/Exempt No	Percent	Hazardous
Proprietary Ingredient	Proprietary	100	No

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled
Move person into fresh air. If cough or other symptoms develop, consult a physician.

In case of skin contact
Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, consult a physician. Wash contaminated clothing and shoes before reuse.

In case of eye contact
Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, consult a physician.

If swallowed
Do NOT induce vomiting. Wash out mouth with water and keep at rest. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labeling (see Section 2.2) and/or in Section 11.

4.3 Indication of any immediate medical attention and special treatment needed

No data available.

5. FIRE FIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Carbon dioxide, dry chemical powder, alcohol or polymer foam.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, halogenated hydrogen gas.

5.3 Advice for firefighters

As in any fire, wear full protective clothing and equipment.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapors, mist, or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleanup

Construct temporary dikes of dirt or any appropriate readily available material to prevent spreading of the material. Collect spillage with an electrically powered vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For protective clothing, see Section 8. For disposal, see Section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapors or mist. Provide adequate exhaust ventilation at places where aerosols are formed. For precautions, see Section 2.2. Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

7.2 Conditions for safe storage

Keep container tightly closed in a dry, cool, and well-ventilated place.

7.3 Specific end uses(s)

Apart from the uses mentioned in Section 1.2, no other specific uses are stipulated.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
No PELs, TLVs, or OELs for this product or its ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values nor have they been determined by the manufacturer.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of the workday. Use general dilution ventilation and/or local exhaust ventilation to control airborne exposures to below relevant Exposure Limits and/or control dust/fume/gas/mist/vapor/spray.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN166 (EU).

Skin protection
Handle with chemical-resistant gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body protection
Impervious clothing. The type of protective equipment must be selected according to the amount of dangerous substance at the specific workplace.

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid Color: colorless
b)	Odor	Odorless.
c)	Boiling point	Not determined.
d)	Freeze point	Not determined.
e)	Density	Not determined.
f)	Flash point	Not determined.
g)	pH	Not determined.
h)	Evaporation factor	Not determined.
i)	Solubility	Not soluble in water.
j)	Vapor pressure	Not determined.
k)	Oxidizing properties	Not determined.
l)	Vapor density	Not determined.
m)	Viscosity	Not determined.
n)	Auto-ignition temperature	Not determined.
o)	Explosive properties	Not determined.
p)	Percent volatile	100 %

9.2 Other safety information

No data available.

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available.

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Will not polymerize.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

Other decomposition products – No data available.
In the event of a fire: see Section 5.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity – oral
Based on available data the classification criteria are not met.

Acute toxicity – dermal
Based on available data the classification criteria are not met.

Acute toxicity – inhalation
Based on available data the classification criteria are not met.

Skin corrosion/irritation
Skin irritant 2 – H315 Causes skin irritation.

Serious eye damage/irritation
Eye irritant 2 – H319 May cause severe eye irritation.

Respiratory sensitization
Based on available data the classification criteria are not met.

Skin sensitization
Based on available data the classification criteria are not met.

Germ cell mutagenicity

Genotoxicity – in vitro
Based on available data the classification criteria are not met.

Genotoxicity- in vivo
Based on available data the classification criteria are not met.

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible, or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

Reproductive toxicity – fertility
Based on available data the classification criteria are not met.

Reproductive toxicity – development
Based on available data the classification criteria are not met.

Specific target organ toxicity – single exposure
STOT SE 3 – H335 May cause respiratory irritation.

Specific target organ toxicity – repeated exposure
Based on available data the classification criteria are not met.

Aspiration hazard
Not anticipated to present an aspiration hazard, based on chemical structure.

Additional information
RTECS: Not available.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available.

12.2 Persistence and degradability

Presumed to be persistent.

12.3 Bio-accumulative potential

No data available.

12.4 Mobility in soil

No data available.

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment are not available as chemical safety assessment not required/ not conducted.

12.6 Other adverse effects

No data available.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods.

IMDG
Not dangerous goods.

IATA
Not dangerous goods.

15. REGULATORY INFORMATION

HSNO Regulatory Information: Not available within New Zealand.

Regulatory information is based on U.S. regulations. Globally Harmonized System (GHS) of classification and labelling of chemicals in accordance with U.S. 29 CFR 1910 (OSHA HCS).

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
SAR 311/312: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 311/312.

CERCLA (Comprehensive Response, Compensation, and Liability Act)
Not Applicable.

TSCA (Toxic Substance Control Act)
The components of this product are in compliance with the chemical notification requirements of TSCA.

German Water Endangerment Class
WGK: 1

16. OTHER INFORMATION

HMIS Rating

Health Hazard:	1
Chronic Health Hazard:	
Flammability:	0
Physical Hazard:	0

NFPA Rating

Health Hazard:	1
Fire Hazard:	0
Reactivity Hazard:	0

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: ProTechnics Environmental Compliance Department

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Contact information: +1 713 328 2320

Date of revision: 04-Apr-2019

SAFETY DATA SHEET

Date-Issued: 04-2019
SDS Ref. No: APFAW_Aus
Date-Revised:
Revision No:000

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product Identifiers

Product name	:	Water Flow Assurance Tracer
Product number	:	APFAW 001 or APFAW 002
Generic name	:	APFAW 001 or APFAW 002

1.2 Relevant identified used of the substance or mixture and uses advised against

Identified uses	:	Diagnostic
Uses advised against	:	Not available

1.3 Details of the supplier of the safety data sheet

Company	:	ProTechnics Division of Core Laboratories 6510 W. Sam Houston Parkway N. Houston, Texas 77041
Telephone	:	+1 713 328 2320
Email	:	david.trinker@corelab.com

Australia contact information

Company	:	ProTechnics International Division of Core Laboratories 31-35 George St. Thebarton, SA, Australia 5031
Telephone	:	(08) 8152 0244

1.4 Emergency telephone number(s)

Australia Emergency Contact Information

Poisons Information Centre	:	13 11 26 (24 hour)
Ambulance, Fire, Police	:	000

U.S. Emergency Contact Information

Emergency phone number	:	+1 713 328 2320
Transportation emergency	:	+1 800 535 5053 (inside US)
	:	+1 352 323 3500 collect (outside US)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute toxicity, Oral (Category 4), H302
Respiratory Sensitization (Category 1)
Skin Sensitization (Category 1)

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word	Warning
Hazard statement(s)	
H302	Harmful if swallowed
Precautionary statement(s)	
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink, or smoke when using this product.
P280	Wear protective gloves.
P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P304 + P340	IF INHALED: Remove affected person into fresh air and keep at rest in a position comfortable for breathing.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

3. COMPOSITION / INFORMATION ON INGREDIENTS

3.1 Substances

Substance/ mixture Substance

Ingredient	CAS/Exempt No	Percent	Hazardous
Proprietary Ingredient	Proprietary	100	No

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled
Move person into fresh air. If cough or other symptoms develop, consult a physician.

In case of skin contact
Remove contaminated clothing including shoes and immediately wash affected area with plenty of soap and water. If irritation continues, consult a physician. Wash contaminated clothing and shoes before reuse.

In case of eye contact
Immediately flush eyes with plenty of water for two to three minutes. Remove any contact lenses and continue flushing for 15 minutes. If irritation continues, consult a physician.

If swallowed
Wash out mouth with water and keep at rest. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labeling (see Section 2.2) and/or in Section 11.

4.3 Indication of any immediate medical attention and special treatment needed

No data available.

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5. FIRE FIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use fire-extinguishing media appropriate for surrounding materials.

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Nitrogen oxides, Sulfur oxides.

5.3 Advice for firefighters

As in any fire, wear full protective clothing and equipment.

5.4 Further information

No data available.

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6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours or mist. Evacuate personnel to safe areas.

6.2 Environmental precautions

Do not let product enter drains, if safe to do so.

6.3 Methods and materials for containment and cleanup

Construct temporary dikes of dirt or any appropriate readily available material to prevent spreading of the material. Cover with appropriate absorbent and sweep or shovel into an appropriate container.

6.4 Reference to other sections

For protective clothing, see Section 8. For disposal, see Section 13.

---

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of aerosols. Provide adequate exhaust ventilation at places where aerosols are formed. For precautions, see Section 2.2. Handle and use in a manner consistent with good industrial/manufacturing techniques and practices.

7.2 Conditions for safe storage

Keep container tightly closed in a dry, cool, and well-ventilated place.

7.3 Specific end uses(s)

Apart from the uses mentioned in Section 1.2, no other specific uses are stipulated.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
No PELs, TLVs, or OELs for this product or its ingredients are listed in the current issue of ACGIH's Guide to Occupational Exposure Values, nor have they been determined by the manufacturer.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of the workday.

Personal protective equipment

Eye/face protection
Safety glasses with side-shields conforming to EN166. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN166 (EU).

Skin protection
Handle with chemical-resistant gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Body protection
Impervious clothing. The type of protective equipment must be selected according to the amount of dangerous substance at the specific workplace.

Control of environmental exposure
Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: Powder Color: White (PRE 1) : Yellow (PRE 2)
b)	Odor	Odorless
c)	Melting range	234 – 236.5°C – (lit.) (PRE 1) : >300°C (PRE 2)
d)	Freeze point	Not determined
e)	Density	1.230 g/cm^3 (PRE 1)
f)	Flash point	Not determined
g)	pH	5.5 – 6.5 at 10 g/L at 20°C (PRE 1) : 7.5 at 10g/L (PRE 2)
h)	Evaporation factor	Not determined
i)	Solubility	18.7 g/L at 16°C (PRE 1) : Soluble (PRE 2)
j)	Vapor pressure	15 mmHg at 89°C (PRE 1)
k)	Oxidizing properties	Not determined

l)	Vapor density	Not determined
m)	Viscosity	Not determined

9.2 Other safety information

No data available.

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available.

10.2 Chemical stability

The product is stable under normal ambient conditions of temperature and pressure.

10.3 Possibility of hazardous reactions

Will not polymerize.

10.4 Conditions to avoid

No data available.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

None.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity – oral
(PRE 1) LD_{50} Oral – rat – male and female – 367.7 mg/kg
(OECD Test Guideline 401)

(PRE 2) LD_{50} Oral – rat – male and female – 12750 mg/kg
(OECD Test Guideline 401)

Acute toxicity – inhalation
(PRE 1) LC_{50} Inhalation – rat – male and female – 4.94 mg/L
(OECD Test Guideline 401)

Acute toxicity – dermal
(PRE 1) LD_{50} Inhalation – rat – male and female – > 2,000 mg/kg
(OECD Test Guideline 401)

Skin corrosion/irritation
Skin irritant 2 – H315 Causes skin irritation.

Serious eye damage/irritation
Eye irritant 2 – H319 May cause severe eye irritation.

Respiratory sensitization
Based on available data the classification criteria are not met.

Skin sensitization
Based on available data the classification criteria are not met.

Germ cell mutagenicity

Genotoxicity – in vitro
Based on available data the classification criteria are not met.

Genotoxicity- in vivo
Based on available data the classification criteria are not met.

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible, or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

Reproductive toxicity – fertility
Based on available data the classification criteria are not met.

Reproductive toxicity – development
Based on available data the classification criteria are not met.

Specific target organ toxicity – single exposure
STOT SE 3 – H335 May cause respiratory irritation.

Specific target organ toxicity – repeated exposure
Based on available data the classification criteria are not met.

Aspiration hazard
Not anticipated to present an aspiration hazard, based on chemical structure.

Additional information
RTECS: EV64750000

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

No data available.

12.2 Persistence and degradability

Presumed to be persistent.

12.3 Bioaccumulative potential

No data available.

12.4 Mobility in soil

No data available.

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment are not available as chemical safety assessment not required/ not conducted.

12.6 Other adverse effects

No data available.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Dispose of at a supervised appropriate waste disposal facility according to current applicable laws and regulations and product characteristics at time of disposal.

Contaminated packaging
Contaminated containers should be cleaned and disposed of in the same manner as the product in accordance with applicable regulations.

14. TRANSPORT INFORMATION

Pre 1 **DOT (US)**

UN-No	UN1544
Hazard Class	6.1
Packing Group	III

IMDG

UN-No	UN1544
Hazard Class	6.1
Packing Group	III

IATA

UN-No	UN1544
Hazard Class	6.1
Packing Group	III

15. REGULATORY INFORMATION

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

CERCLA (Comprehensive Response, Compensation, and Liability Act)
Not Applicable.

TSCA (Toxic Substance Control Act)
The components of this product are in compliance with the chemical notification requirements of TSCA.

16. OTHER INFORMATION

HMIS Rating

Health Hazard:	2
Chronic Health Hazard:	*
Flammability:	1
Physical Hazard:	1

NFPA Rating

Health Hazard:	2
Fire Hazard:	1
Reactivity Hazard:	1

MANUFACTURER DISCLAIMER: Information given herein is offered in good faith as accurate, but without guarantee. Conditions of use and suitability of the product for particular uses are beyond our control; all risks of use of the product are therefore assumed by the user. Nothing is intended as a recommendation for uses which infringe valid patents or as extending license under valid patents. Appropriate warnings and safe handling procedures should be provided to handlers and users.

Prepared by: **ProTechnics Environmental Compliance Department**

ProTechnics Division of Core Laboratories
6510 W. Sam Houston Parkway N.
Houston, Texas 77041

Date of creation: 04-Apr-2019

Contact information: 713-328-2320

Appendix D.2 May 2021 Safety Data Sheets

SDS no. U028
Version 5
Revision date 08-Jun-2018
Supersedes Date: 03-Jun-2014

Safety Data Sheet
Gelling Agent U28 - 30% Active

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Gelling Agent U28 - 30% Active
Product code U028

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a gelling agent in oilfield applications

Uses advised against No information available

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 1 Subcategory 1A

Environmental hazards Not classified

Physical Hazards

Substances/mixtures corrosive to metal	Category 1

2.2 Label elements

Signal word
DANGER

Hazard Statements
H314 - Causes severe skin burns and eye damage
H290 - May be corrosive to metals

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves and eye/face protection
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

Supplementary precautionary statements
P234 - Keep only in original container
P264 - Wash face, hands and any exposed skin thoroughly after handling
P363 - Wash contaminated clothing before reuse
P310 - Immediately call a POISON CENTER or doctor/physician
P390 - Absorb spillage to prevent material damage
P220 - Keep/Store away from combustible materials

Sodium hydroxide

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Sodium hydroxide	215-185-5	[redacted]	30

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Do NOT induce vomiting. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person. Immediate medical attention is required.

Skin contact Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.

Eye Contact Get immediate medical attention. Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye.

4.2. Most important symptoms and effects, both acute and delayed

General advice Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Contact with metals may evolve flammable hydrogen gas.

Hazardous combustion products
Fire or high temperatures create: Heating or fire can release toxic gas.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 2R

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Do not get on skin or clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin or on clothing. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Store between 15-25 deg. C (59-77 deg. F) Avoid extreme temperatures Store away from incompatibles, Strong acids Halogenated compounds Metals
Storage class	Corrosive storage.
Packaging materials	High density polyethylene (HDPE) drum or can

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.

, Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium hydroxide	Not determined	2 mg/m³ Peak	2 mg/m³ Ceiling
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium hydroxide	2 mg/m³ Ceiling	2 mg/m³ Ceiling	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium hydroxide	Not determined	2.0 mg/m³ STEL	2 mg/m³ Ceiling
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium hydroxide	2 mg/m³ Ceiling	2 mg/m³ TWA	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium hydroxide	2 mg/m³ TWA	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles / Face-shield

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Wear protective nitrile rubber gloves
Break through time >480 minutes
Glove thickness 0.35-0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Chemical respirator with inorganic vapour cartridge (Grey B). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Odorless
Color	Colorless
Odor threshold	Not applicable

Property	Values	Remarks
pH	13.5	
pH @ dilution	No information available	
Melting / freezing point	8 °C / 46 °F	
Boiling point/range	115 °C / 239 °F	
Flash point		
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.3	@20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	Not applicable	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	75 mPa s	@ 20 °C
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Corrosive.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid extreme temperatures. Store at ambient conditions.

10.5 Incompatible materials

Strong acids. Halogenated compounds. Metals. Gives off hydrogen by reaction with metals.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information Causes severe skin burns and eye damage.

Inhalation Inhalation of corrosive fumes/gases may cause coughing, choking, headache, dizziness, and weakness for several hours. Pulmonary edema may occur with tightness in the chest, shortness of breath, bluish skin, decreased blood pressure, and increased heart rate.

Eye contact Causes burns. Causes serious eye damage.

Skin contact Corrosive. Causes burns.

Ingestion Can burn mouth, throat, and stomach.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium hydroxide	No data available	1350 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Skin contact. Eye contact.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium hydroxide	= 45.4 mg/L LC50 Oncorhynchus mykiss 96 h	No information available	No information available

12.2 Persistence and degradability

This product is expected to be readily biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of as special waste in compliance with local and national regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN1824
UN No. (IMDG/ANTAQ)	UN1824
UN No. (ICAO/ANAC)	UN1824

14.2. UN proper shipping name
SODIUM HYDROXIDE SOLUTION,

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	8
IMDG/ANTAQ Hazard class	8
ICAO/ANAC Hazard class/division	8

14.4 Packing group

ADR/RID/ADN/ADG Packing group	PG II
IMDG/ANTAQ Packing group	PG II
ICAO/ANAC Packing group	PG II

14.5 Environmental hazard
No

14.6 Special precautions

Hazard identification no (ADR)	80
EmS (IMDG)	F-A, S-B

Emergency Action Code (EAC)	2R
Tunnel restriction code	(E)
Hazchem code ADG	2R

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Sodium hydroxide
Schedule 6
Schedule 5

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	03-Jun-2014
Revision date	08-Jun-2018
Version	5
This SDS has been revised in the following section(s)	1, 2, 8, 11, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3
Flammability	0
Physical hazard	1
PPE	X

Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. B499
Version 1
Revision date 10-Jun-2016
Supersedes date None

Safety Data Sheet
Natural Corrosion Inhibitor B499

1. Identification of the substance/preparation and of the Company/undertaking

1.1 Product identifier

Product name Natural Corrosion Inhibitor B499
Product code B499

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a fracturing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards identification

2.1 Classification of the substance or mixture

Classification according to (EC) No. 1272/2008

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary Statements - EU (§28, 1272/2008)

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

-

Contains

2.3 Other data

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

3.2 Mixtures

Not Applicable

4. First aid measures

4.1 First-Aid Measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Get medical attention if any discomfort continues.

4.2 Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Main symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which shall not be used for safety reasons
None known.

5.2 Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create:, Carbon oxides (COx), Nitrogen oxides (NOx), Hydrogen cyanide (hydrocyanic acid), Thermal decomposition can lead to release of toxic and corrosive gases/vapors.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and materials for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Use non-sparking tools and equipment. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition.

Hygiene measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid heat, flames and other sources of ignition.
Storage class	Chemical storage.
Packaging material	Use specially constructed containers only.

7.3 Specific end uses

See Section 1.2.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust.

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering measures to reduce exposure
Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed.

Personal protective equipment

Eye protection	Safety glasses with side-shields. Tightly fitting safety goggles.
Hand protection	Repeated or prolonged contact:, Use protective gloves made of:, Butyl, Nitrile, Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
Hygiene measures	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Flakes Powder
Odor	Odorless
Color	Off-white
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution		
Melting/freezing point	260-280 °C / 500-536 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.5 - 0.7	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	500 °C / 932 °F	
Decomposition temperature	400 C	

Kinematic viscosity	No information available
Dynamic viscosity	No information available
Log Pow	No information available

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

10. Stability and reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not Applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Skin contact. Inhalation. Eye contact.
Routes of entry	No route of entry noted.
Specific target organ toxicity (single exposure)	Not classified
Specific target organ toxicity (repeated exposure)	Not classified.
Aspiration hazard	Not Applicable.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
No product level data available.

Toxicity to fish
No product level data available.

Toxicity to daphnia and other aquatic invertebrates
No product level data available.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility in soil

Mobility
The product is miscible with water. May spread in water systems.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.
EWC Waste disposal No.	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: Waste Code: 16 03 06 - organic wastes other than those mentioned in 16 03 05 01 04 10 – dusty and powdery wastes other than those mentioned in 01 04 07,

14. Transport information

14.1 UN Number
Not regulated

14.2 Proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG Hazard class	Not regulated
ICAO Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG Packing group	Not regulated
ICAO Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions

Not Applicable

Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No Poisons Schedule number allocated

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for transport by road or rail.

International inventories

USA (TSCA)	Complies
European Union (EINECS and ELINCS)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

15.2 Chemical Safety Report

No information available

16. Other information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel

Revision date	10-Jun-2016
Version	1
The following sections have been revised:	New issue.

Full text of H-Statements referred to under sections 2 and 3

This product is not classified as hazardous therefore no (H) hazard statements assigned.

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. F112
Version 3
Revision date 15-Aug-2018
Supersedes Date: 07-May-2018

Safety Data Sheet
Surfactant F112

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Surfactant F112
Product code F112

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Surfactant in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2

Environmental hazards

Chronic aquatic toxicity	Category 3

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P273 - Avoid release to the environment
P280 - Wear protective gloves and eye/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P391 - Collect spillage
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P337 + P313 - If eye irritation persists: Get medical advice/attention
P264 - Wash face, hands and any exposed skin thoroughly after handling
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse

Contains
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-

Dicoco dimethyl quaternary ammonium chloride

Propan-2-ol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Inhalation of vapors in high concentration may cause irritation of respiratory system

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	500-077-5	[redacted]	10-<20
Dicoco dimethyl quaternary ammonium chloride	263-087-6	[redacted]	0.5-<1.0
Propan-2-ol	200-661-7	[redacted]	0.1-<0.25

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion If swallowed, call a poison control center or doctor immediately. Do NOT induce vomiting. If conscious, drink plenty of water.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Get immediate medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Extinguish with carbon dioxide, dry chemical, foam or waterspray.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors Carbon oxides (COx), Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 3Z

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Wear suitable protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13). After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin or on clothing. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands before eating, drinking or smoking Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Not determined	Not determined	Not determined
Dicoco dimethyl quaternary ammonium chloride	Not determined	Not determined	Not determined
Propan-2-ol	500 ppm STEL 1230 mg/m³ STEL 400 ppm TWA 983 mg/m³ TWA	500ppmSTEL 1230mg/m³STEL 400ppmTWA 983mg/m³TWA	500 ppm STEL 1230 mg/m³ STEL 400 ppm TWA 983 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Not determined	Not determined	Not determined
Dicoco dimethyl quaternary ammonium chloride	Not determined	Not determined	Not determined
Propan-2-ol	Not determined	400 ppm TWA 983 mg/m³ TWA 500 ppm STEL 1230 mg/m³ STEL	200 ppm ACL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Not determined	Not determined	Not determined
Dicoco dimethyl quaternary ammonium chloride	Not determined	Not determined	Not determined
Propan-2-ol	10 mg/m³ MAC	1225 mg/m³ STEL 500 ppm STEL	500 ppm STEL 1230 mg/m³ STEL 400 ppm TWA 983 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Not determined	Not determined	Not determined
Dicoco dimethyl quaternary ammonium chloride	Not determined	Not determined	Not determined
Propan-2-ol	400 ppm TWA 983 mg/m³ TWA	400 ppm TWA 980 mg/m³ TWA	50 mg/m³ STEL 10 mg/m³ TWA
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Not determined	Not determined	Not determined
Dicoco dimethyl quaternary ammonium chloride	Not determined	Not determined	Not determined
Propan-2-ol	400 ppm TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment
Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Tightly

	fitting safety goggles
Hand protection	Impervious gloves made of: Nitrile or Butyl Break through time >480 minutes Glove thickness 0.5 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor/acid gas protection (E, yellow) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Alcohol
Color	Clear Yellow
Odor threshold	Not applicable

Property	Values	Remarks
pH	9-11	
pH @ dilution	No information available	Not applicable
Melting / freezing point	5 °C / 41 °F	
Boiling point/range	~ 100 °C / 212 °F	
Flash point	> 93.3 °C / > 199.4 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.99 - 1.03 g/cm^3	@ 20 °C
Bulk density	No information available	
Relative density	~ 1.0	@ 20°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	5-50 mPa s	@ 16 °C
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	< 1
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	Causes serious eye irritation.
Skin contact	Causes skin irritation.
Ingestion	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation

Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	LD50: 1250 mg/kg, rat, (based on data from similar substance)	LD50: > 2000 mg/kg, rat, (based on data from similar component)	No data available
Dicoco dimethyl quaternary ammonium chloride	= 960 mg/kg (Rat)	LD50 > 2930 mg/kg, rabbit	No data available
Propan-2-ol	= 1870 mg/kg (Rat)	= 4059 mg/kg (Rabbit)	= 72600 mg/m³ (Rat) 4 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Eye contact. Skin contact. Inhalation.

Routes of entry Eye contact. Skin contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Harmful to aquatic life with long lasting effects

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	LC50 96h, Brachydanio rerio (zebrafish): > 100 mg/l (test based on similar component)	EC50, 72h: > 100 mg/kg (based on similar substance)	EC50, 48h, Daphnia magna (Water flea): > 100 mg/l (based on similar product)
Dicoco dimethyl quaternary ammonium chloride	No information available	No information available	EC50, 48h, Daphnia : 0.01 mg/l
Propan-2-ol	> 1400000 µg/L LC50 Lepomis macrochirus 96 h = 11130 mg/L LC50 Pimephales promelas 96 h = 9640 mg/L LC50 Pimephales promelas 96 h	> 1000 mg/L EC50 Desmodesmus subspicatus 96 h > 1000 mg/L EC50 Desmodesmus subspicatus 72 h	= 13299 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Product is biodegradable.

Chemical Name	Persistence and degradability
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Readily biodegradable
Dicoco dimethyl quaternary ammonium chloride	No information available
Propan-2-ol	Readily biodegradable

12.3 Bioaccumulative potential

Does not bioaccumulate.

Chemical Name	Bioaccumulation
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Not likely to bioaccumulate
Dicoco dimethyl quaternary ammonium chloride	No information available
Propan-2-ol	No bioaccumulation potential

12.4 Mobility

Mobility
Soluble in water.

Chemical Name	Mobility
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Miscible in water
Dicoco dimethyl quaternary ammonium chloride	Soluble in water
Propan-2-ol	Soluble in water

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	No information available
Dicoco dimethyl quaternary ammonium chloride	No information available
Propan-2-ol	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable
Hazchem code ADG 3Z

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	07-May-2018
Revision date	15-Aug-2018
Version	3
This SDS has been revised in the following section(s)	2, 12, 14, 16 There have been changes with regard to classification.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2
Flammability	1
Physical hazard	0
PPE	X

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The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.
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Safety Data Sheet
Hydrochloric Acid 15% H15

1. Identification of the substance/preparation and of the Company/undertaking

1.1 Product identifier

Product name	Hydrochloric Acid 15% H15
Product code	H015
Norway Pr. no.	17101
Denmark Pr. no.	1088965

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use	Used as an acidizing additive in oilfield applications
Uses advised against	Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield UK PLC
Victory House, Churchill Court
Manor Royal, Crawley
West Sussex RH10 9LU
+ 47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

Denmark	Poison Control Hotline (DK): +45 82 12 12 12
Netherlands	National Poisons Information Centre (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
Norway	Poison information centre: +47 22 59 13 00

2. Hazards Identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Health hazards

Skin corrosion/irritation	Category 1 Subcategory 1B
Serious eye damage/eye irritation	Category 1
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards Not classified

Physical Hazards

Substances/mixtures corrosive to metal	Category 1

2.2 Label elements

Signal word
DANGER

Hazard statements
H314 - Causes severe skin burns and eye damage
H335 - May cause respiratory irritation
H290 - May be corrosive to metals

Precautionary Statements - EU (§28, 1272/2008)
P260 - Do not breathe dust/fume/gas/mist/vapours/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/ physician
P406 - Store in corrosive resistant/ . container with a resistant inner liner

Supplementary precautionary statements
P234 - Keep only in original container
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P362 - Take off contaminated clothing and wash before reuse
P390 - Absorb spillage to prevent material damage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/container in accordance with local regulations.

-

Contains
Hydrochloric acid

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%	Classification according to 67/548/EEC	Regulation (EC) No 1272/2008	REACH registration number
Hydrochloric acid	231-595-7	[redacted]	15	-	Skin Corr. 1A (H314) STOT SE 3 (H335) Met. Corr.1 (H290) Note B	01-2119484862-27-xxxx

Comments
The product contains other ingredients which do not contribute to the overall classification.
Note B: Some substances (acids, bases, etc.) are placed on the market in aqueous solutions at various concentrations and, therefore, these solutions require different classification and labelling since the hazards vary at different concentrations.

4. First aid measures

4.1 First Aid

Inhalation Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Seek medical attention at once.

Ingestion Do NOT induce vomiting. Get immediate medical attention. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person.

Skin contact Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.

Eye contact Remove contact lenses. Immediately flush eyes with water for 15 minutes while holding eyelids open. Immediate medical attention is required.

4.2 Most important symptoms and effects, both acute and delayed

General advice Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Main symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media
The product itself does not burn, Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2 Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Contact with metals may evolve flammable hydrogen gas.

Hazardous combustion products
Fire or high temperatures create: Chlorine, chlorine oxides, hydrogen chloride.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Do not get on skin or clothing. Wash thoroughly after handling. Do not breathe vapours or spray mist. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment

Prevent further leakage or spillage if safe to do so. Dyke far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

6.4 Reference to other sections

See section 13 for more information.

7. Handling and storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene measures
Use good work and personal hygiene practices to avoid exposure Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Use only in area provided with appropriate exhaust ventilation. Keep airborne concentrations below exposure limits. Keep away from heat.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid excessive heat for prolonged periods of time. Store away from incompatibles, Strong oxidising agents Alkalis Metals

Storage class Corrosive storage.

Packaging materials Use specially constructed containers only

7.3 Specific end uses

See Section 1.2.

8. Exposure controls/personal protection

8.1 Control parameters

Chemical Name	EU OEL - Third List	Austria	Australia	Denmark
Hydrochloric acid	10 ppm STEL 15 mg/m³ STEL 5 ppm TWA 8 mg/m³ TWA	10 ppm STEL 15 mg/m³ STEL 5 ppm TWA 8 mg/m³ TWA	Not determined	5 ppm Ceiling 8 mg/m³ Ceiling
Chemical Name	**Malaysia**	**France**	**Germany**	**Hungary**
Hydrochloric acid	5 ppm Ceiling 7.5 mg/m³ Ceiling	5ppmSTEL 7.6mg/m³STEL	2 ppm TWA 3.0 mg/m³ TWA	8mg/m³TWA 16mg/m³STEL
Chemical Name	**New Zealand**	**Italy**	**Netherlands**	**Norway**
Hydrochloric acid	5 ppm Ceiling 7.5 mg/m³ Ceiling	Not determined	8 mg/m³ GW	5 ppm Ceiling; 7 mg/m³ Ceiling
Chemical Name	**Poland**	**Portugal**	**Romania**	**Russia**
Hydrochloric acid	10 mg/m³ STEL NDSCh	10 ppm STEL VLE-CD	10ppmSTEL	Acute dangerous

	5 mg/m³ TWA NDS	15 mg/m³ STEL VLE-CD 5 ppm TWA indicative limit value 8 mg/m³ TWA indicative limit value	15mg/m³STEL 5ppmTWA 8mg/m³TWA	substance 5 mg/m³ MAC
Chemical Name	**Spain**	**Switzerland**	**Turkey**	**UK**
Hydrochloric acid	10 ppm STEL 15 mg/m³ STEL 5 ppm TWA VLA-ED 7.6 mg/m³ TWA VLA-ED	4 ppm STEL 6 mg/m³ STEL 2 ppm TWA MAK 3.0 mg/m³ TWA MAK	10 ppm STEL 15 mg/m³ STEL 5 ppm TWA 8 mg/m³ TWA	5 ppm STEL aerosol mist and gas 8 mg/m³ STEL aerosol mist and gas 1 ppm TWA aerosol mist and gas 2 mg/m³ TWA aerosol mist and gas

Derived No Effect Level (DNEL)

Short term exposure local effects

Hydrochloric acid

Inhalation 15 mg/m³

Long term exposure local effects

Hydrochloric acid

Inhalation 8 mg/m³

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering measures to reduce exposure

Ensure adequate ventilation. Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection Eye protection must conform to standard EN 166. Chemical splash goggles and face shield.

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Use protective gloves made of: Butyl Rubber Nitrile Viton
Break through time >480 minutes
Glove thickness 0.5 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Respirator with combination filter for vapour/particulate (EN 141), Type E/P2, At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

Hygiene measures Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odour	Pungent
Colour	Colourless
Odour threshold	No information available

Property	Values	Remarks
pH	< 2	
pH @ dilution		
Melting / freezing point	< 0 °C / 32 °F	
Boiling point/range	~100 °C / 212 °F	
Flash point	Not applicable	
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	31.33 hPa (@ 20°C)	
Vapour density	1.267	
Specific gravity	1.1	@ 16 °C
Bulk density	No information available	
Relative density	1.161 - 1.19 g/cm³	@ 20 °C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	1 mPa.s (@ 20 °C)	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidising properties	None known

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

10. Stability and reactivity

10.1 Reactivity

Corrosive. Corrosive to Metals. Contact with metals may evolve flammable hydrogen gas.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerisation
Hazardous polymerisation does not occur.

10.4 Conditions to avoid

Avoid excessive heat for prolonged periods of time.

10.5 Incompatible materials

Strong oxidising agents. Alkalis. Metals.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Vapours are corrosive. After 24-36 hours, injured persons may develop serious shortness of breath and lung oedema. Vapours irritate the respiratory system, and may cause coughing and difficulties in breathing.

Eye contact Causes serious eye damage.

Skin contact Causes severe skin burns.

Ingestion Ingestion causes burns of the upper digestive and respiratory tracts.

Unknown acute toxicity Not applicable.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrochloric acid	238 - 277 mg/kg (Rat)	> 5010 mg/kg (Rabbit)	= 1.68 mg/L (Rat) 1 h

Sensitisation This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	Inhalation. Skin contact. Eye contact.
Specific target organ toxicity - Single exposure	Category 3
Specific target organ toxicity - Repeated exposure	Not classified.
Target organ effects	Respiratory system.
Aspiration hazard	Not applicable.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Hydrochloric acid	= 282 mg/L LC50 Gambusia affinis 96 h	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility in soil

Mobility
Soluble in water.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of as hazardous waste in compliance with local and national regulations.
Contaminated packaging	Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.
EWC Waste Disposal No	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 7131 Inorganic Acids 16 03 03 - inorganic wastes containing dangerous substances

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN 1789
UN No. (IMDG)	UN 1789
UN No. (ICAO)	UN 1789

14.2. UN proper shipping name
HYDROCHLORIC ACID SOLUTION 15%

14.3. Hazard class(es)

ADR/RID/ADN/ADG Hazard class	8
IMDG Hazard class	8
ICAO Hazard class/division	8

14.4 Packing group

ADR/RID/ADN/ADG Packing Group	III
IMDG Packing group	III

ICAO Packing group III

14.5 Environmental hazard
No

14.6 Special precautions

Hazard ID	80
EmS (IMDG)	F-A, S-B
Emergency Action Code (EAC)	2R
Tunnel restriction code	(E)

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Germany, Water Endangering Classes (VwVwS)	Hazardous to water/Class 1

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Hydrochloric acid
Schedule 6
Schedule 5

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

15.2 Chemical Safety Report

No information available

16. Other information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supercedes date	19/Apr/2016
Revision date	31/Mar/2017
Version	3
This SDS has been revised in the following section(s)	All sections There have been changes with regard to classification.

Text of R phrases mentioned in Section 3
R34 - Causes burns
R37 - Irritating to respiratory system

Full text of H-Statements referred to under sections 2 and 3

H314 - Causes severe skin burns and eye damage
H335 - May cause respiratory irritation
H290 - May be corrosive to metals

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. J218
Version 5
Revision date 09-Aug-2018
Supersedes Date: 08-Sep-2017

Safety Data Sheet
Breaker J218

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Breaker J218
Product code J218

CAS No [redacted]
EC No 231-786-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a fracturing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

Croatia	01-23-48-342(for medical information) -Center for Poison

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2A
Respiratory sensitization	Category 1
Skin sensitization	Category 1
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards Not classified

Physical Hazards

Oxidizing Solids	Category 3

2.2 Label elements

Signal word
DANGER

Hazard Statements
H302 - Harmful if swallowed
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H319 - Causes serious eye irritation
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 - May cause respiratory irritation
H272 - May intensify fire; oxidizer

Precautionary statements
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P304 + P341 - IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing
P342 + P311 - If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician
P280 - Wear protective gloves and eye/face protection

Supplementary precautionary statements
P220 - Keep away from clothing and other combustible materials
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P285 - In case of inadequate ventilation wear respiratory protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P330 - Rinse mouth
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P337 + P313 - If eye irritation persists: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/ container to an approved waste disposal plant
P410 - Protect from sunlight
P411 + P235 - Store at temperatures not exceeding 38 °C/ 100 °F. Keep cool
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable
P370 + P378 - In case of fire: Use water spray to extinguish

Contains
Diammonium peroxidisulphate

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Do not expose materials or their containers to moisture.

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Diammonium peroxidisulphate	231-786-5	[redacted]	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get immediate medical attention.

Ingestion Rinse mouth. Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Get immediate medical attention.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention.

Eye Contact Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Get immediate medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Deluge with water. Other methods not effective.

Extinguishing media which must not be used for safety reasons
Dry chemical, carbon dioxide and other gas-filled extinguishers.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
May intensify fire; oxidizer.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors Sulfur oxides, Oxygen, Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 1Z

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Do not breathe dust. Avoid contact with the skin and the eyes.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Spilled oxidizer must be removed immediately and isolated for disposal. Isolated material must be monitored for signs of decomposition (fuming/smoking). If spilled material is wet, dissolve with large quantity of water. All disposals must be carried out at the earliest opportunity and in accordance with local /regional /national /international regulations. Take up mechanically and collect in suitable container for disposal. Use non-sparking tools and equipment. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Do not handle until all safety precautions have been read and understood. Handle in accordance with good industrial hygiene and safety practice. Follow procedures for safe handling of oxidizers. Do not expose materials or their containers to moisture. Keep away from open flames, hot surfaces and sources of ignition. Avoid handling causing generation of dust. Avoid contact with skin and eyes. May produce an allergic reaction.

Hygiene Measures
Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing When using do not smoke, eat or drink.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Oxidizers must be stored separately from all other materials. Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Keep away from direct sunlight. Keep at a temperature not exceeding 110 °F /43 °C Keep away from open flames,

hot surfaces and sources of ignition Oxidizing material - Keep away from flammable and combustible materials. Store away from incompatible materials Oxidizing agents Reducing Agents Acids

Storage class Oxidiser storage.

Packaging materials Use specially constructed containers only.

Packaging materials to be avoided Containers made of MONEL, copper, brass, or iron.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Control as an ACGIH particulate not otherwise specified (PNOS): 10 mg/m³ (Inhalable); 3 mg/m³ (Respirable) and an OSHA particulate not otherwise regulated (PNOR): 15 mg/m³ (Total); 5 mg/m³ (Respirable).

Component Information

Chemical Name	Arabic	Australia	Egypt
Diammonium peroxidisulphate	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Diammonium peroxidisulphate	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Diammonium peroxidisulphate	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Diammonium peroxidisulphate	0.1 mg/m³ TWA	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Diammonium peroxidisulphate	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will

vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Do not wear rings, watches or anything similar which can retain the product and may give rise to skin conditions. Wear protective butyl rubber gloves Break through time >480 minutes Glove thickness 2 mm Frequent change is advisable
Respiratory protection	Use the indicated respiratory protection if the occupational exposure limit is exceeded and/or in case of product release (dust) Effective dust mask. Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Crystalline
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	4 - 5 @10 g/l	
Melting / freezing point	120 °C / 249 °F	
Boiling point/range	No information available	
Flash point		
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	

Vapor density	No information available	
Specific gravity	No information available	
Bulk density	1000 Kg/m³	
Relative density	1.26 g/cm³	@ 20°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	120 °C / 249 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	Strong oxidizer. Contact with other material may cause fire

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

This product is a strong oxidizer and reacts violently with combustibles and reducing agents.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid contamination. Avoid dust formation. Protect from moisture. Keep away from direct sunlight. Keep at a temperature not exceeding 110 °F /43 °C. Keep away from open flames, hot surfaces and sources of ignition. Oxidizing material - Keep away from flammable and combustible materials.

10.5 Incompatible materials

Do not mix oxidizers of any concentration with other oxidizing agents, reducing agents, flammable or combustible liquids or solids, acids, most metals and heavy metals, oxygen scavengers, corrosion inhibitors, surfactants, gelling agents, fluid-loss additives, cross linkers, solvents, foaming agents, clay control agents, or any chemical not specifically mentioned as being compatible with the specific oxidizer.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information May produce an allergic reaction.

Inhalation May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause irritation of respiratory tract.

Eye contact Causes serious eye irritation.

Skin contact Irritating to skin. May cause an allergic skin reaction.

Ingestion Harmful if swallowed.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Diammonium peroxidisulphate	700-742 mg/kg (Rat)	> 2000 mg/kg (Rat)	No data available

Sensitization May cause sensitization by inhalation and skin contact.

Mutagenic effects This substance has no evidence of mutagenic properties.

Carcinogenicity This substance has no evidence of carcinogenic properties.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation. Skin contact. Eye contact.

Routes of entry Inhalation. Ingestion. Skin contact.

Specific target organ toxicity - Single exposure Category 3

Specific target organ toxicity - Repeated exposure Not classified.

Target organ effects Respiratory system.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Diammonium peroxidisulphate	= 76.3 mg/L LC50 Oncorhynchus mykiss 96 h	= 136 mg/l EC50 Phaenodactylum tricornutum 72h	= 120 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Do not re-use empty containers. Dispose of contents/container to an approved waste disposal plant.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN 1444
UN No. (IMDG/ANTAQ)	UN 1444
UN No. (ICAO/ANAC)	UN 1444

14.2. UN proper shipping name
AMMONIUM PERSULFATE,

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	5.1
IMDG/ANTAQ Hazard class	5.1
ICAO/ANAC Hazard class/division	5.1

14.4 Packing group

ADR/RID/ADN/ADG Packing group	PG III
IMDG/ANTAQ Packing group	PG III
ICAO/ANAC Packing group	PG III

14.5 Environmental hazard

Marine pollutant
No

14.6 Special precautions

Hazard identification no (ADR)	50
EmS (IMDG)	F-A, S-Q
Tunnel restriction code	(E)
Hazchem code ADG	1Z

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Not applicable

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Diammonium peroxidisulphate
Schedule 6

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	08-Sep-2017
Revision date	09-Aug-2018
Version	5
This SDS has been revised in the following section(s)	2, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2
Flammability	1
Physical hazard	2
PPE	X

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SDS no. J475
Version 4
Revision date 31-Aug-2017
Supersedes Date: 21-Aug-2017

Safety Data Sheet
EB-Clean* J475 Breaker

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name EB-Clean* J475 Breaker
Product code J475

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a fracturing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2
Respiratory sensitization	Category 1
Skin sensitization	Category 1
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards Not classified

Physical Hazards

Oxidizing Solids	Category 3

2.2 Label elements

Signal word
DANGER

Hazard Statements
H302 - Harmful if swallowed
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H319 - Causes serious eye irritation
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 - May cause respiratory irritation
H272 - May intensify fire; oxidizer

Precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P370 + P378 - In case of fire: Use water spray to extinguish
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P410 - Protect from sunlight
P411 - Store at temperatures not exceeding 38 °C/ 100 °F

Supplementary precautionary statements
P221 - Take any precaution to avoid mixing with combustibles
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P285 - In case of inadequate ventilation wear respiratory protection
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P304 + P341 - IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P330 - Rinse mouth
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P337 + P313 - If eye irritation persists: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Diammonium peroxodisulphate

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Diammonium peroxodisulphate	231-786-5	[redacted]	60 - 100

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get immediate medical attention.

Ingestion Rinse mouth. Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Get immediate medical attention.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention.

Eye Contact Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Get immediate medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Deluge with water. Other methods not effective.

Extinguishing media which must not be used for safety reasons
Dry chemical, carbon dioxide and other gas-filled extinguishers.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
May intensify fire; oxidizer.

Hazardous combustion products
Heating or fire can release toxic gas Sulphur oxides, Oxygen, Nitrogen.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 1Z

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Do not breathe dust. Avoid contact with the skin and the eyes.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Spilled oxidizer must be removed immediately and isolated for disposal. Isolated material must be monitored for signs of decomposition (fuming/smoking). If spilled material is wet, dissolve with large quantity of water. All disposals must be carried out at the earliest opportunity and in accordance with local /regional /national /international regulations. Take up mechanically and collect in suitable container for disposal. Take precautionary measures against static discharges. Use non-sparking tools and equipment. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Do not handle until all safety precautions have been read and understood. Handle in accordance with good industrial hygiene and safety practice. Follow procedures for safe handling of oxidizers. Do not expose materials or their containers to moisture. Keep

away from open flames, hot surfaces and sources of ignition. Avoid handling causing generation of dust. Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Avoid contact with skin and eyes. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Provide appropriate exhaust ventilation at places where dust is formed. Keep away from heat, sparks, and flame. Keep containers in cool areas out of direct sunlight and away from combustibles.

Storage precautions Oxidizers must be stored separately from all other materials. Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Keep away from direct sunlight. Keep at a temperature not exceeding 100°F /38 °C Keep away from open flames,

hot surfaces and sources of ignition Oxidizing material - Keep away from flammable and combustible materials. Store away from incompatibles, Strong reducing agents Strong bases Reducing Agents Heavy metals

Packaging materials Use specially constructed containers only. Coated (epoxy phenolic) steel drum or high density polyethylene (HDPE) can

Packaging materials to be avoided Containers made of MONEL, copper, brass, or iron.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Diammonium peroxodisulphate	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Diammonium peroxodisulphate	Not determined	0.1 mg/m^3 TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Diammonium peroxodisulphate	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Diammonium peroxodisulphate	0.1 mg/m^3 TWA	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Diammonium peroxodisulphate	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Eye protection must conform to standard EN 166 Wear dust resistant safety goggles where there is a danger of eye contact.
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Do not wear rings, watches or anything similar which can retain the product and may give rise to skin conditions. Impervious gloves made of: polyvinyl alcohol or nitrile-butyl rubber gloves Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Sweet
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	6.5 - 8	@ 10g/l
Melting / freezing point	Decomposes	
Boiling point/range	No information available	
Flash point	> 93 °C / > 200 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.8	@20 °C
Bulk density	1150 kg/m³	
Relative density	No information available	
Water solubility	10 - 20 g/l	@ 20 °C
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	120 °C/ 248 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	

log Pow	No information available

Explosive properties	No information available
Oxidizing properties	Oxidizer. Contact with other material may cause fire

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

This product is a strong oxidizer and reacts violently with combustibles and reducing agents.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Protect from moisture. Avoid dust formation. Avoid contamination. Keep away from direct sunlight.

10.5 Incompatible materials

Do not mix oxidizers of any concentration with other oxidizing agents, reducing agents, flammable or combustible liquids or solids, acids, most metals and heavy metals, oxygen scavengers, corrosion inhibitors, surfactants, gelling agents, fluid-loss additives, cross linkers, solvents, foaming agents, clay control agents, or any chemical not specifically mentioned as being compatible with the specific oxidizer.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information	May produce an allergic reaction.
Inhalation	May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause irritation of respiratory tract. May cause drowsiness or dizziness.
Eye contact	Causes serious eye irritation.
Skin contact	Irritating to skin. May cause an allergic skin reaction.

Ingestion Harmful if swallowed.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Diammonium peroxodisulphate	= 495 mg/kg (Rat)	> 10000 mg/kg (Rabbit)	= 520 mg/L (Rat) 1 h

Sensitization May cause sensitization by inhalation and skin contact.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Skin contact. Eye contact. Ingestion.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Category 3

Specific target organ toxicity - Repeated exposure Not classified.

Target organ effects Respiratory system.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Diammonium peroxodisulphate	= 323 mg/L LC50 Poecilia reticulata 96 h = 76.3 mg/L LC50 Oncorhynchus mykiss 96 h = 103 mg/L LC50 Lepomis macrochirus 96 h	No information available	= 120 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Diammonium peroxodisulphate	Hydrolyzes

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Diammonium peroxodisulphate	Product does not bioaccumulate due to reaction with water

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Chemical Name	Mobility
Diammonium peroxodisulphate	Easily soluble

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Diammonium peroxodisulphate	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of as special waste in compliance with local and national regulations.

Contaminated packaging Do not re-use empty containers. Dispose of contents/container to an approved waste disposal plant.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN1444
UN No. (IMDG/ANTAQ)	UN1444
UN No. (ICAO/ANAC)	UN1444

14.2. UN proper shipping name
AMMONIUM PERSULFATE,

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	5.1
IMDG/ANTAQ Hazard class	5.1
ICAO/ANAC Hazard class/division	5.1

14.4 Packing group

ADR/RID/ADN/ADG Packing group	III
IMDG/ANTAQ Packing group	III
ICAO/ANAC Packing group	III

14.5 Environmental hazard

Marine pollutant
No

14.6 Special precautions

EmS (IMDG)	F-A, S-Q
Tunnel restriction code	E
Hazchem code ADG	1Z

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Diammonium peroxodisulphate
Schedule 6

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	21-Aug-2017
Revision date	31-Aug-2017
Version	4
This SDS has been revised in the following section(s)	8. EXPOSURE CONTROLS / PERSONAL PROTECTION No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2*
Flammability	1
Physical hazard	1
PPE	X

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SDS no. J580
Version 4
Revision date 07-Aug-2018
Supersedes Date: 21-Apr-2017

Safety Data Sheet
Water Gelling Agent J580

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Water Gelling Agent J580
Product code J580

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a fracturing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Suspended dust may present a dust explosion hazard

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Protect from moisture Avoid contact with: Oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust.

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Mechanical ventilation or local exhaust ventilation is required. Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Rubber Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Slight
Color	Light tan
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	5.5 - 7.5 (10g/L)	
Melting / freezing point	> 180 °C / 356 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.40 - 1.45	
Bulk density	800 kg/m³	
Relative density	No information available	
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 242 °C / 468 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties Suspended dust may present a dust explosion hazard
Oxidizing properties None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments

The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.

Routes of exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Listed on PLONOR list of OSPAR The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

The product does not contain any substances expected to be bioaccumulating.

12.4 Mobility

Mobility
Dispersible in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	21-Apr-2017
Revision date	07-Aug-2018
Version	4
This SDS has been revised in the following section(s)	1, 2, 7, 8, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	D

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SDS no. J604
Version 3
Revision date 22-Feb-2019
Supersedes Date: 30-Sep-2015

Safety Data Sheet
Crosslinker J604

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Crosslinker J604
Product code J604

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a fracturing additive in oilfield applications

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H302 - Harmful if swallowed
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P330 - Rinse mouth

Supplementary precautionary statements
P314 - Get medical advice/attention if you feel unwell
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Ethylene Glycol

Sodium Tetraborate Decahydrate

but-2-enedioic acid

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Ethylene Glycol	203-473-3	[redacted]	10-30
Sodium Tetraborate Decahydrate	215-540-4	[redacted]	1-<5
but-2-enedioic acid	203-743-0	[redacted]	1-<3

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water. Remove contaminated clothing and shoes. Seek medical attention if irritation occurs.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid contact with skin, eyes and inhalation of vapors. Wash thoroughly after handling. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13). After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Avoid spills and splashing during use. Do not breathe vapors or spray mist.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Store in original container. Avoid heat, flames and other sources of ignition. Keep away from direct sunlight. Store away from incompatibles, Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Ethylene Glycol	Not determined	40ppmSTELvapour 104mg/m³STELvapour 10mg/m³TWAparticulate 20ppmTWAvapour 52mg/m³TWAvapour	39.4 ppm Ceiling 100 mg/m³ Ceiling
Sodium Tetraborate Decahydrate	Not determined	5mg/m³TWA 1mg/m³TWA	5 mg/m³ TWA
but-2-enedioic acid	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Ethylene Glycol	Not determined	100 mg/m³ STEL	Not determined
Sodium Tetraborate Decahydrate	Not determined	5 mg/m³ TWA	Not determined
but-2-enedioic acid	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Ethylene Glycol	5 mg/m³ MAC	125 mg/m³ TWA 50.0 ppm TWA 100 mg/m³ STEL	50 ppm Ceiling mist and vapour 127 mg/m³ Ceiling mist and vapour
Sodium Tetraborate Decahydrate	Not determined	Not determined	5 mg/m³ TWA
but-2-enedioic acid	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Ethylene Glycol	39.4 ppm Ceiling aerosol 100 mg/m³ Ceiling aerosol	Not determined	10 mg/m³ STEL 5 mg/m³ TWA
Sodium Tetraborate Decahydrate	5 mg/m³ TWA	Not determined	2 mg/m³ MAC
but-2-enedioic acid	Not determined	Not determined	5 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Ethylene Glycol	Not determined	10 mg/m³ TWA 60 mg/m³ TWA 20 mg/m³ STEL 125 mg/m³ STEL	40 ppm STEL 104 mg/m³ STEL Skin 20 ppm TWA 52 mg/m³ TWA
Sodium Tetraborate Decahydrate	5 mg/m³ TWA	Not determined	Not determined
but-2-enedioic acid	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Keep airborne concentrations below exposure limits Ensure adequate ventilation, especially in confined areas

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Wear chemical resistant gloves such as nitrile or neoprene. Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Opaque
Odor	Odorless
Color	Beige or Milky white
Odor threshold	Not applicable

Property	Values	Remarks
pH	6.5 - 7.2	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Does not flash	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.27 - 1.37	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	None known.

9.2 Other information

Pour point	< -15 °C / < 5 °F
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Keep away from direct sunlight.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system. Harmful: danger of serious damage to health by prolonged exposure through inhalation.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Harmful if swallowed. May cause adverse kidney effects. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethylene Glycol	= 4700 mg/kg (Rat)	= 9530 µL/kg (Rabbit) = 10600 mg/kg (Rat)	No data available
Sodium Tetraborate Decahydrate	LD50 = 2660 mg/kg (Rat)	> 10000 mg/kg (Rabbit)	> 2 mg/m³ (Rat) 4 h
but-2-enedioic acid	= 9300 mg/kg (Rat)	> 20000 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity	Contains a known or suspected reproductive toxin.
Routes of Exposure	Inhalation. Skin contact. Eye contact. Ingestion.
Routes of entry	Inhalation. Skin contact. Eye contact.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Category 2.
Target organ effects	Kidney.
Aspiration hazard	Not classified.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ethylene Glycol	= 16000 mg/L LC50 Poecilia reticulata 96 h 40000 - 60000 mg/L LC50 Pimephales promelas 96 h = 40761 mg/L LC50 Oncorhynchus mykiss 96 h = 27540 mg/L LC50 Lepomis macrochirus 96 h 14 - 18 mL/L LC50 Oncorhynchus mykiss 96 h = 41000 mg/L LC50 Oncorhynchus mykiss 96 h	6500 - 13000 mg/L EC50 Pseudokirchneriella subcapitata 96 h	= 46300 mg/L EC50 Daphnia magna 48 h
Sodium Tetraborate Decahydrate	340 mg/L LC50 (Limanda limanda) = 96 h	2.6 - 21.8	1085 - 1402 mg/L LC50 (Daphnia magna) = 48 h
but-2-enedioic acid	= 245 mg/L LC50 Brachydanio rerio 48 h	= 41 mg/L EC50 Desmodesmus subspicatus 72 h	= 73.6 mg/L EC50 Daphnia magna 24 h 204 - 220 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

No information available.

12.3 Bioaccumulative potential

No information available.

12.4 Mobility

Mobility
No information available.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated

IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

Marine pollutant
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Ethylene Glycol
Schedule 6
Schedule 5
Sodium Tetraborate Decahydrate
Schedule 4
Schedule 5

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals)
Supersedes Date:	30-Sep-2015

Revision date	22-Feb-2019
Version	3
This SDS has been revised in the following section(s)	All sections Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2*
Flammability	1
Physical hazard	0
PPE	X

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SDS no. J693
Version 2
Revision date 04/Dec/2018
Supersedes date 13/Oct/2017

Safety Data Sheet
High Viscosity Friction Reducer J693

1. Identification of the Substance/Preparation and of the Company/Undertaking

1.1 Product identifier

Product name High Viscosity Friction Reducer J693

Product code J693

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a fracturing additive in oilfield applications.

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Technology Corporation
110 Schlumberger Drive
Sugar Land, Texas 77478, USA
Telephone: 1-281-285-7873

Schlumberger Canada, Ltd.
200, 125 - 9th Avenue SE
Calgary, Alberta T2G 0P6, Canada
Telephone: 1-613-992-4624

E-mail address SDS@slb.com

Prepared by
Global Regulatory Compliance - Chemicals (GRC - Chemicals)

1.4 Emergency Telephone Number

Emergency telephone (24 Hour) Asia Pacific +65 3158 1074, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, USA +1 281 595 3518/+1 866 928 0789 , Canada +1 800 579 7421 , Argentina: +54 11 5984 3690, Brazil : 0800-720-8000 /0800-777-2323 (WGRA)

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS - Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary Statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

Hazards not otherwise classified
None known

Unknown acute toxicity Not applicable.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	CAS No	Weight-%
Distillates, petroleum, hydrotreated light	[redacted]	15 - 40
Ammonium chloride	[redacted]	1 - 5

Comments
The product contains other ingredients which do not contribute to the overall classification. The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret

The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors, Carbon oxides (COx), Nitrogen oxides (NOx), Ammonia.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid contact with skin, eyes and inhalation of vapors. Wash thoroughly after handling. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13). After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use. If spilled, take caution, as material can cause surfaces to become very slippery.

Hygiene measures
Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product. Wash hands and face before breaks and immediately after handling the product.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid heat, flames and other sources of ignition. Avoid contact with:. Strong oxidizing agents.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits **Oil mist (mineral) workplace exposure limits are currently under review by legislative authorities. This workplace exposure limit (WEL) standard is applicable to highly refined mineral oils and is provided as a guidance limit only LT. EXP = 5mg/m³ and ST. EXP = 10mg/m³.**

Chemical Name	ACGIH TLV	OSHA PEL	Argentina - Occupational Exposure Limits - TWAs (CMPs)	Brazil - Occupational Exposure Limits - TWAs (LTs)	Mexico - Occupational Exposure Limits - TWAs (LMPE-PPTs)
Distillates, petroleum, hydrotreated light	Not determined	Not determined	Not determined	Not determined	Not determined
Ammonium chloride	10 mg/m³	Not determined	10 mg/m³ TWA	Not determined	10 mg/m³ TWA VLE-PPT (fume)

IDLH (Immediately Dangerous to Life or Health)
This product contains substance(s) classified as Immediately Dangerous to Life or Health (IDLH) by the US National Institute for Occupational Safety and Health (NIOSH). The purpose of establishing an IDLH value is to ensure that the worker can escape from a given contaminated environment in the event of failure of the most protective respiratory protection equipment. In the event of failure of respiratory protection equipment every effort should be made to exit immediately.

Chemical Name	IDLH (Immediately Dangerous to Life or Health)
Distillates, petroleum, hydrotreated light [redacted]	-
Ammonium chloride [redacted]	-

8.2 Exposure controls

A risk assessment is recommended to be performed by a qualified and trained personnel to analyze the worksite and recommends the appropriate controls such as engineering controls, work practice controls, and administrative controls as primary means of reducing employee exposure. When there is a remaining hazards after applying the primary controls, Personal Protective Equipment (PPE) must be used.

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes. Safety glasses with side-shields. Tightly fitting safety goggles.

Hand protection Wear chemical resistant gloves such as nitrile or neoprene. Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory Protection All respiratory protection equipment should be used within a comprehensive respiratory protection program that meets the requirements of 29 CFR 1910.134 (U.S. OSHA Respiratory Protection Standard) or local equivalent.If exposed to airborne mist/aerosol of this product, use an organic vapor cartridge with a P-95 pre-filter attached. In work environments containing oil mist/aerosol, use an organic vapor cartridge with a P-95 pre-filter attached.If exposed to vapors from this product, use a NIOSH/MSHA-approved respirator with an organic vapor cartridge.

Skin and body protection Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state Liquid
Appearance Clear
Color White
Odor Mild

Odor threshold	Not applicable	
Property	**Values**	**Remarks**
pH	6.0 - 8.0	
pH @ dilution		
Melting / freezing point	< -6.67 °C/ 20 °F	
Boiling point/range	No information available	
Flash point	> 94 °C/ 201 °F	
Evaporation rate (BuAc =1)	< 1	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	No information available	
Lower flammability limit	No information available	
Vapor pressure	10 (<77 °C)	
Vapor density	No information available	
Specific gravity	1.045 - 1.055	
Bulk density	No information available	
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	
Explosive properties	No information available	
Oxidizing properties	No information available	

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Ingestion may cause stomach discomfort.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Distillates, petroleum, hydrotreated light	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	> 5.2 mg/L (Rat) 4 h
Ammonium chloride	= 1650 mg/kg (Rat)	No data available	No data available

Chemical Name	IARC Group 1 or 2	ACGIH - Carcinogens	OSHA listed carcinogens	NTP
Distillates, petroleum, hydrotreated light	No data available	No data available	No data available	No data available
Ammonium chloride	No data available	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen.

Reproductive toxicity 2-Propenamid (impurity) may adversly affect the male reproductive system.

Developmental toxicity Component substance is listed on California Proposition 65 as a developmental hazard.

Routes of exposure Inhalation. Skin contact. Eye contact. Ingestion.

Routes of entry Inhalation. Skin contact. Eye contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard The viscosity of this product is high enough that it is not an aspiration risk and the H304 phrase does not apply.

12. Ecological Information

12.1 Toxicity

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Distillates, petroleum, hydrotreated light	= 45 mg/L LC50 Pimephales promelas 96 h = 2.2 mg/L LC50 Lepomis macrochirus 96 h = 2.4 mg/L LC50 Oncorhynchus mykiss 96 h	No information available	= 4720 mg/L LC50 Den-dronereides heteropoda 96 h
Ammonium chloride	= 109 mg/L (LC50; carp)	No information available	= 202 mg/L LC50 Daphnia magna 24 h

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Dispersible in water.

12.5 Results of PBT and vPvB assessment

This preparation contains no substance considered to be persistent, bioaccumulating nor toxic (PBT)
This preparation contains no substance considered to be very persistent nor very bioaccumulating (vPvB)

12.6 Other adverse effects.

None known.

13. Disposal Considerations

13.1 Waste treatment methods

Disposal Method Disposal should be made in accordance with federal, state and local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN No. (DOT) Not regulated

UN No. (MT/ANTT)	Not regulated
UN No. (TDG)	Not regulated
UN/ID No. (ADR/RID/ADN/ADG)	Not regulated
UN No. (IMDG/ANTAQ)	Not regulated
UN No. (ICAO/ANAC)	Not regulated
UN No. (DPC)	Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

DOT Hazard class	Not regulated
ANTT Hazard class	Not regulated
TDG Hazard class	Not regulated
ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated
DPC Hazard class	Not regulated

14.4 Packing group

DOT Packing group	Not regulated
ANTT Packing group	Not regulated
TDG Packing group	Not regulated
ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated
DPC Packing group	Not regulated

14.5 Environmental hazard

Marine pollutant	No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not comply
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

Europe - REACH
All products supplied from the European Economic Area (EEA) are compliant with the REACH Regulation EC 1907/2006.For

products supplied from the EEA, Schlumberger and/or its suppliers have pre-registered and is registering all of the substances that it and/or its suppliers manufactures in or imports into the EEA that are subject to Title II of the REACH Regulation. All products supplied from outside the EEA are subject to REACH only if imported into the EEA. The importer of the products must comply with REACH for each imported substance. Contact REACH@slb.com for REACH information.

IMPORTS, Canada
No import volume restrictions.

U.S. Federal and State Regulations

SARA 311/312 Hazard Categories
Should this product meet EPCRA 311/312 Tier reporting criteria at 40 CFR 370, refer to Section 2 of this SDS for appropriate classifications. Under the amended regulations at 40 CFR 370, EPCRA 311/312 Tier II reporting for the 2017 calendar year will need to be consistent with updated hazard classifications.

Chemical Name	SARA 302 / TPQs	SARA 313	CERCLA RQ
Distillates, petroleum, hydrotreated light	N/A	N/A	N/A
Ammonium chloride	N/A	N/A	5000 lb final RQ 2270 kg final RQ

California Proposition 65

WARNING

This product can expose you to chemicals including those listed below, which is [are] known to the State of California to cause cancer, birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov

Chemical Name	California Proposition 65
2-Propenamid (impurity) [redacted]	developmental toxicity male reproductive toxicity carcinogen

16. Other Information

Supersedes date 13/Oct/2017

Revision date 04/Dec/2018

Version 2

This SDS has been revised in the following section(s) 1, 3, 5, 9, 10, 15, 16. Prepared in accordance with OSHA HAZCOM 2012. Prepared in accordance with WHMIS 2015

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	B

N/A - Not Applicable, N/D - Not Determined.

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SDS no. L065
Version 4
Revision date 18-Oct-2016
Supersedes date 11-Dec-2014

Safety Data Sheet
Scale Inhibitor L065

1. Identification of the substance/preparation and of the Company/undertaking

1.1 Product identifier

Product name Scale Inhibitor L065
Product code L065

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Scale Inhibitor. Used as a fracturing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards identification

2.1 Classification of the substance or mixture

Classification according to (EC) No. 1272/2008

Health hazards

Acute oral toxicity	Category 4
Specific target organ toxicity (repeated exposure)	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard statements
H302 - Harmful if swallowed
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary Statements - EU (§28, 1272/2008)
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell
P330 - Rinse mouth
P501 - Dispose of contents/container in accordance with local regulations.

Supplementary precautionary statements
P314 - Get medical advice/attention if you feel unwell

-

Contains
Ethylene glycol

Calcium Chloride

2,2''-oxydiethanol (impurity)

Sodium hydroxide (impurity)

2.3 Other data

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not Applicable

3.2 Mixtures

Component	EC-No.	CAS-No	Weight % - range	Classification (67/548)	Classification (Reg. 1272/2008)	REACH registration number
Ethylene glycol	203-473-3	[redacted]	10-30	Xn; R48/22	Acute Tox. 4 (H302)	No data available

					STOT RE. 2(H373)	
Calcium Chloride	233-140-[redacted] - 5			Xi; R36	Eye Irrit. 2 (H319)	No data available
2,2"-oxydiethanol (impurity)	203-872-2	[redacted]	0.1 - 1.0	Xn; R22, R48/22	Acute Tox. 4 (H302) STOT RE. 2 (H373)	01-2119457857-21-xxxx
Sodium hydroxide (impurity)	215-185-5	[redacted]	<1	C;R35	Skin Corr. 1A (H314)	No data available

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First aid measures

4.1 First-Aid Measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Get medical attention if any discomfort continues.

4.2 Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Main symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which shall not be used for safety reasons
None known.

5.2 Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and materials for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing. Do not eat, drink or smoke when using this product.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid extreme temperatures. Avoid heat, flames and other sources of ignition. Store away from incompatibles, Strong oxidizing agents

Storage class Chemical storage.

Packaging material Use specially constructed containers only.

7.3 Specific end uses

See Section 1.2.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component	EU OEL	Austria	Australia	Denmark
Ethylene glycol	40 ppm STEL 104 mg/m³ STEL 20 ppm TWA 52 mg/m³ TWA Possibility of significant uptake through the skin	20 ppm STEL 52 mg/m³ STEL 10 ppm TWA 26 mg/m³ TWA	40ppmSTELvapour 104mg/m³STELvapour 10mg/m³TWAparticulate 20ppmTWAvapour 52mg/m³TWAvapour skin notation	10 ppm TWA 26 mg/m³ TWA 10 mg/m³ TWA Potential for cutaneous absorption
Calcium Chloride	Not determined	Not determined	Not determined	Not determined
2,2''-oxydiethanol (impurity)	Not determined	40 ppm STEL 176 mg/m³ STEL 10 ppm TWA 44 mg/m³ TWA	23ppmTWA 100mg/m³TWA	2.5 ppm TWA 11 mg/m³ TWA
Sodium hydroxide (impurity)	Not determined	4 mg/m³ STEL inhalable fraction 2 mg/m³ TWA inhalable fraction	Not determined	2 mg/m³ Ceiling
Component	**Malaysia**	**France**	**Germany**	**Hungary**
Ethylene glycol	39.4 ppm Ceiling aerosol 100 mg/m³ Ceiling aerosol	40ppmSTEL 104mg/m³STEL 20 ppmTWA 52 mg/m³TWA	10 ppm TWA 26 mg/m³ TWA	52mg/m³TWA 104mg/m³STEL
Calcium Chloride	Not determined	Not determined	Not determined	Not determined
2,2''-oxydiethanol (impurity)	Not determined	Not determined	10 ppm TWA 44 mg/m³ TWA	Not determined
Sodium hydroxide (impurity)	2 mg/m³ Ceiling	2 mg/m³TWA	Not determined	2mg/m³TWA 2mg/m³STEL
Component	**New Zealand**	**Italy**	**Netherlands**	**Norway**
Ethylene glycol	50 ppm Ceiling mist and vapour 127 mg/m³ Ceiling mist and vapour	Not determined	104mg/m³STEL 52 mg/m³ 10 mg/m³	20 mg/m³ TWA dust 52 ppm TWA total dust and vapor 52 mg/m³ TWA 52 mg/m³ STEL dust 20 ppm STEL Skin
Calcium Chloride	Not Determined	Not determined	Not determined	Not determined
2,2''-oxydiethanol (impurity)	23 ppm TWA 101 mg/m³ TWA	Not determined	Not determined	Not determined
Sodium hydroxide (impurity)	2 mg/m³ Ceiling	Not determined	Not determined	2 mg/m³ Ceiling
Component	**Poland**	**Portugal**	**Romania**	**Russia**
Ethylene glycol	50 mg/m³ STEL NDSCh 15 mg/m³ TWA NDS	Skin 40 ppm STEL VLE-CD 104 mg/m³ STEL VLE-CD 20 ppm TWA indicative limit value 52 mg/m³ TWA indicative limit value	40ppmSTEL 104mg/m³STEL 20ppmTWA 52mg/m³TWA	10 mg/m³ STEL 2308 aerosol and vapor 5 mg/m³ TWA 2308
Calcium Chloride	Not determined	Not determined	Not determined	2 mg/m³ MAC Skin
2,2''-oxydiethanol (impurity)	10 mg/m³ TWA NDS	Not determined	184ppmSTEL 800mg/m³STEL 115ppmTWA	10 mg/m³ MAC (aerosol and vapor)

			500mg/m³TWA	
Sodium hydroxide (impurity)	1 mg/m³ STEL NDSCh 0.5 mg/m³ TWA NDS	Not determined	Not determined	Not determined
Component	**Spain**	**Switzerland**	**Turkey**	**UK**
Ethylene glycol	40 ppm STEL 104 mg/m³ STEL Skin 20 ppm TWA VLA-ED 52 mg/m³ TWA VLA-ED	20 ppm STEL 52 mg/m³ STEL Skin 10 ppm TWA MAK 26 mg/m³ TWA MAK	40 ppm STEL 104 mg/m³ STEL Skin 20 ppm TWA 52 mg/m³ TWA	40 ppm STEL vapour 104 mg/m³ STEL vapour 30 mg/m³ STEL calculated particulate Skin 10 mg/m³ TWA particulates 20 ppm TWA vapour 52 mg/m³ TWA vapour
Calcium Chloride	Not determined	Not determined	Not determined	Not determined
2,2''-oxydiethanol (impurity)	Not determined	40 ppm STEL (KZW): 176 mg/m³ STEL (KZW)	Not determined	69 ppm STEL calculated 303 mg/m³ STEL calculated 23 ppm TWA 101 mg/m³ TWA
Sodium hydroxide (impurity)	2 mg/m³ STEL	2 mg/m³ STEL inhalable dust 2 mg/m³ TWA MAK	Not determined	2 mg/m³ STEL

Derived No Effect Level (DNEL)

Long term exposure systemic effects

2,2''-oxydiethanol (impurity)

Dermal	106 mg/kg bw/day
Inhalation	60 mg/m³

Predicted No Effect Concentration (PNEC)

2,2''-oxydiethanol (impurity)

Fresh water	10 mg/l
Sea water	1 mg/l
Fresh water sediment	20.9 mg/kg sediment dw
Sea sediment	2.09 mg/kg sediment dw
Soil	1.53 mg/kg soil dw
Impact on sewage treatment	199.5 mg/L
Intermittent release	10 mg/l

Sodium hydroxide (impurity)

Impact on sewage treatment	1503

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering measures to reduce exposure
Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Tightly fitting safety goggles. Safety glasses with side-shields.
Hand protection	Use protective gloves made of:, polyvinyl alcohol or nitrile-butyl rubber gloves, Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment, Respirator with combination filter for vapour/particulate (EN 141), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing, Eye wash and emergency shower must be available at

the work place.

Hygiene measures Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Mild
Color	Pale yellow
Odor threshold	Not applicable

Property	Values	Remarks
pH	7.8 - 8.8	
pH @ dilution		
Melting/freezing point	-50 °C / -58 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	> 100 °C / 212 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	7 kPa	@ 20 °C
Vapor density	No information available	
Specific gravity	1.2	@15.6 °C
Bulk density	No information available	
Relative density	1.2	@ 15.6°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	5 mm2/s	@ 40 °C
Dynamic viscosity	6 mPa s	@ 38 °C
Log Pow	No information available	

Explosive properties	Not Applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

10. Stability and reactivity

10.1 Reactivity

Stable under recommended storage conditions.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Avoid extreme temperatures.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation. Components of the product may be absorbed into the body through the skin.

Ingestion Harmful if swallowed. May cause adverse cardiac effects, blood disturbances, and metabolic acidosis. May cause damage to organs through prolonged or repeated exposure.

Unknown acute toxicity Not Applicable.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethylene glycol	= 4700 mg/kg (Rat)	= 9530 µL/kg (Rabbit) = 10600 mg/kg (Rat)	No data available
Calcium Chloride	= 1000 mg/kg (Rat)	= 2630 mg/kg (Rat)	No data available
2,2"-oxydiethanol (impurity)	= 12565 mg/kg (Rat)	= 11890 mg/kg (Rabbit)	No data available
Sodium hydroxide (impurity)	No data available	= 1350 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Skin contact. Ingestion.
Routes of entry	Ingestion. Skin contact. Skin absorption.
Specific target organ toxicity (single exposure)	Not classified
Specific target organ toxicity (repeated exposure)	Category 2.
Target organ effects	Kidney.
Aspiration hazard	Not Applicable.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ethylene glycol	= 41000 mg/L LC50 Oncorhynchus mykiss 96 h 14 - 18 mL/L LC50 Oncorhynchus mykiss 96 h = 27540 mg/L LC50 Lepomis macrochirus 96 h = 40761 mg/L LC50 Oncorhynchus mykiss 96 h 40000 - 60000 mg/L LC50 Pimephales promelas 96 h = 16000 mg/L LC50 Poecilia reticulata 96 h	6500 - 13000 mg/L EC50 Pseudokirchneriella subcapitata 96 h	= 46300 mg/L EC50 Daphnia magna 48 h
Calcium Chloride	= 10650 mg/L LC50 Lepomis macrochirus 96 h	No information available	= 2400 mg/L LC50 Daphnia magna 48 h
2,2"-oxydiethanol (impurity)	= 75200 mg/L LC50 Pimephales promelas 96 h	No information available	= 84000 mg/L EC50 Daphnia magna 48 h
Sodium hydroxide (impurity)	= 45.4 mg/L LC50 Oncorhynchus mykiss 96 h	No information available	No information available

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility in soil

Mobility
The product is water soluble, and may spread in water systems.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.
EWC Waste disposal No.	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 16 05 08 - discarded organic chemicals consisting of or containing dangerous substances.

14. Transport information

14.1 UN Number
Not regulated

14.2 Proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG Hazard class	Not regulated
ICAO Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG Packing group	Not regulated
ICAO Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Ethylene glycol
Schedule 6
Schedule 5
2,2''-oxydiethanol (impurity)
Schedule 6
Schedule 5
Sodium hydroxide (impurity)
Schedule 6
Schedule 5

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for transport by road or rail.

International inventories

USA (TSCA)	Complies
European Union (EINECS and ELINCS)	Does not Comply
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not Comply

China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not Comply
New Zealand (NZIoC)	Complies

15.2 Chemical Safety Report

No information available

16. Other information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes date	11-Dec-2014
Revision date	18-Oct-2016
Version	4
The following sections have been revised:	All sections, There have been changes with regard to classification.

Text of R phrases mentioned in Section 3
R22 - Harmful if swallowed
R35 - Causes severe burns
R36 - Irritating to eyes

R48/22 - Harmful: danger of serious damage to health by prolonged exposure if swallowed

Full text of H-Statements referred to under sections 2 and 3

H302 - Harmful if swallowed
H373 - May cause damage to organs through prolonged or repeated exposure
H314 - Causes severe skin burns and eye damage
H319 - Causes serious eye irritation

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. L071
Version 4
Revision date 31-Jul-2017
Supersedes Date: 02-Aug-2016

Safety Data Sheet
L071 Temporary Clay Stabilizer

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name L071 Temporary Clay Stabilizer
Product code L071

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Clay control agent in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

May cause slight irritation

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if symptoms occur.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Thermal decomposition can lead to release of irritating gases and vapors, Nitrogen oxides (NOx), Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Keep people away from and upwind of spill/leak. If spilled, take caution, as material can cause surfaces to become very slippery.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid breathing vapors or mists. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Store away from incompatibles, Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established.

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required. See section 7 for more information

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 resistant to the solvent(s) in use Impervious gloves made of: Nitrile Break through time >480 minutes Glove thickness 0.4 mm or PVC disposable gloves Break through time >480 minutes Glove thickness 0.7 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Use respirator with

organic vapor protection (A, brown)

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Mild amine
Color	Clear - Blue
Odor threshold	Not applicable

Property	Values	Remarks
pH	6.5 - 9.5	
pH @ dilution	No information available	Not applicable
Melting / freezing point	No information available	
Boiling point/range	125 °C / 257 °F	
Flash point	> 98 °C / 208.4 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.99 - 1.20	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available

Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	May cause irritation of respiratory tract.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Ingestion. Skin contact. Eye contact.
Routes of entry	Skin contact. Eye contact.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not classified.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
After release, adsorbs onto soil.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

Marine pollutant
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	02-Aug-2016
Revision date	31-Jul-2017
Version	4
This SDS has been revised in the following section(s)	1, 2, 3, 5, 7, 8, 9, 11, 15, 16 Updated according to GHS/CLP. No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Training Advice
It is a good industrial hygiene practice to minimize skin contact

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	B

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The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.
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SDS no. M003
Version 5
Revision date 18-Sep-2018
Supersedes Date: 10-Apr-2017

Safety Data Sheet
Soda Ash M3

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Soda Ash M3
Product code M003

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Buffer in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Serious eye damage/eye irritation	Category 2A

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H319 - Causes serious eye irritation

Precautionary statements
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves and eye/face protection
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Sodium carbonate

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Sodium carbonate	207-838-8	[redacted]	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention immediately if symptoms occur.

Eye Contact Remove contact lenses, if worn. Promptly wash eyes with lots of water while lifting eye lids. Continue to rinse for at least 15 minutes. Seek medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Avoid dust formation.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Avoid contact with water and moist air - product is hygroscopic. Store away from incompatibles, Powdered aluminum Strong acids

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium carbonate	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium carbonate	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium carbonate	2 mg/m³ MAC	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium carbonate	Not determined	Not determined	Skin notation Skin
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium carbonate	Not determined	Not determined	Not determined

Notes

No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Impervious gloves made of: Nitrile PVA Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	11	
pH @ dilution	No information available	
Melting / freezing point	851 °C / 1564 °F	
Boiling point/range	Not applicable	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	

Vapor pressure	Not applicable	
Vapor density	Not applicable	
Specific gravity	2.5	@20 °C
Bulk density	No information available	
Relative density	2.53	@ 20°C.
Water solubility	212.5g/L	@ 20 °C
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	>400°C/ 752°F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Decomposes by reaction with strong acids.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Protect from moisture. Avoid contact with water and moist air - product is hygroscopic.

10.5 Incompatible materials

Powdered aluminum. Strong acids.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and

cough.

Eye contact Causes serious eye irritation. May cause pain, redness, discomfort.

Skin contact May cause skin irritation and/or dermatitis.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium carbonate	= 4090 mg/kg (Rat)	No data available	= 2300 mg/m³ (Rat) 2 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Skin contact. Eye contact. Inhalation.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium carbonate	310 - 1220 mg/L LC50 Pimephales promelas 96 h = 300 mg/L LC50 Lepomis macrochirus 96 h	= 242 mg/L EC50 Nitzschia 120 h	= 265 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies

New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	10-Apr-2017
Revision date	18-Sep-2018
Version	5
This SDS has been revised in the following section(s)	1, 2, 7, 8, 15, 16 Updated according to GHS/CLP. No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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Safety Data Sheet
Myacide® GA 25

1. Identification

Product identifier used on the label

Myacide® GA 25

Recommended use of the chemical and restriction on use
Recommended use*: Approved only for uses listed on the FIFRA label.

* The “Recommended use” identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:
BASF CORPORATION
100 Park Avenue
Florham Park, NJ 07932, USA

Telephone: +1 973 245-6000

Emergency telephone number

CHEMTREC: 1-800-424-9300
BASF HOTLINE: 1-800-832-HELP (4357)

Other means of identification

Substance number:	145849
EPA Registration number:	33753-26
Molecular formula:	CHO(CH2)3CHO
Chemical family:	dialdehydes, aqueous solution
Synonyms:	GLUTARALDEHYDE

2. Hazards Identification

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Classification of the product

Acute Tox.	4 (oral)	Acute toxicity
Acute Tox.	4 (Inhalation - mist)	Acute toxicity
Skin Corr./Irrit.	1B	Skin corrosion/irritation
Eye Dam./Irrit.	1	Serious eye damage/eye irritation
Resp. Sens.	1	Respiratory sensitization

Skin Sens.	1A	Skin sensitization
STOT SE	3 (irritating to respiratory system)	Specific target organ toxicity — single exposure
Aquatic Chronic	2	Hazardous to the aquatic environment - chronic
Aquatic Acute	1	Hazardous to the aquatic environment - acute

Label elements

Pictogram:

Signal Word:
Danger

Hazard Statement:

H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H317	May cause an allergic skin reaction.
H335	May cause respiratory irritation.
H314	Causes severe skin burns and eye damage.
H302 + H332	Harmful if swallowed or if inhaled
H411	Toxic to aquatic life with long lasting effects.
H400	Very toxic to aquatic life.

Precautionary Statements (Prevention):

P280	Wear protective gloves/protective clothing/eye protection/face protection.
P271	Use only outdoors or in a well-ventilated area.
P260	Do not breathe dust/mist/vapours.
P273	Avoid release to the environment.
P284	In case of inadequate ventilation wear respiratory protection.
P272	Contaminated work clothing should not be allowed out of the workplace.
P270	Do not eat, drink or smoke when using this product.
P264	Wash with plenty of water and soap thoroughly after handling.

Precautionary Statements (Response):

P310	Immediately call a POISON CENTER or doctor/physician.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P304 + P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P301 + P330 + P331	IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P362 + P364	Take off contaminated clothing and wash it before reuse.
P391	Collect spillage.

Precautionary Statements (Storage):

P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.

Precautionary Statements (Disposal):

P501	Dispose of contents/container in accordance with local regulations.

Hazards not otherwise classified

No specific dangers known, if the regulations/notes for storage and handling are considered.

Labeling of special preparations (GHS):
Corrosive to the respiratory tract.

3. Composition / Information on Ingredients

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

CAS Number	Weight %	Chemical name
[redacted]	>= 20.0 - < 50.0%	glutaral
[redacted]	>= 0.0 - < 0.3%	Methanol

4. First-Aid Measures

Description of first aid measures

General advice:
Immediately remove contaminated clothing. If the patient is likely to become unconscious, place and transport in stable sideways position (recovery position). First aid personnel should pay attention to their own safety.

If inhaled:
Keep patient calm, remove to fresh air, seek medical attention.

If on skin:
Remove contaminated clothing. Rinse skin immediately with plenty of water for 15 - 20 minutes. Seek medical attention. Consult a skin specialist.

If in eyes:
Immediately wash affected eyes for at least 15 minutes under running water with eyelids held open, consult an eye specialist.

If swallowed:
Immediately rinse mouth and then drink plenty of water, do not induce vomiting, seek medical attention.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further symptoms and / or effects are not known so far
Hazards: No applicable information available.

Indication of any immediate medical attention and special treatment needed

Note to physician
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote, administer corticosteroid dose aerosol to prevent pulmonary odema.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
water spray, dry powder, foam

Special hazards arising from the substance or mixture

Hazards during fire-fighting:
harmful vapours
Evolution of fumes/fog. The substances/groups of substances mentioned can be released in case of fire.

Advice for fire-fighters

Protective equipment for fire-fighting:
Wear a self-contained breathing apparatus in confined areas or when exposed to combustion products.

Further information:
Contaminated extinguishing water must be disposed of in accordance with official regulations.

Impact Sensitivity:

Impact Weight:	10 kg
Height of Fall:	0.4 m
Method:	Explosive properties
Remarks:	Substance/product is not impact sensitve at room temperature.

6. Accidental release measures

Further accidental release measures:
Pack in tightly closed containers for disposal.

Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

Environmental precautions

Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

For small amounts: Pick up with absorbent material (e.g. sand, sawdust, general-purpose binder).
Dispose of absorbed material in accordance with regulations.
For large amounts: Pump off product.
Spills should be contained, solidified, and placed in suitable containers for disposal.

7. Handling and Storage

Precautions for safe handling

No special measures necessary provided product is used correctly.

Protection against fire and explosion:
No special precautions necessary.

Conditions for safe storage, including any incompatibilities

Segregate from foods and animal feeds.

Further information on storage conditions: Keep container tightly closed and in a cool place. Store protected against freezing.

8. Exposure Controls/Personal Protection

Users of a pesticidal product should refer to the product label for personal protective equipment requirements.

Components with occupational exposure limits

Methanol	OSHA PEL	PEL 200 ppm 260 mg/m3 ; TWA value 200 ppm 260 mg/m3 ; SKIN_FINAL ; The substance can be absorbed through the skin. STEL value 250 ppm 325 mg/m3 ;
	ACGIH TLV	TWA value 200 ppm ; STEL value 250 ppm ; Skin Designation ; The substance can be absorbed through the skin.
glutaral	OSHA PEL	CLV 0.2 ppm 0.8 mg/m3 ;
	ACGIH TLV	CLV 0.05 ppm ;

Advice on system design:
Provide local exhaust ventilation to control vapours/mists.

Personal protective equipment

RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS:

Respiratory protection:
Wear respiratory protection if ventilation is inadequate. Respiratory protection in case of vapour/aerosol release. Wear a NIOSH-certified (or equivalent) organic vapour/particulate respirator.

Hand protection:
Wear chemical resistant protective gloves.

Eye protection:
Tightly fitting safety goggles (chemical goggles) and face shield.

Body protection:
Body protection must be chosen based on level of activity and exposure., Protective coverall and/or impermeable apron and boots as necessary.

General safety and hygiene measures:
Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is required additionally to the stated personal protection equipment. Keep away from food, drink and animal feeding stuffs. Avoid contact with skin and eyes. Remove contaminated clothing. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and Chemical Properties

Form:	liquid
Odour:	characteristic

Odour threshold:	No applicable information available.	
Colour:	yellow	
pH value:	5.9 (0.5 %(m), 23 °C)	
Freezing point:	approx. -5 °C (1 ATM)	
Boiling point:	> 100 °C (1 ATM)	
Sublimation point:	No applicable information available.	
Flash point:	not applicable	
Flammability:	No applicable information available.	
Lower explosion limit:	No applicable information available.	
Upper explosion limit:	No applicable information available.	
Autoignition:	> 275 °C	(DIN 51794)
Vapour pressure:	approx. 17.5 mmHg (20 °C) The product has not been tested. The statement has been derived from the properties of the individual components.	
Density:	1.06 g/cm3 (20 °C)	
Relative density:	1.06 (20 °C)	
Vapour density:	No applicable information available.	
Partitioning coefficient n-octanol/water (log Pow):	No applicable information available.	
Thermal decomposition:	No decomposition if correctly stored and handled.	
Viscosity, dynamic:	No applicable information available.	
Viscosity, kinematic:	No applicable information available.	
Solubility in water:	soluble	
Solubility (quantitative):	No applicable information available.	
Solubility (qualitative):	No applicable information available.	
Molar mass:	100 g/mol	
Evaporation rate:	Value can be approximated from Henry's Law Constant or vapor pressure.	
Other Information:	If necessary, information on other physical and chemical parameters is indicated in this section.	

10. Stability and Reactivity

Reactivity
No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals:
No corrosive effect on metal.

Formation of flammable gases:	Remarks:	Forms no flammable gases in the presence of water.

Chemical stability
The product is stable if stored and handled as prescribed/indicated.

Possibility of hazardous reactions
The product is chemically stable.

Conditions to avoid
No conditions to avoid anticipated.

Incompatible materials
acids, bases, amines

Hazardous decomposition products

Decomposition products:
Hazardous decomposition products:
carbon monoxide, carbon dioxide

Thermal decomposition:
No decomposition if correctly stored and handled.

11. Toxicological information

Primary routes of exposure

Routes of entry for solids and liquids are ingestion and inhalation, but may include eye or skin contact. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquefied gases.

Acute Toxicity/Effects

Acute toxicity
Assessment of acute toxicity: Of moderate toxicity after single ingestion. Of moderate toxicity after short-term inhalation. Of low toxicity after short-term skin contact.

Oral
Type of value: ATE
Value: 301 mg/kg

Tested as a preparation.

Information on: glutaral
Type of value: LD50
Species: rat (female)
Value: approx. 77 mg/kg (similar to OECD guideline 401)

Information on: Methanol
Type of value: LD50
Species: rat
Value: > 1187 - 2769 mg/kg (BASF-Test)

Inhalation
Type of value: ATE
Value: 1.09 mg/l
Determined for mist

Dermal
Type of value: ATE
Value: 3,790 mg/kg

Assessment other acute effects
Assessment of STOT single:

Causes temporary irritation of the respiratory tract.

Irritation / corrosion
Assessment of irritating effects: Corrosive! Damages skin and eyes.

Skin

Information on: glutaral
Species: rabbit
Result: Corrosive.
Method: similar to OECD guideline 404

Eye

Information on: glutaral
Species: rabbit
Result: Risk of serious damage to eyes.
Method: Draize test

Sensitization
Assessment of sensitization: The substance may cause sensitization of the respiratory tract. Sensitization after skin contact possible.

Information on: glutaral
Open epicutaneous test (OET)
Species: guinea pig
Result: sensitizing

Species: human
Result: sensitizing

Aspiration Hazard
No aspiration hazard expected.

Chronic Toxicity/Effects

Repeated dose toxicity

Information on: glutaral
Assessment of repeated dose toxicity: After repeated exposure the prominent effect is local irritation. The substance may cause damage to the upper respiratory tract after repeated inhalation, as shown in animal studies.

Genetic toxicity

Information on: glutaral
Assessment of mutagenicity: The substance was mutagenic in various test systems with bacterias and cell cultures; however, these results could not be confirmed in tests with mammals.

Carcinogenicity

Assessment of carcinogenicity: None of the components in this product at concentrations greater than 0.1% are listed by IARC; NTP, OSHA or ACGIH as a carcinogen.

Reproductive toxicity

Information on: glutaral
Assessment of reproduction toxicity: The results of animal studies gave no indication of a fertility impairing effect.

Teratogenicity

Information on: glutaral
Assessment of teratogenicity: No indications of a developmental toxic / teratogenic effect were seen in animal studies.

Other Information
The product has not been tested. The statement has been derived from the properties of the individual components.

Symptoms of Exposure

The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further symptoms and / or effects are not known so far

Medical conditions aggravated by overexposure
Contact may aggravate pulmonary disorders.

12. Ecological Information

Toxicity

Aquatic toxicity
Assessment of aquatic toxicity:
Very toxic to aquatic life. Toxic to aquatic life with long lasting effects.
The ecological data given are those of the active ingredient.

Toxicity to fish
LC50 (96 h) 0.8 mg/l, Salmo gairdneri, syn. O. mykiss (Fish test acute, static)
The details of the toxic effect relate to the nominal concentration.

LC50 (96 h) 6.2 mg/l, Cyprinodon variegatus (Fish test acute, static)
The details of the toxic effect relate to the nominal concentration.

Aquatic invertebrates
EC50 (48 h) 2.1 mg/l, Daphnia magna (Daphnia test acute, static)
The details of the toxic effect relate to the nominal concentration.

EC50 (96 h) 0.78 mg/l, Crassostrea virginica (OPP 72-3 (EPA-Guideline), Flow through.)
The statement of the toxic effect relates to the analytically determined concentration.

Aquatic plants
EC50 (72 h) 0.6 mg/l (growth rate), Desmodesmus subspicatus (OECD Guideline 201, static)
The statement of the toxic effect relates to the analytically determined concentration.

No observed effect concentration (72 h) 0.025 mg/l (growth rate), Desmodesmus subspicatus (OECD Guideline 201, static)
The statement of the toxic effect relates to the analytically determined concentration.

EC50 (72 h) 0.92 mg/l (growth rate), Skeletonema costatum (ISO/DIS 10253, static)
The details of the toxic effect relate to the nominal concentration.

Chronic toxicity to fish
No observed effect concentration (97 d) 1.6 mg/l, Oncorhynchus mykiss (Flow through.)
The details of the toxic effect relate to the nominal concentration.

Chronic toxicity to aquatic invertebrates
No observed effect concentration (21 d) 5.0 mg/l, Daphnia magna (OECD Guideline 211, semistatic)

Assessment of terrestrial toxicity
Toxic effects have been observed in studies with terrestric plants. Toxic effects have been observed in studies with soil living organisms.

Soil living organisms

Toxicity to soil dwelling organisms:
LC50 (14 d) 170 mg/kg, Eisenia foetida (OECD Guideline 207, artificial soil)
The details of the toxic effect relate to the nominal concentration.

EC10 (28 d) 10.45 mg/kg, soil dwelling microorganisms (OECD 217, natural soil)
The details of the toxic effect relate to the nominal concentration.

Toxicity to terrestrial plants

EC20 (19 d) 441 mg/kg, Vicia sativa (OECD Guideline 208)

Other terrestrial non-mammals
LD50 (14 d) 206 mg/kg, Anas platyrhynchos (other)

Microorganisms/Effect on activated sludge

Toxicity to microorganisms
OECD Guideline 209 aerobic
activated sludge, domestic/EC20 (30 min): approx. 15 mg/l
The details of the toxic effect relate to the nominal concentration.

Persistence and degradability

Assessment biodegradation and elimination (H2O)
Readily biodegradable (according to OECD criteria).

Elimination information

90 - 100 % DOC reduction (28 d) (OECD 301 A (new version)) (aerobic, activated sludge, domestic)

Assessment biodegradation and elimination (H2O)

Information on: glutaral

Readily biodegradable (according to OECD criteria).

Elimination information

Information on: glutaral
90 - 100 % DOC reduction (28 d) (OECD 301 A (new version)) (aerobic, activated sludge, domestic)

Assessment of stability in water
In contact with water the substance will hydrolyse slowly.

Information on Stability in Water (Hydrolysis)
$t_{1/2}$ > 1 a (50 °C), (Directive 92/69/EEC, C.7, pH 7)
In contact with water the substance will hydrolyse slowly.

Assessment of stability in water

Information on: glutaral

In contact with water the substance will hydrolyse slowly.

Bioaccumulative potential

Assessment bioaccumulation potential
No significant accumulation in organisms is expected as a result of the distribution coefficient of n-octanol/water (log Pow).

Bioaccumulation potential
Because of the n-octanol/water distribution coefficient (log Pow) accumulation in organisms is not to be expected.

Assessment bioaccumulation potential

Information on: glutaral

No significant accumulation in organisms is expected as a result of the distribution coefficient of n-octanol/water (log Pow).

Mobility in soil

Assessment transport between environmental compartments
The substance will not evaporate into the atmosphere from the water surface.
Adsorption to solid soil phase is possible.

Information on: glutaral

The substance will not evaporate into the atmosphere from the water surface.
Adsorption to solid soil phase is possible.

Additional information

Other ecotoxicological advice:
Data refer to a diluted aqueous solution of the substance.

13. Disposal considerations

Waste disposal of substance:

Dispose of in accordance with national, state and local regulations. It is the waste generator's responsibility to determine if a particular waste is hazardous under RCRA.

Container disposal:
Dispose of in a licensed facility. Recommend crushing, puncturing or other means to prevent unauthorized use of used containers.

RCRA:
This product meets the D002 (characteristic corrosivity) criteria.

14. Transport Information

Land transport
USDOT

Hazard class:	8
Packing group:	II
ID number:	UN 3265
Hazard label:	8, EHSM
Proper shipping name:	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (contains GLUTARALDEHYDE)

Sea transport
IMDG

Hazard class:	8
Packing group:	II
ID number:	UN 3265
Hazard label:	8, EHSM
Marine pollutant:	YES
Proper shipping name:	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (contains GLUTARALDEHYDE)

Air transport
IATA/ICAO

Hazard class:	8
Packing group:	II
ID number:	UN 3265
Hazard label:	8
Proper shipping name:	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (contains GLUTARALDEHYDE)

15. Regulatory Information

Federal Regulations

Registration status:

Biocide	TSCA, US	released / exempt

EPCRA 311/312 (Hazard categories): Refer to SDS section 2 for GHS hazard classes applicable for this product.

State regulations

State RTK	CAS Number	Chemical name
NJ	[redacted]	glutaral
PA	[redacted]	glutaral

Safe Drinking Water & Toxic Enforcement Act, CA Prop. 65:

WARNING: This product can expose you to chemicals including METHANOL, which is known to the State of California to cause birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

NFPA Hazard codes:
Health: 3 Fire: 1 Reactivity: 0 Special:

HMIS III rating
Health: 3 Flammability: 1 Physical hazard: 0

Labeling requirements under FIFRA

This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label.

DANGER:
CORROSIVE.
CAUSES IRREVERSIBLE EYE DAMAGE.
CAUSES SKIN IRRITATION.
HARMFUL IF INHALED.
HARMFUL IF SWALLOWED.
HARMFUL IF ABSORBED THROUGH SKIN.
MAY CAUSE ALLERGIC SKIN REACTION.
CAUSES ASTHMATIC SIGNS AND SYMPTOMS IN HYPER-REACTIVE INDIVIDUALS.
Do not get in eyes, on skin, or on clothing.
Avoid inhalation of vapour.
Not to be used as an aerosol.
Do not swallow.
Wear protective eyeware (goggles or face shield).
Wear chemical resistant protective gloves.
Wear protective clothing.
Wash with plenty of water and soap thoroughly after handling.
Remove contaminated clothing immediately and clean before re-use or dispose it if necessary.

16. Other Information

SDS Prepared by:
BASF NA Product Regulations
SDS Prepared on: 2018/08/31

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operations on society and the environment during production, storage, transport, use and disposal of our products.

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END OF DATA SHEET

SDS no. S100
Version 8
Revision date 05-Oct-2020
Supersedes Date: 08-Sep-2017

Safety Data Sheet
Sand S100

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Sand S100
Product code S100

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a fracturing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P314 - Get medical advice/attention if you feel unwell
P501 - Dispose of contents/container to industrial incineration plant

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Contains
Quartz, Crystalline silica

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Quartz, Crystalline silica	238-878-4	[redacted]	60-100

3.2 Mixtures

Not applicable

Comments
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention if irritation occurs.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
React with hydrofluoric acid (HF) forming toxic gas (SiF_4).

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Vacuum up. Avoid generating dust. Put into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. For personal protection see section 8.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Store away from incompatibles, React with hydrofluoric acid (HF) forming toxic gas (SiF4) Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only. Bag with moisture barrier Paper bag (minimum 3 ply), or other industrial container designed for powders and granulated materials

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Quartz, Crystalline silica	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Quartz, Crystalline silica	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Quartz, Crystalline silica	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**

Quartz, Crystalline silica	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Quartz, Crystalline silica	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Use protective gloves made of: Nitrile Neoprene gloves Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules
Odor	Odorless
Color	Tan
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	No information available	
Melting / freezing point	> 1700 °C / 3092 °F	
Boiling point/range	No information available	

Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	Not applicable	
Specific gravity	2.6	@20 °C
Bulk density	1100 - 1600 kg/m³	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

React with hydrofluoric acid (HF) forming toxic gas (SiF4).

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation.

10.5 Incompatible materials

Hydrofluoric acid (HF). Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. May cause respiratory irritation. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.

Eye contact Dust may cause mechanical irritation.

Skin contact Repeated exposure may cause skin dryness or cracking.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Quartz, Crystalline silica	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Skin contact. Eye contact.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Category 2.

Target organ effects Respiratory system. Lungs.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Quartz, Crystalline silica	No information available	No information available	No information available

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Quartz, Crystalline silica	Inorganic compound

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Quartz, Crystalline silica	Product/Substance is inorganic

12.4 Mobility

Mobility
The product is insoluble and sinks in water. See component information below.

Chemical Name	Mobility
Quartz, Crystalline silica	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Quartz, Crystalline silica	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by

Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Poh Yue Cheong
Supersedes Date:	08-Sep-2017
Revision date	05-Oct-2020
Version	8
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3*
Flammability	0
Physical hazard	0
PPE	E

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SDS no. S521-2040-NRT
Version 1
Revision date 26-Apr-2016
Supersedes date None

Safety Data Sheet
CARBOPROP® NRT S521-2040-NRT

1. Identification of the substance/preparation and of the Company/undertaking

1.1 Product identifier

Product name	CARBOPROP® NRT S521-2040-NRT
Product code	S521-2040-NRT

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use	Used as a proppant in oilfield applications
Uses advised against	Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards identification

2.1 Classification of the substance or mixture

Classification according to (EC) No. 1272/2008

Health hazards	Not classified
Environmental hazards	Not classified
Physical Hazards	Not classified

2.2 Label elements

Signal word
None

Hazard statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary Statements - EU (§28, 1272/2008)

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

-

Contains

2.3 Other data

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

3.2 Mixtures

Not Applicable

4. First aid measures

4.1 First-Aid Measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Get medical attention if any discomfort continues.

4.2 Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Main symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which shall not be used for safety reasons
None known.

5.2 Special hazards arising from the substance or mixture

Hazardous combustion products
None known.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and materials for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Avoid generating or breathing dust. Take up mechanically and collect in suitable container for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing. Do not eat, drink or smoke when using this product.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place. Store away from incompatibles, Strong oxidizing agents
Storage class	Chemical storage.
Packaging material	Use specially constructed containers only.

7.3 Specific end uses

See Section 1.2.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust.

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may

be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering measures to reduce exposure
Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed.

Personal protective equipment

Eye protection	Safety glasses with side-shields. Tightly fitting safety goggles.
Hand protection	Use protective gloves made of:, Neoprene, Nitrile, PVC, Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment, Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

Hygiene measures Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules
Odor	Odorless
Color	Brown Dark green Black
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution		
Melting/freezing point	> 2000 °C / 3632 °F	
Boiling point/range	Not Applicable	
Flash point		
Evaporation rate (BuAc =1)	Not Applicable	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	Not applicable	
Vapor density	Not applicable	
Specific gravity	3.15 - 3.65 g/cm3	
Bulk density	1.73 - 2.15 g/cm3	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
Log Pow	No information available	

Explosive properties	Not Applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

10. Stability and reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not Applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.

Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	No information available.
Routes of exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	No route of entry noted.
Specific target organ toxicity (single exposure)	Not classified
Specific target organ toxicity (repeated exposure)	Not classified.
Aspiration hazard	Not Applicable.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

The product does not contain any substances expected to be bioaccumulating.

12.4 Mobility in soil

Mobility
Insoluble in water.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.
EWC Waste disposal No.	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: 16 03 04 - inorganic wastes other than those mentioned in 16 03 03

14. Transport information

14.1 UN Number
Not regulated

14.2 Proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG Hazard class	Not regulated
ICAO Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG Packing group	Not regulated
ICAO Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not Applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code.

International inventories

USA (TSCA)	Complies
European Union (EINECS and ELINCS)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

15.2 Chemical Safety Report

No information available

16. Other information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Revision date	26-Apr-2016
Version	1
The following sections have been revised:	New issue.

Full text of H-Statements referred to under sections 2 and 3

This product is not classified as hazardous therefore no (H) hazard statements assigned.

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. S521-2040
Version 6
Revision date 09-Jul-2018
Supersedes Date: 26-Apr-2016

Safety Data Sheet
CARBOPROP

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name	CARBOPROP
Product code	S521-2040

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use	Used as a proppant in oilfield applications
Uses advised against	Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards	Not classified
Environmental hazards	Not classified
Physical Hazards	Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Inhalation of dust in high concentration may cause irritation of respiratory system

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Avoid generating or breathing dust. Take up mechanically and collect in suitable container for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Store away from incompatibles, Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust.

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile PVC Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules
Odor	Odorless
Color	Brown Dark green Black
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	No information available	
Melting / freezing point	> 2000 °C / 3632 °F	
Boiling point/range	Not applicable	
Flash point	Not applicable	
Evaporation rate (BuAc =1)	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	Not applicable	
Vapor density	Not applicable	
Specific gravity	3.15 - 3.65 g/cm3	
Bulk density	1.73 - 2.15 g/cm3	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	No information available.
Routes of exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	No route of entry noted.

Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

The product does not contain any substances expected to be bioaccumulating.

12.4 Mobility

Mobility
Insoluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	26-Apr-2016
Revision date	09-Jul-2018
Version	6
This SDS has been revised in the following section(s)	The following sections have been revised: 1, 7, 8, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.
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Appendix D.3 January 2022 Safety Data Sheets

SDS no. B499
Version 1
Revision date 10-Jun-2016
Supersedes date None

Safety Data Sheet
Natural Corrosion Inhibitor B499

1. Identification of the substance/preparation and of the Company/undertaking

1.1 Product identifier

Product name Natural Corrosion Inhibitor B499
Product code B499

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a fracturing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards identification

2.1 Classification of the substance or mixture

Classification according to (EC) No. 1272/2008

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary Statements - EU (§28, 1272/2008)

This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

-

Contains

2.3 Other data

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

3.2 Mixtures

Not Applicable

4. First aid measures

4.1 First-Aid Measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Get medical attention if any discomfort continues.

4.2 Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Main symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which shall not be used for safety reasons
None known.

5.2 Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Fire or high temperatures create:, Carbon oxides (COx), Nitrogen oxides (NOx), Hydrogen cyanide (hydrocyanic acid), Thermal decomposition can lead to release of toxic and corrosive gases/vapors.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and materials for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Sweep up and shovel into suitable containers for disposal. Use non-sparking tools and equipment. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Keep away from open flames, hot surfaces and sources of ignition.

Hygiene measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid heat, flames and other sources of ignition.
Storage class	Chemical storage.
Packaging material	Use specially constructed containers only.

7.3 Specific end uses

See Section 1.2.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust.

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering measures to reduce exposure
Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed.

Personal protective equipment

Eye protection	Safety glasses with side-shields. Tightly fitting safety goggles.
Hand protection	Repeated or prolonged contact:, Use protective gloves made of:, Butyl, Nitrile, Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.
Hygiene measures	Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Flakes Powder
Odor	Odorless
Color	Off-white
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution		
Melting/freezing point	260-280 °C / 500-536 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.5 - 0.7	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	500 °C / 932 °F	
Decomposition temperature	400 C	

Kinematic viscosity	No information available
Dynamic viscosity	No information available
Log Pow	No information available

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

10. Stability and reactivity

10.1 Reactivity

Dust may form explosive mixture in air.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

No materials to be especially mentioned.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust in high concentration may cause irritation of respiratory system.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not Applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Skin contact. Inhalation. Eye contact.
Routes of entry	No route of entry noted.
Specific target organ toxicity (single exposure)	Not classified
Specific target organ toxicity (repeated exposure)	Not classified.
Aspiration hazard	Not Applicable.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
No product level data available.

Toxicity to fish
No product level data available.

Toxicity to daphnia and other aquatic invertebrates
No product level data available.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility in soil

Mobility
The product is miscible with water. May spread in water systems.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.
EWC Waste disposal No.	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: Waste Code: 16 03 06 - organic wastes other than those mentioned in 16 03 05 01 04 10 – dusty and powdery wastes other than those mentioned in 01 04 07,

14. Transport information

14.1 UN Number
Not regulated

14.2 Proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG Hazard class	Not regulated
ICAO Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG Packing group	Not regulated
ICAO Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions

Not Applicable

Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No Poisons Schedule number allocated

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for transport by road or rail.

International inventories

USA (TSCA)	Complies
European Union (EINECS and ELINCS)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

15.2 Chemical Safety Report

No information available

16. Other information

Prepared by Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel

Revision date	10-Jun-2016
Version	1
The following sections have been revised:	New issue.

Full text of H-Statements referred to under sections 2 and 3

This product is not classified as hazardous therefore no (H) hazard statements assigned.

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. B645-4070
Version 1
Revision date 28-Feb-2019
Supersedes Date: None

Safety Data Sheet
40/70-Mesh Sand B645

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name 40/70-Mesh Sand B645
Product code B645-4070
Country Limitations Limited to use in these countries: Australia

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a proppant in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P314 - Get medical advice/attention if you feel unwell
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

-

Contains
Quartz, Crystalline Silica

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Quartz, Crystalline Silica	238-878-4	[redacted]	60 - 100

3.2 Mixtures

Not applicable

Comments
IARC Monographs, Vol. 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or cristobalite from occupational sources causes cancer in humans. IARC Classification Group I.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water. Remove contaminated clothing and shoes. Seek medical attention if irritation occurs.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Do not get on skin or clothing. Wash thoroughly after handling. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Avoid dust formation. Sweep up and shovel into suitable containers for disposal. Material becomes slippery when wet. Use caution if wet.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid handling causing generation of dust. Material becomes slippery when wet. Use caution if wet. Avoid breathing dust; if exposed to high dust concentration, leave area immediately.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits.

Storage precautions Follow safe warehousing practices regarding palletizing, banding, shrink-wrapping and/or stacking. Keep containers tightly closed in a dry, cool and well-ventilated place Store away from incompatibles, Oxidizing agents Hydrofluoric acid (HF)

Storage class Chemical storage.

Packaging materials Paper bag (minimum 3 ply), or other industrial container designed for powders and granulated materials

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
Quartz, Crystalline Silica	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Quartz, Crystalline Silica	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Quartz, Crystalline Silica	1 mg/m³ MAC	Not determined	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**

Quartz, Crystalline Silica	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance glass;regulated under Quartz 1123, 1124
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Quartz, Crystalline Silica	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required. Keep airborne concentrations below exposure limits

Personal protective equipment

Eye protection	Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear chemical resistant gloves such as nitrile or neoprene. Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules
Odor	Odorless
Color	Tan or White
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	No information available	
Melting / freezing point	> 1700 °C / 3092 °F	
Boiling point/range	No information available	
Flash point	Not applicable	

Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	2.55 - 2.75	@20 °C
Bulk density	1450 -1650 kg/m³	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity		
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

React with hydrofluoric acid (HF) forming toxic gas (SiF4).

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation.

10.5 Incompatible materials

Hydrofluoric acid (HF). Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.

Eye contact Dust may cause mechanical irritation.

Skin contact Repeated exposure may cause skin dryness or cracking.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Quartz, Crystalline Silica	= 500 mg/kg (Rat)	No data available	No data available

Sensitization Not classified.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Skin contact. Eye contact.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Category 2.

Target organ effects Lungs. Respiratory system.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Quartz, Crystalline Silica	No information available	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Quartz, Crystalline Silica	Inorganic compound

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Quartz, Crystalline Silica	Product/Substance is inorganic No bioaccumulation potential

12.4 Mobility

Mobility
Insoluble in water.

Chemical Name	Mobility
Quartz, Crystalline Silica	No information available

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Quartz, Crystalline Silica	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known. Check for additional information in sect. 7.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

Marine pollutant
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals)
Revision date	28-Feb-2019
Version	1
This SDS has been revised in the following section(s)	New issue.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1*
Flammability	0
Physical hazard	0
PPE	E

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SDS no. F112
Version 3
Revision date 15-Aug-2018
Supersedes Date: 07-May-2018

Safety Data Sheet
Surfactant F112

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Surfactant F112
Product code F112

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Surfactant in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2

Environmental hazards

Chronic aquatic toxicity	Category 3

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H412 - Harmful to aquatic life with long lasting effects

Precautionary statements
P273 - Avoid release to the environment
P280 - Wear protective gloves and eye/face protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P391 - Collect spillage
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Supplementary precautionary statements
P337 + P313 - If eye irritation persists: Get medical advice/attention
P264 - Wash face, hands and any exposed skin thoroughly after handling
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse

Contains
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-

Dicoco dimethyl quaternary ammonium chloride

Propan-2-ol

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Inhalation of vapors in high concentration may cause irritation of respiratory system

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	500-077-5	[redacted]	10-<20
Dicoco dimethyl quaternary ammonium chloride	263-087-6	[redacted]	0.5-<1.0
Propan-2-ol	200-661-7	[redacted]	0.1-<0.25

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion If swallowed, call a poison control center or doctor immediately. Do NOT induce vomiting. If conscious, drink plenty of water.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Get medical attention if irritation persists.

Eye Contact Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Get immediate medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Extinguish with carbon dioxide, dry chemical, foam or waterspray.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors Carbon oxides (COx), Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 3Z

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Wear suitable protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13). After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin or on clothing. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands before eating, drinking or smoking Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid contact with: Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Component Information

Chemical Name	Arabic	Australia	Egypt
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Not determined	Not determined	Not determined
Dicoco dimethyl quaternary ammonium chloride	Not determined	Not determined	Not determined
Propan-2-ol	500 ppm STEL 1230 mg/m³ STEL 400 ppm TWA 983 mg/m³ TWA	500ppmSTEL 1230mg/m³STEL 400ppmTWA 983mg/m³TWA	500 ppm STEL 1230 mg/m³ STEL 400 ppm TWA 983 mg/m³ TWA
Chemical Name	**India**	**Indonesian**	**Japan**
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Not determined	Not determined	Not determined
Dicoco dimethyl quaternary ammonium chloride	Not determined	Not determined	Not determined
Propan-2-ol	Not determined	400 ppm TWA 983 mg/m³ TWA 500 ppm STEL 1230 mg/m³ STEL	200 ppm ACL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Not determined	Not determined	Not determined
Dicoco dimethyl quaternary ammonium chloride	Not determined	Not determined	Not determined
Propan-2-ol	10 mg/m³ MAC	1225 mg/m³ STEL 500 ppm STEL	500 ppm STEL 1230 mg/m³ STEL 400 ppm TWA 983 mg/m³ TWA
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Not determined	Not determined	Not determined
Dicoco dimethyl quaternary ammonium chloride	Not determined	Not determined	Not determined
Propan-2-ol	400 ppm TWA 983 mg/m³ TWA	400 ppm TWA 980 mg/m³ TWA	50 mg/m³ STEL 10 mg/m³ TWA
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Not determined	Not determined	Not determined
Dicoco dimethyl quaternary ammonium chloride	Not determined	Not determined	Not determined
Propan-2-ol	400 ppm TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment
Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Tightly

	fitting safety goggles
Hand protection	Impervious gloves made of: Nitrile or Butyl Break through time >480 minutes Glove thickness 0.5 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Use respirator with organic vapor/acid gas protection (E, yellow) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Alcohol
Color	Clear Yellow
Odor threshold	Not applicable

Property	Values	Remarks
pH	9-11	
pH @ dilution	No information available	Not applicable
Melting / freezing point	5 °C / 41 °F	
Boiling point/range	~ 100 °C / 212 °F	
Flash point	> 93.3 °C / > 199.4 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.99 - 1.03 g/cm^3	@ 20 °C
Bulk density	No information available	
Relative density	~ 1.0	@ 20°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	5-50 mPa s	@ 16 °C
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	< 1
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of vapors in high concentration may cause irritation of respiratory system.
Eye contact	Causes serious eye irritation.
Skin contact	Causes skin irritation.
Ingestion	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.
Unknown acute toxicity	Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation

Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	LD50: 1250 mg/kg, rat, (based on data from similar substance)	LD50: > 2000 mg/kg, rat, (based on data from similar component)	No data available
Dicoco dimethyl quaternary ammonium chloride	= 960 mg/kg (Rat)	LD50 > 2930 mg/kg, rabbit	No data available
Propan-2-ol	= 1870 mg/kg (Rat)	= 4059 mg/kg (Rabbit)	= 72600 mg/m³ (Rat) 4 h

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Eye contact. Skin contact. Inhalation.

Routes of entry Eye contact. Skin contact.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Harmful to aquatic life with long lasting effects

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	LC50 96h, Brachydanio rerio (zebrafish): > 100 mg/l (test based on similar component)	EC50, 72h: > 100 mg/kg (based on similar substance)	EC50, 48h, Daphnia magna (Water flea): > 100 mg/l (based on similar product)
Dicoco dimethyl quaternary ammonium chloride	No information available	No information available	EC50, 48h, Daphnia : 0.01 mg/l
Propan-2-ol	> 1400000 µg/L LC50 Lepomis macrochirus 96 h = 11130 mg/L LC50 Pimephales promelas 96 h = 9640 mg/L LC50 Pimephales promelas 96 h	> 1000 mg/L EC50 Desmodesmus subspicatus 96 h > 1000 mg/L EC50 Desmodesmus subspicatus 72 h	= 13299 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Product is biodegradable.

Chemical Name	Persistence and degradability
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Readily biodegradable
Dicoco dimethyl quaternary ammonium chloride	No information available
Propan-2-ol	Readily biodegradable

12.3 Bioaccumulative potential

Does not bioaccumulate.

Chemical Name	Bioaccumulation
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Not likely to bioaccumulate
Dicoco dimethyl quaternary ammonium chloride	No information available
Propan-2-ol	No bioaccumulation potential

12.4 Mobility

Mobility
Soluble in water.

Chemical Name	Mobility
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	Miscible in water
Dicoco dimethyl quaternary ammonium chloride	Soluble in water
Propan-2-ol	Soluble in water

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Poly(oxy-1,2-ethanediyl), alphahexyl-omega-hydroxy-	No information available
Dicoco dimethyl quaternary ammonium chloride	No information available
Propan-2-ol	No information available

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable
Hazchem code ADG 3Z

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	07-May-2018
Revision date	15-Aug-2018
Version	3
This SDS has been revised in the following section(s)	2, 12, 14, 16 There have been changes with regard to classification.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2
Flammability	1
Physical hazard	0
PPE	X

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CONSOLIDATED CHEMICAL CO.
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Website: www.conchem.com.au

glutaraldehyde 25% solution
CONSOLIDATED CHEMICAL CO

Chemwatch Hazard Alert Code: **3**

Chemwatch: **45628**
Version No: **5.1.3.1**
Safety Data Sheet according to WHS Regulations (Hazardous Chemicals) Amendment 2020 and ADG requirements

Issue Date: **01/11/2019**
Print Date: **05/05/2021**
S.GHS.AUS.EN

SECTION 1 Identification of the substance / mixture and of the company / undertaking

Product Identifier

Product name	glutaraldehyde 25% solution
Proper shipping name	CORROSIVE LIQUID, TOXIC, N.O.S. (contains glutaraldehyde)
Chemical formula	Not Applicable
Other means of identification	Not Available

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	Biocide for sterilization of endoscopic instruments, polyester, rubber or plastic equipment which is not suitable for heat sterilized. As a biocide in water treatment, biocide in aircraft, portable toilets. In disinfectant solutions for animal housing. Preservative in mineral oils. [~Medicine ~]

Details of the supplier of the safety data sheet

Registered company name	**CONSOLIDATED CHEMICAL CO**
Address	52-62 Waterview Close, Dandenong South VIC 3175 Australia
Telephone	03 8903 3444
Fax	03 9799 7666
Website	www.conchem.com.au
Email	melb@conchem.com.au

Emergency telephone number

Association / Organisation	**CONSOLIDATED CHEMICAL CO**	**CHEMWATCH EMERGENCY RESPONSE**
Emergency telephone numbers	**1800 839 984**	**+61 2 9186 1132**
Other emergency telephone numbers	**Not Available**	**+61 1800 951 288**

Once connected and if the message is not in your prefered language then please dial 01

SECTION 2 Hazards identification

Classification of the substance or mixture

HAZARDOUS CHEMICAL. DANGEROUS GOODS. According to the WHS Regulations and the ADG Code.

Poisons Schedule	S6

Page 1 continued...

Classification [1]	Corrosive to Metals Category 1, Acute Toxicity (Oral) Category 4, Acute Toxicity (Inhalation) Category 4, Skin Corrosion/Irritation Category 1B, Serious Eye Damage/Eye Irritation Category 1, Skin Sensitizer Category 1, Respiratory Sensitizer Category 1, Acute Aquatic Hazard Category 1
Legend:	*1. Classified by Chemwatch; 2. Classification drawn from HCIS; 3. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI*

Label elements

Hazard pictogram(s)	
Signal word	**Danger**

Hazard statement(s)

H290	May be corrosive to metals.
H302	Harmful if swallowed.
H332	Harmful if inhaled.
H314	Causes severe skin burns and eye damage.
H317	May cause an allergic skin reaction.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H400	Very toxic to aquatic life.

Supplementary statement(s)

Not Applicable

Precautionary statement(s) Prevention

P260	Do not breathe mist/vapours/spray.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/protective clothing/eye protection/face protection/hearing protection.
P284	[In case of inadequate ventilation] wear respiratory protection.
P234	Keep only in original packaging.
P270	Do not eat, drink or smoke when using this product.
P273	Avoid release to the environment.
P272	Contaminated work clothing should not be allowed out of the workplace.

Precautionary statement(s) Response

P301+P330+P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303+P361+P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER/doctor/physician/first aider.
P342+P311	If experiencing respiratory symptoms: Call a POISON CENTER/doctor/physician/first aider.
P302+P352	IF ON SKIN: Wash with plenty of water.
P363	Wash contaminated clothing before reuse.
P333+P313	If skin irritation or rash occurs: Get medical advice/attention.
P362+P364	Take off contaminated clothing and wash it before reuse.
P390	Absorb spillage to prevent material damage.
P391	Collect spillage.
P301+P312	IF SWALLOWED: Call a POISON CENTER/doctor/physician/first aider if you feel unwell.

Precautionary statement(s) Storage

P405	Store locked up.

Continued...

Precautionary statement(s) Disposal

P501	Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation.

SECTION 3 Composition / information on ingredients

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
[redacted]	25	glutaraldehyde
[redacted]	75	water

Legend:	*1. Classified by Chemwatch; 2. Classification drawn from HCIS; 3. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI; 4. Classification drawn from C&L; * EU IOELVs available*

SECTION 4 First aid measures

Description of first aid measures

Eye Contact	If this product comes in contact with the eyes: ‣ Immediately hold eyelids apart and flush the eye continuously with running water. ‣ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ‣ Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes. ‣ Transport to hospital or doctor without delay. ‣ Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.
Skin Contact	If skin or hair contact occurs: ‣ Immediately flush body and clothes with large amounts of water, using safety shower if available. ‣ Quickly remove all contaminated clothing, including footwear. ‣ Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Centre. ‣ Transport to hospital, or doctor.
Inhalation	‣ If fumes or combustion products are inhaled remove from contaminated area. ‣ Lay patient down. Keep warm and rested. ‣ Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures. ‣ Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary. ‣ Transport to hospital, or doctor, without delay.
Ingestion	‣ For advice, contact a Poisons Information Centre or a doctor at once. ‣ Urgent hospital treatment is likely to be needed. ‣ If swallowed do **NOT** induce vomiting. ‣ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ‣ Observe the patient carefully. ‣ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ‣ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ‣ Transport to hospital or doctor without delay. ‣ Avoid giving milk or oils. ‣ Avoid giving alcohol. ‣ If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.

Indication of any immediate medical attention and special treatment needed

Any material aspirated during vomiting may produce lung injury. Therefore emesis should not be induced mechanically or pharmacologically. Mechanical means should be used if it is considered necessary to evacuate the stomach contents; these include gastric lavage after endotracheal intubation. If spontaneous vomiting has occurred after ingestion, the patient should be monitored for difficult breathing, as adverse effects of aspiration into the lungs may be delayed up to 48 hours.
For simple aldehydes:

BASIC TREATMENT

‣ Establish a patent airway with suction where necessary.
‣ Watch for signs of respiratory insufficiency and assist ventilation as necessary.
‣ Administer oxygen by non-rebreather mask at 10 to 15 l/min.

Continued...

- Monitor and treat, where necessary, for pulmonary oedema .
- Monitor and treat, where necessary, for shock.
- **DO NOT** use emetics. Where ingestion is suspected rinse mouth and give up to 200 ml water (5 ml/kg recommended) for dilution where patient is able to swallow, has a strong gag reflex and does not drool.
- Give activated charcoal.

ADVANCED TREATMENT

- Consider orotracheal or nasotracheal intubation for airway control in unconscious patient or where respiratory arrest has occurred.
- Consider intubation at first sign of upper airway obstruction resulting from oedema.
- Positive-pressure ventilation using a bag-valve mask might be of use.
- Monitor and treat, where necessary, for arrhythmias.
- Start an IV D5W TKO. If signs of hypovolaemia are present use lactated Ringers solution. Fluid overload might create complications.
- Drug therapy should be considered for pulmonary oedema.
- Hypotension with signs of hypovolaemia requires the cautious administration of fluids. Fluid overload might create complications.
- Treat seizures with diazepam.
- Proparacaine hydrochloride should be used to assist eye irrigation.

EMERGENCY DEPARTMENT

- Laboratory analysis of complete blood count, serum electrolytes, BUN, creatinine, glucose, urinalysis, baseline for serum aminotransferases (ALT and AST), calcium, phosphorus and magnesium, may assist in establishing a treatment regime. Other useful analyses include anion and osmolar gaps, arterial blood gases (ABGs), chest radiographs and electrocardiographs.
- Positive end-expiratory pressure (PEEP)-assisted ventilation may be required for acute parenchymal injury or adult respiratory distress syndrome.
- Treat bronchospasm in a similar manner to that employed for reactive airway disease. Severe exposures may require inhaled corticosteroids.
- Sodium bicarbonate may correct acidosis.
- Haemodialysis may assist in severely symptomatic patients.
- Consult a toxicologist as necessary.

BRONSTEIN, A.C. and CURRANCE, P.L.
EMERGENCY CARE FOR HAZARDOUS MATERIALS EXPOSURE: 2nd Ed. 1994

SECTION 5 Firefighting measures

Extinguishing media

The product contains a substantial proportion of water, therefore there are no restrictions on the type of extinguishing media which may be used. Choice of extinguishing media should take into account surrounding areas.
Though the material is non-combustible, evaporation of water from the mixture, caused by the heat of nearby fire, may produce floating layers of combustible substances.
In such an event consider:

- foam.

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	▸ Alert Fire Brigade and tell them location and nature of hazard. ▸ Wear full body protective clothing with breathing apparatus. ▸ Prevent, by any means available, spillage from entering drains or water course. ▸ Use fire fighting procedures suitable for surrounding area.
Fire/Explosion Hazard	▸ The material is not readily combustible under normal conditions. ▸ However, it will break down under fire conditions and the organic component may burn. ▸ Not considered to be a significant fire risk. ▸ Heat may cause expansion or decomposition with violent rupture of containers. Decomposes on heating and produces toxic fumes of: carbon dioxide (CO2) aldehydes other pyrolysis products typical of burning organic material.
HAZCHEM	2X

SECTION 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

See section 8

Continued...

Environmental precautions

See section 12

Methods and material for containment and cleaning up

Minor Spills	‣ Clean up all spills immediately. ‣ Avoid breathing vapours and contact with skin and eyes. ‣ Control personal contact with the substance, by using protective equipment. ‣ Contain and absorb spill with sand, earth, inert material or vermiculite.
Major Spills	‣ **DO NOT** touch the spill material ‣ Clear area of personnel and move upwind. ‣ Alert Fire Brigade and tell them location and nature of hazard. ‣ Wear full body protective clothing with breathing apparatus. ‣ Prevent, by any means available, spillage from entering drains or water course.

Personal Protective Equipment advice is contained in Section 8 of the SDS.

SECTION 7 Handling and storage

Precautions for safe handling

Safe handling	‣ **DO NOT** allow clothing wet with material to stay in contact with skin ‣ Avoid all personal contact, including inhalation. ‣ Wear protective clothing when risk of exposure occurs. ‣ Use in a well-ventilated area. ‣ Avoid contact with moisture.
Other information	‣ Store in original containers. ‣ Keep containers securely sealed. ‣ Store in a cool, dry, well-ventilated area. ‣ Store away from incompatible materials and foodstuff containers.

Conditions for safe storage, including any incompatibilities

Suitable container	‣ Glass container is suitable for laboratory quantities ‣ Lined metal can, lined metal pail/ can. ‣ Plastic pail. ‣ Polyliner drum. ‣ Packing as recommended by manufacturer. For low viscosity materials ‣ Drums and jerricans must be of the non-removable head type. ‣ Where a can is to be used as an inner package, the can must have a screwed enclosure. For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C.): ‣ Removable head packaging; ‣ Cans with friction closures and ‣ low pressure tubes and cartridges may be used.
Storage incompatibility	‣ Flammable and/or toxic gases are generated by the combination of aldehydes with azo, diazo compounds, dithiocarbamates, nitrides, and strong reducing agents. ‣ Many aldehydes are incompatible with strong acids, amines, strong oxidisers, and alkaline materials. ‣ Several medium range aldehydes ignite in air, particularly if exposure is increased by sorption on paper or cloth - ignition often occurs within 2 hours Glutaraldehyde: ‣ is a strong reducing agent ‣ reacts with water forming an aqueous polymer solution ‣ reacts violently with strong oxidisers, strong acids, bromine, ketones ‣ is incompatible with caustics, ammonia, amines, acetophenone, acetyl benzene, xylidenes ‣ the activated form (an alkaline solutions) react readily with alcohol, ketones, amines, hydrazines and proteins ‣ Incidents involving interaction of active oxidants and reducing agents, either by design or accident, are usually very energetic and examples of so-called redox reactions. ‣ Avoid strong bases.

+	x	+	x	+	+	+

X — *Must not be stored together*
0 — *May be stored together with specific preventions*
\+ — *May be stored together*

Continued...

Note: Depending on other risk factors, compatibility assessment based on the table above may not be relevant to storage situations, particularly where large volumes of dangerous goods are stored and handled. Reference should be made to the Safety Data Sheets for each substance or article and risks assessed accordingly.

SECTION 8 Exposure controls / personal protection

Control parameters

Occupational Exposure Limits (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
Australia Exposure Standards	glutaraldehyde	Glutaraldehyde	Not Available	Not Available	0.1 ppm / 0.41 mg/m3	Not Available

Emergency Limits

Ingredient	TEEL-1	TEEL-2	TEEL-3
glutaraldehyde	Not Available	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
glutaraldehyde	Not Available	Not Available
water	Not Available	Not Available

Exposure controls

Appropriate engineering controls	Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The basic types of engineering controls are: Process controls which involve changing the way a job activity or process is done to reduce the risk. Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.
Personal protection	
Eye and face protection	‣ Chemical goggles. ‣ Full face shield may be required for supplementary but never for primary protection of eyes. ‣ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task.
Skin protection	See Hand protection below
Hands/feet protection	Latex rubber gloves are not recommended [NIOSH]. ‣ Wear chemical protective gloves, e.g. PVC. ‣ Wear safety footwear or safety gumboots, e.g. Rubber ‣ When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots. **NOTE:** ‣ The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact. ‣ Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed. The selection of suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice. Personal hygiene is a key element of effective hand care.
Body protection	See Other protection below
Other protection	‣ Overalls. ‣ PVC Apron. ‣ PVC protective suit may be required if exposure severe. ‣ Eyewash unit.

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:
"Forsberg Clothing Performance Index".

Respiratory protection

Type A Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Continued...

The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
glutaraldehyde 25% solution

Material	CPI
BUTYL	A
NEOPRENE	A
VITON	A
NATURAL RUBBER	C
PVA	C
PVC	C

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Required minimum protection factor	Maximum gas/vapour concentration present in air p.p.m. (by volume)	Half-face Respirator	Full-Face Respirator
up to 10	1000	A-AUS / Class1	-
up to 50	1000	-	A-AUS / Class 1
up to 50	5000	Airline *	-
up to 100	5000	-	A-2
up to 100	10000	-	A-3
100+			Airline**

* - Continuous Flow ** - Continuous-flow or positive pressure demand
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

SECTION 9 Physical and chemical properties

Information on basic physical and chemical properties

Appearance	Colourless liquid; soluble in water. Sharp irritating odour. Vapours may be irritating in concentrations of about 0.3 ppm in air. Soluble in alcohol and benzene.

Physical state	Liquid	**Relative density (Water= 1)**	1.13 @ 20 C
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Available
pH (as supplied)	<7	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	-21 freezing pt	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	101.2	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Non Flammable	**Taste**	Not Available
Evaporation rate	Slow	**Explosive properties**	Not Available
Flammability	Non Flammable	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Applicable	**Surface Tension (dyn/cm or mN/m)**	Not Available
Lower Explosive Limit (%)	Not Applicable	**Volatile Component (%vol)**	50
Vapour pressure (kPa)	1.99	**Gas group**	Not Available
Solubility in water	Miscible	**pH as a solution (1%)**	<7
Vapour density (Air = 1)	3.5	**VOC g/L**	Not Available

SECTION 10 Stability and reactivity

Reactivity	See section 7
Chemical stability	• Unstable in the presence of incompatible materials. • Product is considered stable. • Hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7

Continued...

Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 Toxicological information

Information on toxicological effects

Inhaled	Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may produce toxic effects. Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by sleepiness, reduced alertness, loss of reflexes, lack of co-ordination, and vertigo. Inhalation hazard is increased at higher temperatures. Glutaraldehyde strongly irritates the eyes, nose, airways and skin. It causes chest tightness, excessive secretion of tears, wetness and crusting around the face and excessive salivation. There may be distinct acute nervous behaviour and liver damage. Chronic exposures may cause lung congestion, kidney and adrenal damage, sluggishness, weight loss and loss of appetite. Acute effects from inhalation of high vapour concentrations may be chest and nasal irritation with coughing, sneezing, headache and even nausea. Exposure to aldehydes causes neurological symptoms such as headache, drowsiness, dizziness, seizures, depression and coma. Cardiovascular involvement may result in increased heart rate, collapse and low blood pressure; respiratory effects include throat spasms, irritation, difficulty swallowing, pulmonary oedema and an asthma-like condition.
Ingestion	Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual. The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion. Swallowing of the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis; serious consequences may result. (ICSC13733) Animal testing showed that glutaraldehyde can cause kidney damage, congestion and distension of the stomach and intestines, congestion of the liver, spleen, kidney and adrenal glands, and bleeding and congestion of the lungs. Death has occurred at sufficiently high doses. Other toxic effects include sluggishness, excessive tear secretion, diarrhoea and crusting around the nose.
Skin Contact	Skin contact with the material may be harmful; systemic effects may result following absorption. The material can produce chemical burns following direct contact with the skin. Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected. A test in Sweden revealed that hospital workers exposed to glutaraldehyde had higher rates of skin disorders, such as contact dermatitis, compared to those who were not exposed. In Australia, skin inflammation has been observed in different types of workers exposed to glutaraldehyde, including endoscopy nurses, hospital cleaners, radiographers and dental assistants. Facial irritation was reported in egg collectors spraying eggs with a glutaraldehyde sanitising solution. Animal testing showed that cumulative toxicity or death may occur with repeated skin contact with 25-50% glutaraldehyde, but not at a concentration of 5% or less.
Eye	The material can produce chemical burns to the eye following direct contact. Vapours or mists may be extremely irritating. If applied to the eyes, this material causes severe eye damage. The vapour when concentrated has pronounced eye irritation effects and this gives some warning of high vapour concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area. Exposure to glutaraldehyde has resulted in eye irritation in a number of cases, including endoscopy nurses and other hospital workers. Solutions splashed into the eye may cause irritation, pain and increased sensitivity to light. Animal testing showed that glutaraldehyde can irritate the conjunctiva and injure the cornea. Solutions greater than 0.1% in strength are potentially hazardous.
Chronic	Repeated or prolonged exposure to corrosives may result in the erosion of teeth, inflammatory and ulcerative changes in the mouth and necrosis (rarely) of the jaw. Bronchial irritation, with cough, and frequent attacks of bronchial pneumonia may ensue. Inhaling this product is more likely to cause a sensitisation reaction in some persons compared to the general population. Skin contact with the material is more likely to cause a sensitisation reaction in some persons compared to the general population. Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure. Low concentrations cause skin reddening and irritation, occupational asthma, nasal discharge, sneezing and congestion. Long term exposure may cause chronic fatigue. There may be reduced body weight and damage to the nose with repeated high doses. It does not cause changes to foetal development, but may cause blood cancers (leukaemias).

glutaraldehyde 25% solution	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
glutaraldehyde	**TOXICITY**	**IRRITATION**
	Dermal (rabbit) LD50: >2000 mg/kg[1]	Eye (rabbit): 0.25mg/24h-SEVERE

Continued...

	Inhalation(Rat) LC50; 0.1 mg/l4h[2]	Eye (rabbit): 1 mg-SEVERE
	Oral(Rat) LD50; 154 mg/kg[1]	Skin (human): 6 mg/3d-int-SEVERE
		Skin (rabbit): 13 mg open-mild
		Skin (rabbit): 2 mg/24h-SEVERE
water	**TOXICITY**	**IRRITATION**
	Oral(Rat) LD50; >90000 mg/kg[2]	Not Available
Legend:	*1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2.* Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances*	

glutaraldehyde 25% solution	The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis. The material may produce respiratory tract irritation, and result in damage to the lung including reduced lung function. The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.
GLUTARALDEHYDE	The following information refers to contact allergens as a group and may not be specific to this product. Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its sensitisation potential: the distribution of the substance and the opportunities for contact with it are equally important. Allergic reactions involving the respiratory tract are usually due to interactions between IgE antibodies and allergens and occur rapidly. Allergic potential of the allergen and period of exposure often determine the severity of symptoms. Some people may be genetically more prone than others, and exposure to other irritants may aggravate symptoms. Allergy causing activity is due to interactions with proteins. Attention should be paid to atopic diathesis, characterised by increased susceptibility to nasal inflammation, asthma and eczema. Exogenous allergic alveolitis is induced essentially by allergen specific immune-complexes of the IgG type; cell-mediated reactions (T lymphocytes) may be involved. Such allergy is of the delayed type with onset up to four hours following exposure. The material may cause severe skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin. Repeated exposures may produce severe ulceration.
WATER	No significant acute toxicological data identified in literature search.
glutaraldehyde 25% solution & GLUTARALDEHYDE	Asthma-like symptoms may continue for months or even years after exposure to the material ends. This may be due to a non-allergic condition known as reactive airways dysfunction syndrome (RADS) which can occur after exposure to high levels of highly irritating compound. Main criteria for diagnosing RADS include the absence of previous airways disease in a non-atopic individual, with sudden onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. Other criteria for diagnosis of RADS include a reversible airflow pattern on lung function tests, moderate to severe bronchial hyperreactivity on methacholine challenge testing, and the lack of minimal lymphocytic inflammation, without eosinophilia. Animal testing shows that glutaraldehyde has a high acute toxicity through inhalation and it may cause lung damage. It is corrosive to the skin and eyes and exposure to its vapours has caused irritation to the nose and breathing difficulties. It can sensitise skin and irritate the joints in animal testing. Prolonged skin contact can result in absorption through the skin (although absorption rates are low) according to laboratory testing with human skin tissue.

Acute Toxicity	✔	**Carcinogenicity**	✘
Skin Irritation/Corrosion	✔	**Reproductivity**	✘
Serious Eye Damage/Irritation	✔	**STOT - Single Exposure**	✘
Respiratory or Skin sensitisation	✔	**STOT - Repeated Exposure**	✘
Mutagenicity	✘	**Aspiration Hazard**	✘

Legend: ✘ *– Data either not available or does not fill the criteria for classification*
✔ *– Data available to make classification*

SECTION 12 Ecological information

Toxicity

	Endpoint	Test Duration (hr)	Species	Value	Source
glutaraldehyde 25% solution	Not Available	Not Available	Not Available	Not Available	Not Available

Continued...

	Endpoint	Test Duration (hr)	Species	Value	Source
glutaraldehyde	NOEC(ECx)	672h	Crustacea	10mg/l	1
	EC50	72h	Algae or other aquatic plants	0.375mg/l	2
	EC50	48h	Crustacea	0.002-0.004mg/L	4
	LC50	96h	Fish	0.022mg/L	4
	EC50	96h	Algae or other aquatic plants	<=0.004mg/L	4

	Endpoint	Test Duration (hr)	Species	Value	Source
water	Not Available	Not Available	Not Available	Not Available	Not Available

Legend:	*Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 (QSAR) - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data*

Very toxic to aquatic organisms.
Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.
Wastes resulting from use of the product must be disposed of on site or at approved waste sites.
Glutaraldehyde is a hydrophilic substance that will mainly partition to water, with minor amounts partitioning to the atmosphere following release to the environment. Hydrolysis is slow, but glutaraldehyde, like other aldehydes, undergoes aerial oxidation in solution. It biodegrades rapidly in aerobic and anaerobic aquatic environments at subcidal concentrations (below 10 mg/L) and will not bioaccumulate. Tropospheric degradation is also rapid.
Prevent, by any means available, spillage from entering drains or water courses.
DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
glutaraldehyde	LOW	LOW
water	LOW	LOW

Bioaccumulative potential

Ingredient	Bioaccumulation
glutaraldehyde	LOW (LogKOW = -0.1821)

Mobility in soil

Ingredient	Mobility
glutaraldehyde	HIGH (KOC = 1.094)

SECTION 13 Disposal considerations

Waste treatment methods

Product / Packaging disposal

- Containers may still present a chemical hazard/ danger when empty.
- Return to supplier for reuse/ recycling if possible.

Otherwise:

- If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
- Where possible retain label warnings and SDS and observe all notices pertaining to the product.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.
A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use.

- **DO NOT** allow wash water from cleaning or process equipment to enter drains.
- It may be necessary to collect all wash water for treatment before disposal.
- In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
- Where in doubt contact the responsible authority.

Continued...

	‣ Recycle wherever possible. ‣ Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified. ‣ Treat and neutralise at an approved treatment plant. Treatment should involve: Neutralisation followed by: burial in a land-fill specifically licensed to accept chemical and / or pharmaceutical wastes or Incineration in a licensed apparatus (after admixture with suitable combustible material) ‣ Decontaminate empty containers.

SECTION 14 Transport information

Labels Required

Marine Pollutant	
HAZCHEM	2X

Land transport (ADG)

UN number	2922
UN proper shipping name	CORROSIVE LIQUID, TOXIC, N.O.S. (contains glutaraldehyde)
Transport hazard class(es)	Class: 8 Subrisk: 6.1
Packing group	III
Environmental hazard	Environmentally hazardous
Special precautions for user	Special provisions: 223 274 Limited quantity: 5 L

Air transport (ICAO-IATA / DGR)

UN number	2922
UN proper shipping name	Corrosive liquid, toxic, n.o.s. * (contains glutaraldehyde)
Transport hazard class(es)	ICAO/IATA Class: 8 ICAO / IATA Subrisk: 6.1 ERG Code: 8P
Packing group	III
Environmental hazard	Environmentally hazardous
Special precautions for user	Special provisions: A3 A803 Cargo Only Packing Instructions: 856 Cargo Only Maximum Qty / Pack: 60 L Passenger and Cargo Packing Instructions: 852 Passenger and Cargo Maximum Qty / Pack: 5 L Passenger and Cargo Limited Quantity Packing Instructions: Y841 Passenger and Cargo Limited Maximum Qty / Pack: 1 L

Sea transport (IMDG-Code / GGVSee)

UN number	2922
UN proper shipping name	CORROSIVE LIQUID, TOXIC, N.O.S. (contains glutaraldehyde)

Continued...

Transport hazard class(es)	IMDG Class	8
	IMDG Subrisk	6.1
Packing group	III	
Environmental hazard	Marine Pollutant	
Special precautions for user	EMS Number	F-A , S-B
	Special provisions	223 274
	Limited Quantities	5 L

Transport in bulk according to Annex II of MARPOL and the IBC code

Product name	Pollution Category	Ship Type
Glutaraldehyde solutions (50% or less)	Y	3

Transport in bulk in accordance with MARPOL Annex V and the IMSBC Code

Product name	Group
glutaraldehyde	Not Available
water	Not Available

Transport in bulk in accordance with the ICG Code

Product name	Ship Type
glutaraldehyde	Not Available
water	Not Available

SECTION 15 Regulatory information

Safety, health and environmental regulations / legislation specific for the substance or mixture

glutaraldehyde is found on the following regulatory lists

Australia Hazardous Chemical Information System (HCIS) - Hazardous Chemicals
Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 2
Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 5
Australia Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP) - Schedule 6
Australian Inventory of Industrial Chemicals (AIIC)

water is found on the following regulatory lists

Australian Inventory of Industrial Chemicals (AIIC)

National Inventory Status

National Inventory	Status
Australia - AIIC / Australia Non-Industrial Use	Yes
Canada - DSL	Yes
Canada - NDSL	No (glutaraldehyde; water)
China - IECSC	Yes
Europe - EINEC / ELINCS / NLP	Yes
Japan - ENCS	Yes
Korea - KECI	Yes
New Zealand - NZIoC	Yes
Philippines - PICCS	Yes
USA - TSCA	Yes
Taiwan - TCSI	Yes
Mexico - INSQ	Yes
Vietnam - NCI	Yes

Continued...

National Inventory	Status
Russia - FBEPH	Yes
Legend:	*Yes = All CAS declared ingredients are on the inventory* *No = One or more of the CAS listed ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)*

SECTION 16 Other information

Revision Date	01/11/2019
Initial Date	01/11/2009

SDS Version Summary

Version	Date of Update	Sections Updated
5.1.1.1	01/11/2019	One-off system update. NOTE: This may or may not change the GHS classification
5.1.2.1	26/04/2021	Regulation Change
5.1.3.1	03/05/2021	Regulation Change

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

The SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

Definitions and abbreviations

PC—TWA: Permissible Concentration-Time Weighted Average
PC—STEL: Permissible Concentration-Short Term Exposure Limit
IARC: International Agency for Research on Cancer
ACGIH: American Conference of Governmental Industrial Hygienists
STEL: Short Term Exposure Limit
TEEL: Temporary Emergency Exposure Limit。
IDLH: Immediately Dangerous to Life or Health Concentrations
ES: Exposure Standard
OSF: Odour Safety Factor
NOAEL :No Observed Adverse Effect Level
LOAEL: Lowest Observed Adverse Effect Level
TLV: Threshold Limit Value
LOD: Limit Of Detection
OTV: Odour Threshold Value
BCF: BioConcentration Factors
BEI: Biological Exposure Index
AIIC: Australian Inventory of Industrial Chemicals
DSL: Domestic Substances List
NDSL: Non-Domestic Substances List
IECSC: Inventory of Existing Chemical Substance in China
EINECS: European INventory of Existing Commercial chemical Substances
ELINCS: European List of Notified Chemical Substances
NLP: No-Longer Polymers
ENCS: Existing and New Chemical Substances Inventory
KECI: Korea Existing Chemicals Inventory
NZIoC: New Zealand Inventory of Chemicals
PICCS: Philippine Inventory of Chemicals and Chemical Substances
TSCA: Toxic Substances Control Act
TCSI: Taiwan Chemical Substance Inventory
INSQ: Inventario Nacional de Sustancias Químicas
NCI: National Chemical Inventory
FBEPH: Russian Register of Potentially Hazardous Chemical and Biological Substances

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TEL (+61 3) 9572 4700.

end of SDS

Safety Data Sheet
Hydrochloric Acid 15% H15

1. Identification of the substance/preparation and of the Company/undertaking

1.1 Product identifier

Product name	Hydrochloric Acid 15% H15
Product code	H015
Norway Pr. no.	17101
Denmark Pr. no.	1088965

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use	Used as an acidizing additive in oilfield applications
Uses advised against	Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield UK PLC
Victory House, Churchill Court
Manor Royal, Crawley
West Sussex RH10 9LU
+ 47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

Denmark	Poison Control Hotline (DK): +45 82 12 12 12
Netherlands	National Poisons Information Centre (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
Norway	Poison information centre: +47 22 59 13 00

2. Hazards Identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Health hazards

Skin corrosion/irritation	Category 1 Subcategory 1B
Serious eye damage/eye irritation	Category 1
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards Not classified

Physical Hazards

Substances/mixtures corrosive to metal	Category 1

2.2 Label elements

Signal word
DANGER

Hazard statements
H314 - Causes severe skin burns and eye damage
H335 - May cause respiratory irritation
H290 - May be corrosive to metals

Precautionary Statements - EU (§28, 1272/2008)
P260 - Do not breathe dust/fume/gas/mist/vapours/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/ physician
P406 - Store in corrosive resistant/ . container with a resistant inner liner

Supplementary precautionary statements
P234 - Keep only in original container
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P362 - Take off contaminated clothing and wash before reuse
P390 - Absorb spillage to prevent material damage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/container in accordance with local regulations.

-

Contains
Hydrochloric acid

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%	Classification according to 67/548/EEC	Regulation (EC) No 1272/2008	REACH registration number
Hydrochloric acid	231-595-7	[redacted]	15	-	Skin Corr. 1A (H314) STOT SE 3 (H335) Met. Corr.1 (H290) Note B	01-2119484862-27-xxxx

Comments
The product contains other ingredients which do not contribute to the overall classification.
Note B: Some substances (acids, bases, etc.) are placed on the market in aqueous solutions at various concentrations and, therefore, these solutions require different classification and labelling since the hazards vary at different concentrations.

4. First aid measures

4.1 First Aid

Inhalation Move the exposed person to fresh air at once. If breathing is difficult, (trained personnel should) give oxygen. If not breathing, give artificial respiration. Seek medical attention at once.

Ingestion Do NOT induce vomiting. Get immediate medical attention. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person.

Skin contact Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.

Eye contact Remove contact lenses. Immediately flush eyes with water for 15 minutes while holding eyelids open. Immediate medical attention is required.

4.2 Most important symptoms and effects, both acute and delayed

General advice Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Main symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media
The product itself does not burn, Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2 Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Contact with metals may evolve flammable hydrogen gas.

Hazardous combustion products
Fire or high temperatures create: Chlorine, chlorine oxides, hydrogen chloride.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Do not get on skin or clothing. Wash thoroughly after handling. Do not breathe vapours or spray mist. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment

Prevent further leakage or spillage if safe to do so. Dyke far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

6.4 Reference to other sections

See section 13 for more information.

7. Handling and storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene measures
Use good work and personal hygiene practices to avoid exposure Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Use only in area provided with appropriate exhaust ventilation. Keep airborne concentrations below exposure limits. Keep away from heat.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Avoid excessive heat for prolonged periods of time. Store away from incompatibles, Strong oxidising agents Alkalis Metals

Storage class Corrosive storage.

Packaging materials Use specially constructed containers only

7.3 Specific end uses

See Section 1.2.

8. Exposure controls/personal protection

8.1 Control parameters

Chemical Name	EU OEL - Third List	Austria	Australia	Denmark
Hydrochloric acid	10 ppm STEL 15 mg/m³ STEL 5 ppm TWA 8 mg/m³ TWA	10 ppm STEL 15 mg/m³ STEL 5 ppm TWA 8 mg/m³ TWA	Not determined	5 ppm Ceiling 8 mg/m³ Ceiling
Chemical Name	**Malaysia**	**France**	**Germany**	**Hungary**
Hydrochloric acid	5 ppm Ceiling 7.5 mg/m³ Ceiling	5ppmSTEL 7.6mg/m³STEL	2 ppm TWA 3.0 mg/m³ TWA	8mg/m³TWA 16mg/m³STEL
Chemical Name	**New Zealand**	**Italy**	**Netherlands**	**Norway**
Hydrochloric acid	5 ppm Ceiling 7.5 mg/m³ Ceiling	Not determined	8 mg/m³ GW	5 ppm Ceiling; 7 mg/m³ Ceiling
Chemical Name	**Poland**	**Portugal**	**Romania**	**Russia**
Hydrochloric acid	10 mg/m³ STEL NDSCh	10 ppm STEL VLE-CD	10ppmSTEL	Acute dangerous

	5 mg/m³ TWA NDS	15 mg/m³ STEL VLE-CD 5 ppm TWA indicative limit value 8 mg/m³ TWA indicative limit value	15mg/m³STEL 5ppmTWA 8mg/m³TWA	substance 5 mg/m³ MAC
Chemical Name	**Spain**	**Switzerland**	**Turkey**	**UK**
Hydrochloric acid	10 ppm STEL 15 mg/m³ STEL 5 ppm TWA VLA-ED 7.6 mg/m³ TWA VLA-ED	4 ppm STEL 6 mg/m³ STEL 2 ppm TWA MAK 3.0 mg/m³ TWA MAK	10 ppm STEL 15 mg/m³ STEL 5 ppm TWA 8 mg/m³ TWA	5 ppm STEL aerosol mist and gas 8 mg/m³ STEL aerosol mist and gas 1 ppm TWA aerosol mist and gas 2 mg/m³ TWA aerosol mist and gas

Derived No Effect Level (DNEL)

Short term exposure local effects

Hydrochloric acid

Inhalation 15 mg/m³

Long term exposure local effects

Hydrochloric acid

Inhalation 8 mg/m³

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering measures to reduce exposure

Ensure adequate ventilation. Provide mechanical general and/or local exhaust ventilation to prevent release of vapor or mist into work environment.

Personal protective equipment

Eye protection Eye protection must conform to standard EN 166. Chemical splash goggles and face shield.

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training
Use protective gloves made of: Butyl Rubber Nitrile Viton
Break through time >480 minutes
Glove thickness 0.5 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection No personal respiratory protective equipment normally required, In case of insufficient ventilation wear suitable respiratory equipment, Respirator with combination filter for vapour/particulate (EN 141), Type E/P2, At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing, Eye wash and emergency shower must be available at the work place.

Hygiene measures Wash hands before eating, drinking or smoking, Remove and wash contaminated clothing before re-use.

9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odour	Pungent
Colour	Colourless
Odour threshold	No information available

Property	Values	Remarks
pH	< 2	
pH @ dilution		
Melting / freezing point	< 0 °C / 32 °F	
Boiling point/range	~100 °C / 212 °F	
Flash point	Not applicable	
Evaporation rate	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapour pressure	31.33 hPa (@ 20°C)	
Vapour density	1.267	
Specific gravity	1.1	@ 16 °C
Bulk density	No information available	
Relative density	1.161 - 1.19 g/cm³	@ 20 °C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	1 mPa.s (@ 20 °C)	
log Pow	Not determined	

Explosive properties	Not applicable
Oxidising properties	None known

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

10. Stability and reactivity

10.1 Reactivity

Corrosive. Corrosive to Metals. Contact with metals may evolve flammable hydrogen gas.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerisation
Hazardous polymerisation does not occur.

10.4 Conditions to avoid

Avoid excessive heat for prolonged periods of time.

10.5 Incompatible materials

Strong oxidising agents. Alkalis. Metals.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Vapours are corrosive. After 24-36 hours, injured persons may develop serious shortness of breath and lung oedema. Vapours irritate the respiratory system, and may cause coughing and difficulties in breathing.

Eye contact Causes serious eye damage.

Skin contact Causes severe skin burns.

Ingestion Ingestion causes burns of the upper digestive and respiratory tracts.

Unknown acute toxicity Not applicable.

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrochloric acid	238 - 277 mg/kg (Rat)	> 5010 mg/kg (Rabbit)	= 1.68 mg/L (Rat) 1 h

Sensitisation This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	Inhalation. Skin contact. Eye contact.
Specific target organ toxicity - Single exposure	Category 3
Specific target organ toxicity - Repeated exposure	Not classified.
Target organ effects	Respiratory system.
Aspiration hazard	Not applicable.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment. Large amounts will affect pH and harm aquatic organisms

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Hydrochloric acid	= 282 mg/L LC50 Gambusia affinis 96 h	No information available	No information available

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

12.4 Mobility in soil

Mobility
Soluble in water.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of as hazardous waste in compliance with local and national regulations.
Contaminated packaging	Empty containers should be transported/delivered using a registered waste carrier for local recycling or waste disposal.
EWC Waste Disposal No	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific Waste codes should be assigned by the user based on the application for which the product was used The following Waste Codes are only suggestions: EWC waste disposal No: 7131 Inorganic Acids 16 03 03 - inorganic wastes containing dangerous substances

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN 1789
UN No. (IMDG)	UN 1789
UN No. (ICAO)	UN 1789

14.2. UN proper shipping name
HYDROCHLORIC ACID SOLUTION 15%

14.3. Hazard class(es)

ADR/RID/ADN/ADG Hazard class	8
IMDG Hazard class	8
ICAO Hazard class/division	8

14.4 Packing group

ADR/RID/ADN/ADG Packing Group	III
IMDG Packing group	III

ICAO Packing group III

14.5 Environmental hazard
No

14.6 Special precautions

Hazard ID	80
EmS (IMDG)	F-A, S-B
Emergency Action Code (EAC)	2R
Tunnel restriction code	(E)

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Germany, Water Endangering Classes (VwVwS)	Hazardous to water/Class 1

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Hydrochloric acid
Schedule 6
Schedule 5

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

Dutch Mining Regulations: In accordance with Mining Regulations 9.2 and Chapter 4 of the Working Conditions Decree.

International inventories

USA, Toxic Substances Control Act inventory (TSCA)	Complies
European Union - EINECS and ELINCS	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Inventory - Japan - Existing and New Chemicals list	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korea (KECL)	Complies
Inventory - New Zealand - Inventory of Chemicals (NZIoC)	Complies

15.2 Chemical Safety Report

No information available

16. Other information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supercedes date	19/Apr/2016
Revision date	31/Mar/2017
Version	3
This SDS has been revised in the following section(s)	All sections There have been changes with regard to classification.

Text of R phrases mentioned in Section 3
R34 - Causes burns
R37 - Irritating to respiratory system

Full text of H-Statements referred to under sections 2 and 3

H314 - Causes severe skin burns and eye damage
H335 - May cause respiratory irritation
H290 - May be corrosive to metals

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. J218
Version 5
Revision date 09-Aug-2018
Supersedes Date: 08-Sep-2017

Safety Data Sheet
Breaker J218

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Breaker J218
Product code J218

CAS No [redacted]
EC No 231-786-5

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a fracturing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

Croatia	01-23-48-342(for medical information) -Center for Poison

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2A
Respiratory sensitization	Category 1
Skin sensitization	Category 1
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards Not classified

Physical Hazards

Oxidizing Solids	Category 3

2.2 Label elements

Signal word
DANGER

Hazard Statements
H302 - Harmful if swallowed
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H319 - Causes serious eye irritation
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 - May cause respiratory irritation
H272 - May intensify fire; oxidizer

Precautionary statements
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P304 + P341 - IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing
P342 + P311 - If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician
P280 - Wear protective gloves and eye/face protection

Supplementary precautionary statements
P220 - Keep away from clothing and other combustible materials
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P285 - In case of inadequate ventilation wear respiratory protection
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P330 - Rinse mouth
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P337 + P313 - If eye irritation persists: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/ container to an approved waste disposal plant
P410 - Protect from sunlight
P411 + P235 - Store at temperatures not exceeding 38 °C/ 100 °F. Keep cool
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable
P370 + P378 - In case of fire: Use water spray to extinguish

Contains
Diammonium peroxidisulphate

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Do not expose materials or their containers to moisture.

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Diammonium peroxidisulphate	231-786-5	[redacted]	60-100

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get immediate medical attention.

Ingestion Rinse mouth. Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Get immediate medical attention.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention.

Eye Contact Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Get immediate medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Deluge with water. Other methods not effective.

Extinguishing media which must not be used for safety reasons
Dry chemical, carbon dioxide and other gas-filled extinguishers.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
May intensify fire; oxidizer.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors Sulfur oxides, Oxygen, Nitrogen oxides (NOx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 1Z

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Do not breathe dust. Avoid contact with the skin and the eyes.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Spilled oxidizer must be removed immediately and isolated for disposal. Isolated material must be monitored for signs of decomposition (fuming/smoking). If spilled material is wet, dissolve with large quantity of water. All disposals must be carried out at the earliest opportunity and in accordance with local /regional /national /international regulations. Take up mechanically and collect in suitable container for disposal. Use non-sparking tools and equipment. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Do not handle until all safety precautions have been read and understood. Handle in accordance with good industrial hygiene and safety practice. Follow procedures for safe handling of oxidizers. Do not expose materials or their containers to moisture. Keep away from open flames, hot surfaces and sources of ignition. Avoid handling causing generation of dust. Avoid contact with skin and eyes. May produce an allergic reaction.

Hygiene Measures
Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing When using do not smoke, eat or drink.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Ensure adequate ventilation. Keep airborne concentrations below exposure limits.

Storage precautions Oxidizers must be stored separately from all other materials. Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Keep away from direct sunlight. Keep at a temperature not exceeding 110 °F /43 °C Keep away from open flames,

hot surfaces and sources of ignition Oxidizing material - Keep away from flammable and combustible materials. Store away from incompatible materials Oxidizing agents Reducing Agents Acids

Storage class Oxidiser storage.

Packaging materials Use specially constructed containers only.

Packaging materials to be avoided Containers made of MONEL, copper, brass, or iron.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits Control as an ACGIH particulate not otherwise specified (PNOS): 10 mg/m³ (Inhalable); 3 mg/m³ (Respirable) and an OSHA particulate not otherwise regulated (PNOR): 15 mg/m³ (Total); 5 mg/m³ (Respirable).

Component Information

Chemical Name	Arabic	Australia	Egypt
Diammonium peroxidisulphate	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Diammonium peroxidisulphate	Not determined	0.1 mg/m³ TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Diammonium peroxidisulphate	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Diammonium peroxidisulphate	0.1 mg/m³ TWA	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Diammonium peroxidisulphate	Not determined	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will

vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Tightly fitting safety goggles
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Do not wear rings, watches or anything similar which can retain the product and may give rise to skin conditions. Wear protective butyl rubber gloves Break through time >480 minutes Glove thickness 2 mm Frequent change is advisable
Respiratory protection	Use the indicated respiratory protection if the occupational exposure limit is exceeded and/or in case of product release (dust) Effective dust mask. Half mask with a particle filter P2 (European Norm EN 143 = former DIN 3181) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Crystalline
Odor	Odorless
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	4 - 5 @10 g/l	
Melting / freezing point	120 °C / 249 °F	
Boiling point/range	No information available	
Flash point		
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	

Vapor density	No information available	
Specific gravity	No information available	
Bulk density	1000 Kg/m³	
Relative density	1.26 g/cm³	@ 20°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	120 °C / 249 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	Strong oxidizer. Contact with other material may cause fire

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

This product is a strong oxidizer and reacts violently with combustibles and reducing agents.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid contamination. Avoid dust formation. Protect from moisture. Keep away from direct sunlight. Keep at a temperature not exceeding 110 °F /43 °C. Keep away from open flames, hot surfaces and sources of ignition. Oxidizing material - Keep away from flammable and combustible materials.

10.5 Incompatible materials

Do not mix oxidizers of any concentration with other oxidizing agents, reducing agents, flammable or combustible liquids or solids, acids, most metals and heavy metals, oxygen scavengers, corrosion inhibitors, surfactants, gelling agents, fluid-loss additives, cross linkers, solvents, foaming agents, clay control agents, or any chemical not specifically mentioned as being compatible with the specific oxidizer.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information May produce an allergic reaction.

Inhalation May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause irritation of respiratory tract.

Eye contact Causes serious eye irritation.

Skin contact Irritating to skin. May cause an allergic skin reaction.

Ingestion Harmful if swallowed.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Diammonium peroxidisulphate	700-742 mg/kg (Rat)	> 2000 mg/kg (Rat)	No data available

Sensitization May cause sensitization by inhalation and skin contact.

Mutagenic effects This substance has no evidence of mutagenic properties.

Carcinogenicity This substance has no evidence of carcinogenic properties.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Inhalation. Skin contact. Eye contact.

Routes of entry Inhalation. Ingestion. Skin contact.

Specific target organ toxicity - Single exposure Category 3

Specific target organ toxicity - Repeated exposure Not classified.

Target organ effects Respiratory system.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Diammonium peroxidisulphate	= 76.3 mg/L LC50 Oncorhynchus mykiss 96 h	= 136 mg/l EC50 Phaenodactylum tricornutum 72h	= 120 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations.

Contaminated packaging Do not re-use empty containers. Dispose of contents/container to an approved waste disposal plant.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN 1444
UN No. (IMDG/ANTAQ)	UN 1444
UN No. (ICAO/ANAC)	UN 1444

14.2. UN proper shipping name
AMMONIUM PERSULFATE,

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	5.1
IMDG/ANTAQ Hazard class	5.1
ICAO/ANAC Hazard class/division	5.1

14.4 Packing group

ADR/RID/ADN/ADG Packing group	PG III
IMDG/ANTAQ Packing group	PG III
ICAO/ANAC Packing group	PG III

14.5 Environmental hazard

Marine pollutant
No

14.6 Special precautions

Hazard identification no (ADR)	50
EmS (IMDG)	F-A, S-Q
Tunnel restriction code	(E)
Hazchem code ADG	1Z

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Not applicable

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Diammonium peroxidisulphate
Schedule 6

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	08-Sep-2017
Revision date	09-Aug-2018
Version	5
This SDS has been revised in the following section(s)	2, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2
Flammability	1
Physical hazard	2
PPE	X

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SDS no. J475
Version 4
Revision date 31-Aug-2017
Supersedes Date: 21-Aug-2017

Safety Data Sheet
EB-Clean* J475 Breaker

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name EB-Clean* J475 Breaker
Product code J475

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a fracturing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Skin corrosion/irritation	Category 2
Serious eye damage/eye irritation	Category 2
Respiratory sensitization	Category 1
Skin sensitization	Category 1
Specific target organ toxicity - Single exposure	Category 3

Environmental hazards Not classified

Physical Hazards

Oxidizing Solids	Category 3

2.2 Label elements

Signal word
DANGER

Hazard Statements
H302 - Harmful if swallowed
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H319 - Causes serious eye irritation
H334 - May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 - May cause respiratory irritation
H272 - May intensify fire; oxidizer

Precautionary statements
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P370 + P378 - In case of fire: Use water spray to extinguish
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P410 - Protect from sunlight
P411 - Store at temperatures not exceeding 38 °C/ 100 °F

Supplementary precautionary statements
P221 - Take any precaution to avoid mixing with combustibles
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P272 - Contaminated work clothing should not be allowed out of the workplace
P285 - In case of inadequate ventilation wear respiratory protection
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P304 + P341 - IF INHALED: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P330 - Rinse mouth
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P337 + P313 - If eye irritation persists: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Diammonium peroxodisulphate

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Diammonium peroxodisulphate	231-786-5	[redacted]	60 - 100

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult give oxygen. Get immediate medical attention.

Ingestion Rinse mouth. Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Get immediate medical attention.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention.

Eye Contact Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye. Get immediate medical attention.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Deluge with water. Other methods not effective.

Extinguishing media which must not be used for safety reasons
Dry chemical, carbon dioxide and other gas-filled extinguishers.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
May intensify fire; oxidizer.

Hazardous combustion products
Heating or fire can release toxic gas Sulphur oxides, Oxygen, Nitrogen.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 1Z

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Do not breathe dust. Avoid contact with the skin and the eyes.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Spilled oxidizer must be removed immediately and isolated for disposal. Isolated material must be monitored for signs of decomposition (fuming/smoking). If spilled material is wet, dissolve with large quantity of water. All disposals must be carried out at the earliest opportunity and in accordance with local /regional /national /international regulations. Take up mechanically and collect in suitable container for disposal. Take precautionary measures against static discharges. Use non-sparking tools and equipment. Avoid dust formation. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Do not handle until all safety precautions have been read and understood. Handle in accordance with good industrial hygiene and safety practice. Follow procedures for safe handling of oxidizers. Do not expose materials or their containers to moisture. Keep

away from open flames, hot surfaces and sources of ignition. Avoid handling causing generation of dust. Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Avoid contact with skin and eyes. Persons susceptible to allergic reactions should not handle this product.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Provide appropriate exhaust ventilation at places where dust is formed. Keep away from heat, sparks, and flame. Keep containers in cool areas out of direct sunlight and away from combustibles.

Storage precautions Oxidizers must be stored separately from all other materials. Keep containers tightly closed in a dry, cool and well-ventilated place Protect from moisture Keep away from direct sunlight. Keep at a temperature not exceeding 100°F /38 °C Keep away from open flames,

hot surfaces and sources of ignition Oxidizing material - Keep away from flammable and combustible materials. Store away from incompatibles, Strong reducing agents Strong bases Reducing Agents Heavy metals

Packaging materials Use specially constructed containers only. Coated (epoxy phenolic) steel drum or high density polyethylene (HDPE) can

Packaging materials to be avoided Containers made of MONEL, copper, brass, or iron.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust.
No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Diammonium peroxodisulphate	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Diammonium peroxodisulphate	Not determined	0.1 mg/m^3 TWA	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Diammonium peroxodisulphate	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Diammonium peroxodisulphate	0.1 mg/m^3 TWA	Not determined	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Diammonium peroxodisulphate	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Eye protection must conform to standard EN 166 Wear dust resistant safety goggles where there is a danger of eye contact.
Hand protection	Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Do not wear rings, watches or anything similar which can retain the product and may give rise to skin conditions. Impervious gloves made of: polyvinyl alcohol or nitrile-butyl rubber gloves Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Sweet
Color	White
Odor threshold	Not applicable

Property	Values	Remarks
pH	No information available	
pH @ dilution	6.5 - 8	@ 10g/l
Melting / freezing point	Decomposes	
Boiling point/range	No information available	
Flash point	> 93 °C / > 200 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.8	@20 °C
Bulk density	1150 kg/m³	
Relative density	No information available	
Water solubility	10 - 20 g/l	@ 20 °C
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	120 °C/ 248 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	

log Pow	No information available

Explosive properties	No information available
Oxidizing properties	Oxidizer. Contact with other material may cause fire

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

This product is a strong oxidizer and reacts violently with combustibles and reducing agents.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Protect from moisture. Avoid dust formation. Avoid contamination. Keep away from direct sunlight.

10.5 Incompatible materials

Do not mix oxidizers of any concentration with other oxidizing agents, reducing agents, flammable or combustible liquids or solids, acids, most metals and heavy metals, oxygen scavengers, corrosion inhibitors, surfactants, gelling agents, fluid-loss additives, cross linkers, solvents, foaming agents, clay control agents, or any chemical not specifically mentioned as being compatible with the specific oxidizer.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information	May produce an allergic reaction.
Inhalation	May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause irritation of respiratory tract. May cause drowsiness or dizziness.
Eye contact	Causes serious eye irritation.
Skin contact	Irritating to skin. May cause an allergic skin reaction.

Ingestion Harmful if swallowed.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Diammonium peroxodisulphate	= 495 mg/kg (Rat)	> 10000 mg/kg (Rabbit)	= 520 mg/L (Rat) 1 h

Sensitization May cause sensitization by inhalation and skin contact.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Skin contact. Eye contact. Ingestion.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Category 3

Specific target organ toxicity - Repeated exposure Not classified.

Target organ effects Respiratory system.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Diammonium peroxodisulphate	= 323 mg/L LC50 Poecilia reticulata 96 h = 76.3 mg/L LC50 Oncorhynchus mykiss 96 h = 103 mg/L LC50 Lepomis macrochirus 96 h	No information available	= 120 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

Not Applicable - Inorganic chemical.

Chemical Name	Persistence and degradability
Diammonium peroxodisulphate	Hydrolyzes

12.3 Bioaccumulative potential

Not Applicable - Inorganic chemical.

Chemical Name	Bioaccumulation
Diammonium peroxodisulphate	Product does not bioaccumulate due to reaction with water

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Chemical Name	Mobility
Diammonium peroxodisulphate	Easily soluble

Mobility in soil
No information available.

Chemical Name	Mobility in soil
Diammonium peroxodisulphate	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products Dispose of as special waste in compliance with local and national regulations.

Contaminated packaging Do not re-use empty containers. Dispose of contents/container to an approved waste disposal plant.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN1444
UN No. (IMDG/ANTAQ)	UN1444
UN No. (ICAO/ANAC)	UN1444

14.2. UN proper shipping name
AMMONIUM PERSULFATE,

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	5.1
IMDG/ANTAQ Hazard class	5.1
ICAO/ANAC Hazard class/division	5.1

14.4 Packing group

ADR/RID/ADN/ADG Packing group	III
IMDG/ANTAQ Packing group	III
ICAO/ANAC Packing group	III

14.5 Environmental hazard

Marine pollutant
No

14.6 Special precautions

EmS (IMDG)	F-A, S-Q
Tunnel restriction code	E
Hazchem code ADG	1Z

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Diammonium peroxodisulphate
Schedule 6

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Anne Karin (Anka) Fosse
Supersedes Date:	21-Aug-2017
Revision date	31-Aug-2017
Version	4
This SDS has been revised in the following section(s)	8. EXPOSURE CONTROLS / PERSONAL PROTECTION No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2*
Flammability	1
Physical hazard	1
PPE	X

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SDS no. J580
Version 4
Revision date 07-Aug-2018
Supersedes Date: 21-Apr-2017

Safety Data Sheet
Water Gelling Agent J580

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Water Gelling Agent J580
Product code J580

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a fracturing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Suspended dust may present a dust explosion hazard

Australian statement of hazardous/dangerous nature
Classified as Non-Hazardous according to the criteria of NOHSC.
NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.
Symptoms	
Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Dust may form explosive mixture in air.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Extinguish all ignition sources. Avoid sparks, flames, heat and smoking.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Cover powder spill with plastic sheet or tarp to minimize spreading. Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Take precautionary measures against static discharges. Sweep up and shovel into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Material becomes slippery when wet. Use caution if wet.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Keep away from open flames, hot surfaces and sources of ignition Protect from moisture Avoid contact with: Oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	NUI = Nuisance dust, TWA 4mg/m^3 Respirable Dust, 10mg/m^3 Total Dust.

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Mechanical ventilation or local exhaust ventilation is required. Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against powders and dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Use protective gloves made of: Neoprene Nitrile Rubber Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	Slight
Color	Light tan
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	5.5 - 7.5 (10g/L)	
Melting / freezing point	> 180 °C / 356 °F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.40 - 1.45	
Bulk density	800 kg/m³	
Relative density	No information available	
Water solubility	Dispersible	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	> 242 °C / 468 °F	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties Suspended dust may present a dust explosion hazard
Oxidizing properties None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments

The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Avoid dust formation. Protect from moisture.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.

Routes of exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not applicable.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

Listed on PLONOR list of OSPAR The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

The product does not contain any substances expected to be bioaccumulating.

12.4 Mobility

Mobility
Dispersible in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

No poisons schedule number allocated

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	21-Apr-2017
Revision date	07-Aug-2018
Version	4
This SDS has been revised in the following section(s)	1, 2, 7, 8, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	D

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SDS no. J604
Version 3
Revision date 22-Feb-2019
Supersedes Date: 30-Sep-2015

Safety Data Sheet
Crosslinker J604

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Crosslinker J604
Product code J604

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a fracturing additive in oilfield applications

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Acute toxicity - Oral	Category 4
Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H302 - Harmful if swallowed
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P330 - Rinse mouth

Supplementary precautionary statements
P314 - Get medical advice/attention if you feel unwell
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations as applicable

Contains
Ethylene Glycol

Sodium Tetraborate Decahydrate

but-2-enedioic acid

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Ethylene Glycol	203-473-3	[redacted]	10-30
Sodium Tetraborate Decahydrate	215-540-4	[redacted]	1-<5
but-2-enedioic acid	203-743-0	[redacted]	1-<3

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Seek medical attention if irritation occurs.

Skin contact Wash off immediately with soap and plenty of water. Remove contaminated clothing and shoes. Seek medical attention if irritation occurs.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid contact with skin, eyes and inhalation of vapors. Wash thoroughly after handling. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13). After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Avoid spills and splashing during use. Do not breathe vapors or spray mist.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Do not eat, drink or smoke when using this product Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Store in original container. Avoid heat, flames and other sources of ignition. Keep away from direct sunlight. Store away from incompatibles, Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Ethylene Glycol	Not determined	40ppmSTELvapour 104mg/m³STELvapour 10mg/m³TWAparticulate 20ppmTWAvapour 52mg/m³TWAvapour	39.4 ppm Ceiling 100 mg/m³ Ceiling
Sodium Tetraborate Decahydrate	Not determined	5mg/m³TWA 1mg/m³TWA	5 mg/m³ TWA
but-2-enedioic acid	Not determined	Not determined	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Ethylene Glycol	Not determined	100 mg/m³ STEL	Not determined
Sodium Tetraborate Decahydrate	Not determined	5 mg/m³ TWA	Not determined
but-2-enedioic acid	Not determined	Not determined	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Ethylene Glycol	5 mg/m³ MAC	125 mg/m³ TWA 50.0 ppm TWA 100 mg/m³ STEL	50 ppm Ceiling mist and vapour 127 mg/m³ Ceiling mist and vapour
Sodium Tetraborate Decahydrate	Not determined	Not determined	5 mg/m³ TWA
but-2-enedioic acid	Not determined	Not determined	Not determined
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Ethylene Glycol	39.4 ppm Ceiling aerosol 100 mg/m³ Ceiling aerosol	Not determined	10 mg/m³ STEL 5 mg/m³ TWA
Sodium Tetraborate Decahydrate	5 mg/m³ TWA	Not determined	2 mg/m³ MAC
but-2-enedioic acid	Not determined	Not determined	5 mg/m³ MAC
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Ethylene Glycol	Not determined	10 mg/m³ TWA 60 mg/m³ TWA 20 mg/m³ STEL 125 mg/m³ STEL	40 ppm STEL 104 mg/m³ STEL Skin 20 ppm TWA 52 mg/m³ TWA
Sodium Tetraborate Decahydrate	5 mg/m³ TWA	Not determined	Not determined
but-2-enedioic acid	Not determined	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Keep airborne concentrations below exposure limits Ensure adequate ventilation, especially in confined areas

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles Safety glasses with side-shields

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Wear chemical resistant gloves such as nitrile or neoprene. Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Use respirator with organic vapor protection (A, brown) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Opaque
Odor	Odorless
Color	Beige or Milky white
Odor threshold	Not applicable

Property	Values	Remarks
pH	6.5 - 7.2	
pH @ dilution	No information available	
Melting / freezing point	No information available	
Boiling point/range	No information available	
Flash point	Does not flash	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.27 - 1.37	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Miscible with water.	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	None known.

9.2 Other information

Pour point	< -15 °C / < 5 °F
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Keep away from direct sunlight.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system. Harmful: danger of serious damage to health by prolonged exposure through inhalation.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation.

Ingestion Harmful if swallowed. May cause adverse kidney effects. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethylene Glycol	= 4700 mg/kg (Rat)	= 9530 µL/kg (Rabbit) = 10600 mg/kg (Rat)	No data available
Sodium Tetraborate Decahydrate	LD50 = 2660 mg/kg (Rat)	> 10000 mg/kg (Rabbit)	> 2 mg/m³ (Rat) 4 h
but-2-enedioic acid	= 9300 mg/kg (Rat)	> 20000 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity	Contains a known or suspected reproductive toxin.
Routes of Exposure	Inhalation. Skin contact. Eye contact. Ingestion.
Routes of entry	Inhalation. Skin contact. Eye contact.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Category 2.
Target organ effects	Kidney.
Aspiration hazard	Not classified.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ethylene Glycol	= 16000 mg/L LC50 Poecilia reticulata 96 h 40000 - 60000 mg/L LC50 Pimephales promelas 96 h = 40761 mg/L LC50 Oncorhynchus mykiss 96 h = 27540 mg/L LC50 Lepomis macrochirus 96 h 14 - 18 mL/L LC50 Oncorhynchus mykiss 96 h = 41000 mg/L LC50 Oncorhynchus mykiss 96 h	6500 - 13000 mg/L EC50 Pseudokirchneriella subcapitata 96 h	= 46300 mg/L EC50 Daphnia magna 48 h
Sodium Tetraborate Decahydrate	340 mg/L LC50 (Limanda limanda) = 96 h	2.6 - 21.8	1085 - 1402 mg/L LC50 (Daphnia magna) = 48 h
but-2-enedioic acid	= 245 mg/L LC50 Brachydanio rerio 48 h	= 41 mg/L EC50 Desmodesmus subspicatus 72 h	= 73.6 mg/L EC50 Daphnia magna 24 h 204 - 220 mg/L EC50 Daphnia magna 48 h

12.2 Persistence and degradability

No information available.

12.3 Bioaccumulative potential

No information available.

12.4 Mobility

Mobility
No information available.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated

IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

Marine pollutant
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Ethylene Glycol
Schedule 6
Schedule 5
Sodium Tetraborate Decahydrate
Schedule 4
Schedule 5

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Does not comply
Japan (ENCS)	Does not comply
China (IECSC)	Does not comply
Australia (AICS)	Complies
Korean (KECL)	Does not comply
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals)
Supersedes Date:	30-Sep-2015

Revision date	22-Feb-2019
Version	3
This SDS has been revised in the following section(s)	All sections Updated according to GHS/CLP.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	2*
Flammability	1
Physical hazard	0
PPE	X

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SDS no. J711
Version 1
Revision date 21-Oct-2020
Supersedes Date: None

Safety Data Sheet
Dry High Viscosity Friction Reducer J711

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name	Dry High Viscosity Friction Reducer J711
Product code	J711
Country Limitations	This SDS is not for use in the European Union (EU).

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use	Friction reducer.
Uses advised against	Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield UK PLC
Schlumberger House, Buckingham Gate
Gatwick Airport
West Sussex RH6 0NZ

+ 47 51577424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards	Not classified
Environmental hazards	Not classified
Physical Hazards	Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

–

Contains No hazardous components

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria
Combustible dust

3. Composition/information on Ingredients

3.1 Substances

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

3.2 Mixtures

Not applicable

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if irritation persists.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
Do not use water jet.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Suspended dust may present a dust explosion hazard.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Keep away from combustible material. Avoid contact with heat, sparks, open flame, and static discharge. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Cover powder spill with plastic sheet or tarp to minimize spreading.

Methods for cleaning up
Avoid dust formation. Do not dry sweep dust. Wet dust with water before sweeping or use a vacuum to collect dust. Take precautionary measures against static discharges. Use non-sparkling tools and equipment. Material becomes slippery when wet. Use caution if wet. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid handling causing generation of dust. All equipment used when handling the product must be grounded. Material becomes slippery when wet. Use caution if wet. Avoid breathing dust; if exposed to high dust concentration, leave area immediately. Fine dust dispersed in air may ignite. Take precautionary measures against static discharges.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits. Take precautionary measures against static discharges. Ensure all equipment is electrically grounded before beginning transfer operations.
Storage precautions	Keep container/package tightly closed and in a well-ventilated place. Keep away from open flames, hot surfaces and sources of ignition Avoid contact with: Strong oxidizing agents Strong acids Strong bases
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits	Contains no substances with occupational exposure limit values

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical

hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against dusts Tightly fitting safety goggles Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Wear chemical resistant gloves such as nitrile or neoprene. Frequent change is advisable
Respiratory protection	No personal respiratory protective equipment normally required In case of insufficient ventilation wear suitable respiratory equipment Half mask with a particle filter P2 (BS EN 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Powder
Odor	No information available
Color	Off-white
Odor threshold	Not applicable

Property	Values	Remarks
pH	7 - 8	
pH @ dilution	No information available	
Melting / freezing point	> 300◦C / 572◦F	
Boiling point/range	No information available	
Flash point	No information available	
Evaporation rate	Not applicable	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	

Vapor pressure	No information available
Vapor density	No information available
Specific gravity	0.8
Bulk density	No information available
Relative density	No information available
Water solubility	Soluble in water
Solubility in other solvents	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Kinematic viscosity	No information available
Dynamic viscosity	No information available
log Pow	No information available

Explosive properties	Suspended dust may present a dust explosion hazard
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation. Avoid heat, flames and other sources of ignition.

10.5 Incompatible materials

Strong oxidizing agents. Strong acids. Strong bases.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.
Eye contact	Dust may cause mechanical irritation.
Skin contact	Repeated exposure may cause skin dryness or cracking.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of Exposure	Inhalation. Skin contact. Eye contact.
Routes of entry	Inhalation.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	No information available.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

This SDS is not for use in the European Union (EU).

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Poh Yue Cheong
Revision date	21-Oct-2020
Version	1
This SDS has been revised in the following section(s)	New issue.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	E

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SDS no. L065
Version 4
Revision date 18-Oct-2016
Supersedes date 11-Dec-2014

Safety Data Sheet
Scale Inhibitor L065

1. Identification of the substance/preparation and of the Company/undertaking

1.1 Product identifier

Product name Scale Inhibitor L065
Product code L065

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Scale Inhibitor. Used as a fracturing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518, Canada 001 613 996 6666

2. Hazards identification

2.1 Classification of the substance or mixture

Classification according to (EC) No. 1272/2008

Health hazards

Acute oral toxicity	Category 4
Specific target organ toxicity (repeated exposure)	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard statements
H302 - Harmful if swallowed
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary Statements - EU (§28, 1272/2008)
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/ physician if you feel unwell
P330 - Rinse mouth
P501 - Dispose of contents/container in accordance with local regulations.

Supplementary precautionary statements
P314 - Get medical advice/attention if you feel unwell

-

Contains
Ethylene glycol

Calcium Chloride

2,2''-oxydiethanol (impurity)

Sodium hydroxide (impurity)

2.3 Other data

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not Applicable

3.2 Mixtures

Component	EC-No.	CAS-No	Weight % - range	Classification (67/548)	Classification (Reg. 1272/2008)	REACH registration number
Ethylene glycol	203-473-3	[redacted]	10-30	Xn; R48/22	Acute Tox. 4 (H302)	No data available

					STOT RE. 2(H373)	
Calcium Chloride	233-140-[redacted] - 5			Xi; R36	Eye Irrit. 2 (H319)	No data available
2,2"-oxydiethanol (impurity)	203-872-2	[redacted]	0.1 - 1.0	Xn; R22, R48/22	Acute Tox. 4 (H302) STOT RE. 2 (H373)	01-2119457857-21-xxxx
Sodium hydroxide (impurity)	215-185-5	[redacted]	<1	C;R35	Skin Corr. 1A (H314)	No data available

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First aid measures

4.1 First-Aid Measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

Eye contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses. Get medical attention if any discomfort continues.

4.2 Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Main symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which shall not be used for safety reasons
None known.

5.2 Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and materials for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing. Do not eat, drink or smoke when using this product.

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid extreme temperatures. Avoid heat, flames and other sources of ignition. Store away from incompatibles, Strong oxidizing agents

Storage class Chemical storage.

Packaging material Use specially constructed containers only.

7.3 Specific end uses

See Section 1.2.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component	EU OEL	Austria	Australia	Denmark
Ethylene glycol	40 ppm STEL 104 mg/m³ STEL 20 ppm TWA 52 mg/m³ TWA Possibility of significant uptake through the skin	20 ppm STEL 52 mg/m³ STEL 10 ppm TWA 26 mg/m³ TWA	40ppmSTELvapour 104mg/m³STELvapour 10mg/m³TWAparticulate 20ppmTWAvapour 52mg/m³TWAvapour skin notation	10 ppm TWA 26 mg/m³ TWA 10 mg/m³ TWA Potential for cutaneous absorption
Calcium Chloride	Not determined	Not determined	Not determined	Not determined
2,2''-oxydiethanol (impurity)	Not determined	40 ppm STEL 176 mg/m³ STEL 10 ppm TWA 44 mg/m³ TWA	23ppmTWA 100mg/m³TWA	2.5 ppm TWA 11 mg/m³ TWA
Sodium hydroxide (impurity)	Not determined	4 mg/m³ STEL inhalable fraction 2 mg/m³ TWA inhalable fraction	Not determined	2 mg/m³ Ceiling
Component	**Malaysia**	**France**	**Germany**	**Hungary**
Ethylene glycol	39.4 ppm Ceiling aerosol 100 mg/m³ Ceiling aerosol	40ppmSTEL 104mg/m³STEL 20 ppmTWA 52 mg/m³TWA	10 ppm TWA 26 mg/m³ TWA	52mg/m³TWA 104mg/m³STEL
Calcium Chloride	Not determined	Not determined	Not determined	Not determined
2,2''-oxydiethanol (impurity)	Not determined	Not determined	10 ppm TWA 44 mg/m³ TWA	Not determined
Sodium hydroxide (impurity)	2 mg/m³ Ceiling	2 mg/m³TWA	Not determined	2mg/m³TWA 2mg/m³STEL
Component	**New Zealand**	**Italy**	**Netherlands**	**Norway**
Ethylene glycol	50 ppm Ceiling mist and vapour 127 mg/m³ Ceiling mist and vapour	Not determined	104mg/m³STEL 52 mg/m³ 10 mg/m³	20 mg/m³ TWA dust 52 ppm TWA total dust and vapor 52 mg/m³ TWA 52 mg/m³ STEL dust 20 ppm STEL Skin
Calcium Chloride	Not Determined	Not determined	Not determined	Not determined
2,2''-oxydiethanol (impurity)	23 ppm TWA 101 mg/m³ TWA	Not determined	Not determined	Not determined
Sodium hydroxide (impurity)	2 mg/m³ Ceiling	Not determined	Not determined	2 mg/m³ Ceiling
Component	**Poland**	**Portugal**	**Romania**	**Russia**
Ethylene glycol	50 mg/m³ STEL NDSCh 15 mg/m³ TWA NDS	Skin 40 ppm STEL VLE-CD 104 mg/m³ STEL VLE-CD 20 ppm TWA indicative limit value 52 mg/m³ TWA indicative limit value	40ppmSTEL 104mg/m³STEL 20ppmTWA 52mg/m³TWA	10 mg/m³ STEL 2308 aerosol and vapor 5 mg/m³ TWA 2308
Calcium Chloride	Not determined	Not determined	Not determined	2 mg/m³ MAC Skin
2,2''-oxydiethanol (impurity)	10 mg/m³ TWA NDS	Not determined	184ppmSTEL 800mg/m³STEL 115ppmTWA	10 mg/m³ MAC (aerosol and vapor)

			500mg/m³TWA	
Sodium hydroxide (impurity)	1 mg/m³ STEL NDSCh 0.5 mg/m³ TWA NDS	Not determined	Not determined	Not determined
Component	**Spain**	**Switzerland**	**Turkey**	**UK**
Ethylene glycol	40 ppm STEL 104 mg/m³ STEL Skin 20 ppm TWA VLA-ED 52 mg/m³ TWA VLA-ED	20 ppm STEL 52 mg/m³ STEL Skin 10 ppm TWA MAK 26 mg/m³ TWA MAK	40 ppm STEL 104 mg/m³ STEL Skin 20 ppm TWA 52 mg/m³ TWA	40 ppm STEL vapour 104 mg/m³ STEL vapour 30 mg/m³ STEL calculated particulate Skin 10 mg/m³ TWA particulates 20 ppm TWA vapour 52 mg/m³ TWA vapour
Calcium Chloride	Not determined	Not determined	Not determined	Not determined
2,2''-oxydiethanol (impurity)	Not determined	40 ppm STEL (KZW): 176 mg/m³ STEL (KZW)	Not determined	69 ppm STEL calculated 303 mg/m³ STEL calculated 23 ppm TWA 101 mg/m³ TWA
Sodium hydroxide (impurity)	2 mg/m³ STEL	2 mg/m³ STEL inhalable dust 2 mg/m³ TWA MAK	Not determined	2 mg/m³ STEL

Derived No Effect Level (DNEL)

Long term exposure systemic effects

2,2''-oxydiethanol (impurity)

Dermal	106 mg/kg bw/day
Inhalation	60 mg/m³

Predicted No Effect Concentration (PNEC)

2,2''-oxydiethanol (impurity)

Fresh water	10 mg/l
Sea water	1 mg/l
Fresh water sediment	20.9 mg/kg sediment dw
Sea sediment	2.09 mg/kg sediment dw
Soil	1.53 mg/kg soil dw
Impact on sewage treatment	199.5 mg/L
Intermittent release	10 mg/l

Sodium hydroxide (impurity)

Impact on sewage treatment	1503

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering measures to reduce exposure
Ensure adequate ventilation. Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection	Tightly fitting safety goggles. Safety glasses with side-shields.
Hand protection	Use protective gloves made of:, polyvinyl alcohol or nitrile-butyl rubber gloves, Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment, Respirator with combination filter for vapour/particulate (EN 141), At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear suitable protective clothing, Eye wash and emergency shower must be available at

the work place.

Hygiene measures Wash hands before breaks and immediately after handling the product, Remove and wash contaminated clothing before re-use.

9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Aqueous solution
Odor	Mild
Color	Pale yellow
Odor threshold	Not applicable

Property	Values	Remarks
pH	7.8 - 8.8	
pH @ dilution		
Melting/freezing point	-50 °C / -58 °F	
Boiling point/range	100 °C / 212 °F	
Flash point	> 100 °C / 212 °F	PMCC
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not Applicable	
Flammability Limits in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	7 kPa	@ 20 °C
Vapor density	No information available	
Specific gravity	1.2	@15.6 °C
Bulk density	No information available	
Relative density	1.2	@ 15.6°C.
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	5 mm2/s	@ 40 °C
Dynamic viscosity	6 mPa s	@ 38 °C
Log Pow	No information available	

Explosive properties	Not Applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

10. Stability and reactivity

10.1 Reactivity

Stable under recommended storage conditions.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Avoid extreme temperatures.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of vapors in high concentration may cause irritation of respiratory system.

Eye contact May cause slight irritation.

Skin contact Prolonged contact may cause redness and irritation. Components of the product may be absorbed into the body through the skin.

Ingestion Harmful if swallowed. May cause adverse cardiac effects, blood disturbances, and metabolic acidosis. May cause damage to organs through prolonged or repeated exposure.

Unknown acute toxicity Not Applicable.

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethylene glycol	= 4700 mg/kg (Rat)	= 9530 µL/kg (Rabbit) = 10600 mg/kg (Rat)	No data available
Calcium Chloride	= 1000 mg/kg (Rat)	= 2630 mg/kg (Rat)	No data available
2,2"-oxydiethanol (impurity)	= 12565 mg/kg (Rat)	= 11890 mg/kg (Rabbit)	No data available
Sodium hydroxide (impurity)	No data available	= 1350 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Skin contact. Ingestion.
Routes of entry	Ingestion. Skin contact. Skin absorption.
Specific target organ toxicity (single exposure)	Not classified
Specific target organ toxicity (repeated exposure)	Category 2.
Target organ effects	Kidney.
Aspiration hazard	Not Applicable.

12. Ecological information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Component	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Ethylene glycol	= 41000 mg/L LC50 Oncorhynchus mykiss 96 h 14 - 18 mL/L LC50 Oncorhynchus mykiss 96 h = 27540 mg/L LC50 Lepomis macrochirus 96 h = 40761 mg/L LC50 Oncorhynchus mykiss 96 h 40000 - 60000 mg/L LC50 Pimephales promelas 96 h = 16000 mg/L LC50 Poecilia reticulata 96 h	6500 - 13000 mg/L EC50 Pseudokirchneriella subcapitata 96 h	= 46300 mg/L EC50 Daphnia magna 48 h
Calcium Chloride	= 10650 mg/L LC50 Lepomis macrochirus 96 h	No information available	= 2400 mg/L LC50 Daphnia magna 48 h
2,2"-oxydiethanol (impurity)	= 75200 mg/L LC50 Pimephales promelas 96 h	No information available	= 84000 mg/L EC50 Daphnia magna 48 h
Sodium hydroxide (impurity)	= 45.4 mg/L LC50 Oncorhynchus mykiss 96 h	No information available	No information available

12.2 Persistence and degradability

No product level data available.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility in soil

Mobility
The product is water soluble, and may spread in water systems.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues / unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.
EWC Waste disposal No.	According to the European Waste Catalogue, Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user based on the application for which the product was used. The following Waste Codes are only suggestions: EWC waste disposal No: 16 05 08 - discarded organic chemicals consisting of or containing dangerous substances.

14. Transport information

14.1 UN Number
Not regulated

14.2 Proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG Hazard class	Not regulated
ICAO Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG Packing group	Not regulated
ICAO Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Ethylene glycol
Schedule 6
Schedule 5
2,2''-oxydiethanol (impurity)
Schedule 6
Schedule 5
Sodium hydroxide (impurity)
Schedule 6
Schedule 5

Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC, including amendments.

This safety data sheet complies with the requirements of Regulation (EC) No. 1272/2008.

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edition [NOHSC: 2011 (2003)].

National Occupational Health and Safety Commission's Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004) 3rd Edition].

National Occupational Health and Safety Commission's Exposure Standards for Atmospheric Contaminants in the occupational Environment [NOHSC:1003 (1995)].

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code) for transport by road or rail.

International inventories

USA (TSCA)	Complies
European Union (EINECS and ELINCS)	Does not Comply
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Does not Comply

China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Does not Comply
New Zealand (NZIoC)	Complies

15.2 Chemical Safety Report

No information available

16. Other information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Muriel Martin Beurel
Supersedes date	11-Dec-2014
Revision date	18-Oct-2016
Version	4
The following sections have been revised:	All sections, There have been changes with regard to classification.

Text of R phrases mentioned in Section 3
R22 - Harmful if swallowed
R35 - Causes severe burns
R36 - Irritating to eyes

R48/22 - Harmful: danger of serious damage to health by prolonged exposure if swallowed

Full text of H-Statements referred to under sections 2 and 3

H302 - Harmful if swallowed
H373 - May cause damage to organs through prolonged or repeated exposure
H314 - Causes severe skin burns and eye damage
H319 - Causes serious eye irritation

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

SDS no. L071
Version 4
Revision date 31-Jul-2017
Supersedes Date: 02-Aug-2016

Safety Data Sheet
L071 Temporary Clay Stabilizer

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name L071 Temporary Clay Stabilizer
Product code L071

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Clay control agent in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards Not classified

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
None

Hazard Statements
This product is not classified as hazardous therefore no (H) hazard statements assigned.

Precautionary statements
This product is not classified as hazardous therefore has no (P) precautionary statements assigned.

-

Contains No hazardous components
2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

May cause slight irritation

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

This product does not contain any hazardous ingredients, or ingredients with national workplace exposure limits.

4. First Aid Measures

4.1 First aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Ingestion	Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.
Skin contact	Wash skin thoroughly with soap and water. Get medical attention if symptoms occur.
Eye Contact	Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice	The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation	Please see Section 11. Toxicological Information for further information.
Ingestion	Please see Section 11. Toxicological Information for further information.
Skin contact	Please see Section 11. Toxicological Information for further information.
Eye contact	Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
None known.

Hazardous combustion products
Fire or high temperatures create: Thermal decomposition can lead to release of irritating gases and vapors, Nitrogen oxides (NOx), Carbon oxides (COx).

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8. Keep people away from and upwind of spill/leak. If spilled, take caution, as material can cause surfaces to become very slippery.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid breathing vapors or mists. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Store away from incompatibles, Strong oxidizing agents
Storage class	Chemical storage.
Packaging materials	Use specially constructed containers only.

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits	The product does not contain any hazardous materials with occupational exposure limits established.

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required. See section 7 for more information

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against liquid splashes Safety glasses with side-shields
Hand protection	Wear gloves according to EN 374 resistant to the solvent(s) in use Impervious gloves made of: Nitrile Break through time >480 minutes Glove thickness 0.4 mm or PVC disposable gloves Break through time >480 minutes Glove thickness 0.7 mm Be aware that liquid may penetrate the gloves. Frequent change is advisable.
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Use respirator with

organic vapor protection (A, brown)

Skin and body protection Wear suitable protective clothing Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	No information available
Odor	Mild amine
Color	Clear - Blue
Odor threshold	Not applicable

Property	Values	Remarks
pH	6.5 - 9.5	
pH @ dilution	No information available	Not applicable
Melting / freezing point	No information available	
Boiling point/range	125 °C / 257 °F	
Flash point	> 98 °C / 208.4 °F	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	0.99 - 1.20	
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	No information available
Oxidizing properties	No information available

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	No information available

Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

No specific reactivity hazards associated with this product.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

None known.

10.5 Incompatible materials

Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation	May cause irritation of respiratory tract.
Eye contact	May cause slight irritation.
Skin contact	Prolonged contact may cause redness and irritation.
Ingestion	Ingestion may cause stomach discomfort.
Unknown acute toxicity	Not applicable.

Sensitization	This product does not contain any components suspected to be sensitizing.
Mutagenic effects	This product does not contain any known or suspected mutagens.
Carcinogenicity	This product does not contain any known or suspected carcinogens.

Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
Routes of exposure	Ingestion. Skin contact. Eye contact.
Routes of entry	Skin contact. Eye contact.
Specific target organ toxicity - Single exposure	Not classified
Specific target organ toxicity - Repeated exposure	Not classified.
Aspiration hazard	Not classified.
Other information	Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

12.2 Persistence and degradability

Product is biodegradable.

12.3 Bioaccumulative potential

No product level data available.

12.4 Mobility

Mobility
Soluble in water.

Mobility in soil
After release, adsorbs onto soil.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard

Marine pollutant
No

14.6 Special precautions
None

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	02-Aug-2016
Revision date	31-Jul-2017
Version	4
This SDS has been revised in the following section(s)	1, 2, 3, 5, 7, 8, 9, 11, 15, 16 Updated according to GHS/CLP. No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

Training Advice
It is a good industrial hygiene practice to minimize skin contact

HMIS classification

Health	1
Flammability	1
Physical hazard	0
PPE	B

Disclaimer
The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.
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Safety Data Sheet
Myacide® GA 25

1. Identification

Product identifier used on the label

Myacide® GA 25

Recommended use of the chemical and restriction on use
Recommended use*: Approved only for uses listed on the FIFRA label.

* The “Recommended use” identified for this product is provided solely to comply with a Federal requirement and is not part of the seller's published specification. The terms of this Safety Data Sheet (SDS) do not create or infer any warranty, express or implied, including by incorporation into or reference in the seller's sales agreement.

Details of the supplier of the safety data sheet

Company:
BASF CORPORATION
100 Park Avenue
Florham Park, NJ 07932, USA

Telephone: +1 973 245-6000

Emergency telephone number

CHEMTREC: 1-800-424-9300
BASF HOTLINE: 1-800-832-HELP (4357)

Other means of identification

Substance number:	145849
EPA Registration number:	33753-26
Molecular formula:	CHO(CH2)3CHO
Chemical family:	dialdehydes, aqueous solution
Synonyms:	GLUTARALDEHYDE

2. Hazards Identification

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Classification of the product

Acute Tox.	4 (oral)	Acute toxicity
Acute Tox.	4 (Inhalation - mist)	Acute toxicity
Skin Corr./Irrit.	1B	Skin corrosion/irritation
Eye Dam./Irrit.	1	Serious eye damage/eye irritation
Resp. Sens.	1	Respiratory sensitization

Skin Sens.	1A	Skin sensitization
STOT SE	3 (irritating to respiratory system)	Specific target organ toxicity — single exposure
Aquatic Chronic	2	Hazardous to the aquatic environment - chronic
Aquatic Acute	1	Hazardous to the aquatic environment - acute

Label elements

Pictogram:

Signal Word:
Danger

Hazard Statement:

H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H317	May cause an allergic skin reaction.
H335	May cause respiratory irritation.
H314	Causes severe skin burns and eye damage.
H302 + H332	Harmful if swallowed or if inhaled
H411	Toxic to aquatic life with long lasting effects.
H400	Very toxic to aquatic life.

Precautionary Statements (Prevention):

P280	Wear protective gloves/protective clothing/eye protection/face protection.
P271	Use only outdoors or in a well-ventilated area.
P260	Do not breathe dust/mist/vapours.
P273	Avoid release to the environment.
P284	In case of inadequate ventilation wear respiratory protection.
P272	Contaminated work clothing should not be allowed out of the workplace.
P270	Do not eat, drink or smoke when using this product.
P264	Wash with plenty of water and soap thoroughly after handling.

Precautionary Statements (Response):

P310	Immediately call a POISON CENTER or doctor/physician.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P304 + P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P301 + P330 + P331	IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
P362 + P364	Take off contaminated clothing and wash it before reuse.
P391	Collect spillage.

Precautionary Statements (Storage):

P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P405	Store locked up.

Precautionary Statements (Disposal):

P501	Dispose of contents/container in accordance with local regulations.

Hazards not otherwise classified

No specific dangers known, if the regulations/notes for storage and handling are considered.

Labeling of special preparations (GHS):
Corrosive to the respiratory tract.

3. Composition / Information on Ingredients

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

CAS Number	Weight %	Chemical name
[redacted]	>= 20.0 - < 50.0%	glutaral
[redacted]	>= 0.0 - < 0.3%	Methanol

4. First-Aid Measures

Description of first aid measures

General advice:
Immediately remove contaminated clothing. If the patient is likely to become unconscious, place and transport in stable sideways position (recovery position). First aid personnel should pay attention to their own safety.

If inhaled:
Keep patient calm, remove to fresh air, seek medical attention.

If on skin:
Remove contaminated clothing. Rinse skin immediately with plenty of water for 15 - 20 minutes. Seek medical attention. Consult a skin specialist.

If in eyes:
Immediately wash affected eyes for at least 15 minutes under running water with eyelids held open, consult an eye specialist.

If swallowed:
Immediately rinse mouth and then drink plenty of water, do not induce vomiting, seek medical attention.

Most important symptoms and effects, both acute and delayed

Symptoms: The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further symptoms and / or effects are not known so far
Hazards: No applicable information available.

Indication of any immediate medical attention and special treatment needed

Note to physician
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote, administer corticosteroid dose aerosol to prevent pulmonary odema.

5. Fire-Fighting Measures

Extinguishing media

Suitable extinguishing media:
water spray, dry powder, foam

Special hazards arising from the substance or mixture

Hazards during fire-fighting:
harmful vapours
Evolution of fumes/fog. The substances/groups of substances mentioned can be released in case of fire.

Advice for fire-fighters

Protective equipment for fire-fighting:
Wear a self-contained breathing apparatus in confined areas or when exposed to combustion products.

Further information:
Contaminated extinguishing water must be disposed of in accordance with official regulations.

Impact Sensitivity:

Impact Weight:	10 kg
Height of Fall:	0.4 m
Method:	Explosive properties
Remarks:	Substance/product is not impact sensitve at room temperature.

6. Accidental release measures

Further accidental release measures:
Pack in tightly closed containers for disposal.

Personal precautions, protective equipment and emergency procedures

Use personal protective clothing.

Environmental precautions

Do not discharge into drains/surface waters/groundwater.

Methods and material for containment and cleaning up

For small amounts: Pick up with absorbent material (e.g. sand, sawdust, general-purpose binder).
Dispose of absorbed material in accordance with regulations.
For large amounts: Pump off product.
Spills should be contained, solidified, and placed in suitable containers for disposal.

7. Handling and Storage

Precautions for safe handling

No special measures necessary provided product is used correctly.

Protection against fire and explosion:
No special precautions necessary.

Conditions for safe storage, including any incompatibilities

Segregate from foods and animal feeds.

Further information on storage conditions: Keep container tightly closed and in a cool place. Store protected against freezing.

8. Exposure Controls/Personal Protection

Users of a pesticidal product should refer to the product label for personal protective equipment requirements.

Components with occupational exposure limits

Methanol	OSHA PEL	PEL 200 ppm 260 mg/m3 ; TWA value 200 ppm 260 mg/m3 ; SKIN_FINAL ; The substance can be absorbed through the skin. STEL value 250 ppm 325 mg/m3 ;
	ACGIH TLV	TWA value 200 ppm ; STEL value 250 ppm ; Skin Designation ; The substance can be absorbed through the skin.
glutaral	OSHA PEL	CLV 0.2 ppm 0.8 mg/m3 ;
	ACGIH TLV	CLV 0.05 ppm ;

Advice on system design:
Provide local exhaust ventilation to control vapours/mists.

Personal protective equipment

RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING WORKERS:

Respiratory protection:
Wear respiratory protection if ventilation is inadequate. Respiratory protection in case of vapour/aerosol release. Wear a NIOSH-certified (or equivalent) organic vapour/particulate respirator.

Hand protection:
Wear chemical resistant protective gloves.

Eye protection:
Tightly fitting safety goggles (chemical goggles) and face shield.

Body protection:
Body protection must be chosen based on level of activity and exposure., Protective coverall and/or impermeable apron and boots as necessary.

General safety and hygiene measures:
Handle in accordance with good industrial hygiene and safety practice. Wearing of closed work clothing is required additionally to the stated personal protection equipment. Keep away from food, drink and animal feeding stuffs. Avoid contact with skin and eyes. Remove contaminated clothing. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and Chemical Properties

Form:	liquid
Odour:	characteristic

Odour threshold:	No applicable information available.	
Colour:	yellow	
pH value:	5.9 (0.5 %(m), 23 °C)	
Freezing point:	approx. -5 °C (1 ATM)	
Boiling point:	> 100 °C (1 ATM)	
Sublimation point:	No applicable information available.	
Flash point:	not applicable	
Flammability:	No applicable information available.	
Lower explosion limit:	No applicable information available.	
Upper explosion limit:	No applicable information available.	
Autoignition:	> 275 °C	(DIN 51794)
Vapour pressure:	approx. 17.5 mmHg (20 °C) The product has not been tested. The statement has been derived from the properties of the individual components.	
Density:	1.06 g/cm3 (20 °C)	
Relative density:	1.06 (20 °C)	
Vapour density:	No applicable information available.	
Partitioning coefficient n-octanol/water (log Pow):	No applicable information available.	
Thermal decomposition:	No decomposition if correctly stored and handled.	
Viscosity, dynamic:	No applicable information available.	
Viscosity, kinematic:	No applicable information available.	
Solubility in water:	soluble	
Solubility (quantitative):	No applicable information available.	
Solubility (qualitative):	No applicable information available.	
Molar mass:	100 g/mol	
Evaporation rate:	Value can be approximated from Henry's Law Constant or vapor pressure.	
Other Information:	If necessary, information on other physical and chemical parameters is indicated in this section.	

10. Stability and Reactivity

Reactivity
No hazardous reactions if stored and handled as prescribed/indicated.

Corrosion to metals:
No corrosive effect on metal.

Formation of flammable gases:	Remarks:	Forms no flammable gases in the presence of water.

Chemical stability
The product is stable if stored and handled as prescribed/indicated.

Possibility of hazardous reactions
The product is chemically stable.

Conditions to avoid
No conditions to avoid anticipated.

Incompatible materials
acids, bases, amines

Hazardous decomposition products

Decomposition products:
Hazardous decomposition products:
carbon monoxide, carbon dioxide

Thermal decomposition:
No decomposition if correctly stored and handled.

11. Toxicological information

Primary routes of exposure

Routes of entry for solids and liquids are ingestion and inhalation, but may include eye or skin contact. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquefied gases.

Acute Toxicity/Effects

Acute toxicity
Assessment of acute toxicity: Of moderate toxicity after single ingestion. Of moderate toxicity after short-term inhalation. Of low toxicity after short-term skin contact.

Oral
Type of value: ATE
Value: 301 mg/kg

Tested as a preparation.

Information on: glutaral
Type of value: LD50
Species: rat (female)
Value: approx. 77 mg/kg (similar to OECD guideline 401)

Information on: Methanol
Type of value: LD50
Species: rat
Value: > 1187 - 2769 mg/kg (BASF-Test)

Inhalation
Type of value: ATE
Value: 1.09 mg/l
Determined for mist

Dermal
Type of value: ATE
Value: 3,790 mg/kg

Assessment other acute effects
Assessment of STOT single:

Causes temporary irritation of the respiratory tract.

Irritation / corrosion
Assessment of irritating effects: Corrosive! Damages skin and eyes.

Skin

Information on: glutaral
Species: rabbit
Result: Corrosive.
Method: similar to OECD guideline 404

Eye

Information on: glutaral
Species: rabbit
Result: Risk of serious damage to eyes.
Method: Draize test

Sensitization
Assessment of sensitization: The substance may cause sensitization of the respiratory tract. Sensitization after skin contact possible.

Information on: glutaral
Open epicutaneous test (OET)
Species: guinea pig
Result: sensitizing

Species: human
Result: sensitizing

Aspiration Hazard
No aspiration hazard expected.

Chronic Toxicity/Effects

Repeated dose toxicity

Information on: glutaral
Assessment of repeated dose toxicity: After repeated exposure the prominent effect is local irritation. The substance may cause damage to the upper respiratory tract after repeated inhalation, as shown in animal studies.

Genetic toxicity

Information on: glutaral
Assessment of mutagenicity: The substance was mutagenic in various test systems with bacterias and cell cultures; however, these results could not be confirmed in tests with mammals.

Carcinogenicity

Assessment of carcinogenicity: None of the components in this product at concentrations greater than 0.1% are listed by IARC; NTP, OSHA or ACGIH as a carcinogen.

Reproductive toxicity

Information on: glutaral
Assessment of reproduction toxicity: The results of animal studies gave no indication of a fertility impairing effect.

Teratogenicity

Information on: glutaral
Assessment of teratogenicity: No indications of a developmental toxic / teratogenic effect were seen in animal studies.

Other Information
The product has not been tested. The statement has been derived from the properties of the individual components.

Symptoms of Exposure

The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11., Further symptoms and / or effects are not known so far

Medical conditions aggravated by overexposure
Contact may aggravate pulmonary disorders.

12. Ecological Information

Toxicity

Aquatic toxicity
Assessment of aquatic toxicity:
Very toxic to aquatic life. Toxic to aquatic life with long lasting effects.
The ecological data given are those of the active ingredient.

Toxicity to fish
LC50 (96 h) 0.8 mg/l, Salmo gairdneri, syn. O. mykiss (Fish test acute, static)
The details of the toxic effect relate to the nominal concentration.

LC50 (96 h) 6.2 mg/l, Cyprinodon variegatus (Fish test acute, static)
The details of the toxic effect relate to the nominal concentration.

Aquatic invertebrates
EC50 (48 h) 2.1 mg/l, Daphnia magna (Daphnia test acute, static)
The details of the toxic effect relate to the nominal concentration.

EC50 (96 h) 0.78 mg/l, Crassostrea virginica (OPP 72-3 (EPA-Guideline), Flow through.)
The statement of the toxic effect relates to the analytically determined concentration.

Aquatic plants
EC50 (72 h) 0.6 mg/l (growth rate), Desmodesmus subspicatus (OECD Guideline 201, static)
The statement of the toxic effect relates to the analytically determined concentration.

No observed effect concentration (72 h) 0.025 mg/l (growth rate), Desmodesmus subspicatus (OECD Guideline 201, static)
The statement of the toxic effect relates to the analytically determined concentration.

EC50 (72 h) 0.92 mg/l (growth rate), Skeletonema costatum (ISO/DIS 10253, static)
The details of the toxic effect relate to the nominal concentration.

Chronic toxicity to fish
No observed effect concentration (97 d) 1.6 mg/l, Oncorhynchus mykiss (Flow through.)
The details of the toxic effect relate to the nominal concentration.

Chronic toxicity to aquatic invertebrates
No observed effect concentration (21 d) 5.0 mg/l, Daphnia magna (OECD Guideline 211, semistatic)

Assessment of terrestrial toxicity
Toxic effects have been observed in studies with terrestric plants. Toxic effects have been observed in studies with soil living organisms.

Soil living organisms

Toxicity to soil dwelling organisms:
LC50 (14 d) 170 mg/kg, Eisenia foetida (OECD Guideline 207, artificial soil)
The details of the toxic effect relate to the nominal concentration.

EC10 (28 d) 10.45 mg/kg, soil dwelling microorganisms (OECD 217, natural soil)
The details of the toxic effect relate to the nominal concentration.

Toxicity to terrestrial plants

EC20 (19 d) 441 mg/kg, Vicia sativa (OECD Guideline 208)

Other terrestrial non-mammals
LD50 (14 d) 206 mg/kg, Anas platyrhynchos (other)

Microorganisms/Effect on activated sludge

Toxicity to microorganisms
OECD Guideline 209 aerobic
activated sludge, domestic/EC20 (30 min): approx. 15 mg/l
The details of the toxic effect relate to the nominal concentration.

Persistence and degradability

Assessment biodegradation and elimination (H2O)
Readily biodegradable (according to OECD criteria).

Elimination information

90 - 100 % DOC reduction (28 d) (OECD 301 A (new version)) (aerobic, activated sludge, domestic)

Assessment biodegradation and elimination (H2O)

Information on: glutaral

Readily biodegradable (according to OECD criteria).

Elimination information

Information on: glutaral
90 - 100 % DOC reduction (28 d) (OECD 301 A (new version)) (aerobic, activated sludge, domestic)

Assessment of stability in water
In contact with water the substance will hydrolyse slowly.

Information on Stability in Water (Hydrolysis)
$t_{1/2}$ > 1 a (50 °C), (Directive 92/69/EEC, C.7, pH 7)
In contact with water the substance will hydrolyse slowly.

Assessment of stability in water

Information on: glutaral

In contact with water the substance will hydrolyse slowly.

Bioaccumulative potential

Assessment bioaccumulation potential
No significant accumulation in organisms is expected as a result of the distribution coefficient of n-octanol/water (log Pow).

Bioaccumulation potential
Because of the n-octanol/water distribution coefficient (log Pow) accumulation in organisms is not to be expected.

Assessment bioaccumulation potential

Information on: glutaral

No significant accumulation in organisms is expected as a result of the distribution coefficient of n-octanol/water (log Pow).

Mobility in soil

Assessment transport between environmental compartments
The substance will not evaporate into the atmosphere from the water surface.
Adsorption to solid soil phase is possible.

Information on: glutaral

The substance will not evaporate into the atmosphere from the water surface.
Adsorption to solid soil phase is possible.

Additional information

Other ecotoxicological advice:
Data refer to a diluted aqueous solution of the substance.

13. Disposal considerations

Waste disposal of substance:

Dispose of in accordance with national, state and local regulations. It is the waste generator's responsibility to determine if a particular waste is hazardous under RCRA.

Container disposal:
Dispose of in a licensed facility. Recommend crushing, puncturing or other means to prevent unauthorized use of used containers.

RCRA:
This product meets the D002 (characteristic corrosivity) criteria.

14. Transport Information

Land transport
USDOT

Hazard class:	8
Packing group:	II
ID number:	UN 3265
Hazard label:	8, EHSM
Proper shipping name:	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (contains GLUTARALDEHYDE)

Sea transport
IMDG

Hazard class:	8
Packing group:	II
ID number:	UN 3265
Hazard label:	8, EHSM
Marine pollutant:	YES
Proper shipping name:	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (contains GLUTARALDEHYDE)

Air transport
IATA/ICAO

Hazard class:	8
Packing group:	II
ID number:	UN 3265
Hazard label:	8
Proper shipping name:	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S. (contains GLUTARALDEHYDE)

15. Regulatory Information

Federal Regulations

Registration status:

Biocide	TSCA, US	released / exempt

EPCRA 311/312 (Hazard categories): Refer to SDS section 2 for GHS hazard classes applicable for this product.

State regulations

State RTK	CAS Number	Chemical name
NJ	[redacted]	glutaral
PA	[redacted]	glutaral

Safe Drinking Water & Toxic Enforcement Act, CA Prop. 65:

WARNING: This product can expose you to chemicals including METHANOL, which is known to the State of California to cause birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

NFPA Hazard codes:
Health: 3 Fire: 1 Reactivity: 0 Special:

HMIS III rating
Health: 3 Flammability: 1 Physical hazard: 0

Labeling requirements under FIFRA

This chemical is a pesticide product registered by the Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets, and workplace labels of non-pesticide chemicals. Following is the hazard information as required on the pesticide label.

DANGER:
CORROSIVE.
CAUSES IRREVERSIBLE EYE DAMAGE.
CAUSES SKIN IRRITATION.
HARMFUL IF INHALED.
HARMFUL IF SWALLOWED.
HARMFUL IF ABSORBED THROUGH SKIN.
MAY CAUSE ALLERGIC SKIN REACTION.
CAUSES ASTHMATIC SIGNS AND SYMPTOMS IN HYPER-REACTIVE INDIVIDUALS.
Do not get in eyes, on skin, or on clothing.
Avoid inhalation of vapour.
Not to be used as an aerosol.
Do not swallow.
Wear protective eyeware (goggles or face shield).
Wear chemical resistant protective gloves.
Wear protective clothing.
Wash with plenty of water and soap thoroughly after handling.
Remove contaminated clothing immediately and clean before re-use or dispose it if necessary.

16. Other Information

SDS Prepared by:
BASF NA Product Regulations
SDS Prepared on: 2018/08/31

We support worldwide Responsible Care® initiatives. We value the health and safety of our employees, customers, suppliers and neighbors, and the protection of the environment. Our commitment to Responsible Care is integral to conducting our business and operating our facilities in a safe and environmentally responsible fashion, supporting our customers and suppliers in ensuring the safe and environmentally sound handling of our products, and minimizing the impact of our

operations on society and the environment during production, storage, transport, use and disposal of our products.

Myacide® GA 25 is a registered trademark of BASF Corporation or BASF SE
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END OF DATA SHEET

SDS no. S100
Version 8
Revision date 05-Oct-2020
Supersedes Date: 08-Sep-2017

Safety Data Sheet
Sand S100

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Sand S100
Product code S100

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a fracturing additive in oilfield applications

Uses advised against Consumer use

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Specific target organ toxicity - Repeated exposure	Category 2

Environmental hazards Not classified

Physical Hazards Not classified

2.2 Label elements

Signal word
WARNING

Hazard Statements
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P314 - Get medical advice/attention if you feel unwell
P501 - Dispose of contents/container to industrial incineration plant

_

Contains
Quartz, Crystalline silica

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS.

3. Composition/information on Ingredients

3.1 Substances

Chemical Name	EC No	CAS No	Weight-%
Quartz, Crystalline silica	238-878-4	[redacted]	60-100

3.2 Mixtures

Not applicable

Comments
This product contains a small quantity of quartz, crystalline silica. Prolonged and repeated exposure to concentrations of crystalline silica exceeding the workplace exposure limit (WEL) may lead to chronic lung disease such as silicosis.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Rinse mouth. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Get medical attention if symptoms occur.

Skin contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Seek medical attention if irritation occurs.

Eye Contact Promptly wash eyes with lots of water while lifting eye lids. Remove contact lenses, if worn. Continue to rinse for at least 15 minutes. Get medical attention if any discomfort continues.

4.2. Most important symptoms and effects, both acute and delayed

General advice The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
React with hydrofluoric acid (HF) forming toxic gas (SiF_4).

Hazardous combustion products
Thermal decomposition can lead to release of irritating gases and vapors

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so.

Methods for cleaning up
Vacuum up. Avoid generating dust. Put into suitable containers for disposal. After cleaning, flush away traces with water.

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. For personal protection see section 8.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. When using do not smoke, eat or drink. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions Provide appropriate exhaust ventilation at places where dust is formed. Keep airborne concentrations below exposure limits.

Storage precautions Keep containers tightly closed in a dry, cool and well-ventilated place Store away from incompatibles, React with hydrofluoric acid (HF) forming toxic gas (SiF4) Strong oxidizing agents

Storage class Chemical storage.

Packaging materials Use specially constructed containers only. Bag with moisture barrier Paper bag (minimum 3 ply), or other industrial container designed for powders and granulated materials

8. Exposure Controls/Personal Protection

8.1 Control parameters

Exposure limits No biological limit allocated

Component Information

Chemical Name	Arabic	Australia	Egypt
Quartz, Crystalline silica	0.1 mg/m³ TWA	0.1mg/m³TWArespirable dust	Not determined
Chemical Name	**India**	**Indonesian**	**Japan**
Quartz, Crystalline silica	Not determined	0.1 mg/m³ TWA	0.03 mg/m³ OEL
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Quartz, Crystalline silica	1 mg/m³ MAC	0.1 mg/m³ TWA	0.1 mg/m³ TWA Confirmed carcinogen
Chemical Name	**Malaysia**	**Philippines**	**Russia**

Quartz, Crystalline silica	0.1 mg/m³ TWA	Not determined	3 mg/m³ STEL 1 mg/m³ TWA Fibrogenic substance 1177, 1178
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Quartz, Crystalline silica	0.025 mg/m³ TWA	Not determined	Not determined

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Provide appropriate exhaust ventilation at places where dust is formed

Personal protective equipment

Eye protection	Use eye protection according to EN 166, designed to protect against dusts Safety glasses with side-shields Tightly fitting safety goggles
Hand protection	Wear gloves according to EN 374 to protect against skin effects from powders Repeated or prolonged contact Use protective gloves made of: Nitrile Neoprene gloves Frequent change is advisable
Respiratory protection	In case of insufficient ventilation wear suitable respiratory equipment Suitable mask with particle filter P3 (European Norm 143) At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.
Skin and body protection	Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.
Hygiene Measures	Wash hands before eating, drinking or smoking Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure	Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Solid
Appearance	Granules
Odor	Odorless
Color	Tan
Odor threshold	Not applicable

Property	Values	Remarks
pH	Not applicable	
pH @ dilution	No information available	
Melting / freezing point	> 1700 °C / 3092 °F	
Boiling point/range	No information available	

Flash point	Not applicable	
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	Not applicable	
Specific gravity	2.6	@20 °C
Bulk density	1100 - 1600 kg/m³	
Relative density	No information available	
Water solubility	Insoluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	No information available	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	No information available	
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

React with hydrofluoric acid (HF) forming toxic gas (SiF4).

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid dust formation.

10.5 Incompatible materials

Hydrofluoric acid (HF). Strong oxidizing agents.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Inhalation Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough. May cause respiratory irritation. Repeated or prolonged inhalation of crystalline silica dust can cause delayed lung injury, and other diseases, including silicosis and lung cancer.

Eye contact Dust may cause mechanical irritation.

Skin contact Repeated exposure may cause skin dryness or cracking.

Ingestion Ingestion may cause stomach discomfort.

Unknown acute toxicity Not applicable.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Quartz, Crystalline silica	No data available	No data available	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity Contains a known or suspected carcinogen. Crystalline silica dust is listed by IARC in Group 1 as known to cause lung cancer in humans, if inhaled.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of Exposure Inhalation. Skin contact. Eye contact.

Routes of entry Inhalation.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Category 2.

Target organ effects Respiratory system. Lungs.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

Toxicity to algae
This product is not considered toxic to algae.

Toxicity to fish
This product is not considered toxic to fish.

Toxicity to daphnia and other aquatic invertebrates
This product is not considered toxic to invertebrates.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Quartz, Crystalline silica	No information available	No information available	No information available

12.2 Persistence and degradability

See component information below.

Chemical Name	Persistence and degradability
Quartz, Crystalline silica	Inorganic compound

12.3 Bioaccumulative potential

See component information below.

Chemical Name	Bioaccumulation
Quartz, Crystalline silica	Product/Substance is inorganic

12.4 Mobility

Mobility
The product is insoluble and sinks in water. See component information below.

Chemical Name	Mobility
Quartz, Crystalline silica	Insoluble in water

Mobility in soil
See component information below.

Chemical Name	Mobility in soil
Quartz, Crystalline silica	Not expected to adsorb on soil

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information

Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number
Not regulated

14.2. UN proper shipping name
The product is not covered by international regulation on the transport of dangerous goods

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	Not regulated
IMDG/ANTAQ Hazard class	Not regulated
ICAO/ANAC Hazard class/division	Not regulated

14.4 Packing group

ADR/RID/ADN/ADG Packing group	Not regulated
IMDG/ANTAQ Packing group	Not regulated
ICAO/ANAC Packing group	Not regulated

14.5 Environmental hazard
No

14.6 Special precautions
Not applicable

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety data sheet complies with the requirements of:
The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons
No poisons schedule number allocated

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

Not classified as dangerous goods in accordance with the Australian Code for the Transport of Dangerous Goods by

Road and Rail (ADG)

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Poh Yue Cheong
Supersedes Date:	08-Sep-2017
Revision date	05-Oct-2020
Version	8
This SDS has been revised in the following section(s)	All sections No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3*
Flammability	0
Physical hazard	0
PPE	E

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SDS no. U028
Version 5
Revision date 08-Jun-2018
Supersedes Date: 03-Jun-2014

Safety Data Sheet
Gelling Agent U28 - 30% Active

1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name Gelling Agent U28 - 30% Active
Product code U028

1.2 Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Used as a gelling agent in oilfield applications

Uses advised against No information available

1.3 Details of the supplier of the safety data sheet

Supplier
Schlumberger Oilfield Australia Pty Ltd
ABN: 74 002 459 225
ACN: 002 459 225
256 St. Georges Terrace, Perth WA 6000
+47 5157 7424

SDS@slb.com

1.4 Emergency Telephone Number

Emergency telephone - (24 Hour) Australia +61 2801 44558, Asia Pacific +65 3158 1074, China +86 10 5100 3039, Europe +44 (0) 1235 239 670, Middle East and Africa +44 (0) 1235 239 671, New Zealand +64 9929 1483, USA 001 281 595 3518

2. Hazards Identification

2.1 Classification of the substance or mixture

GHS Classification

Health hazards

Skin corrosion/irritation	Category 1 Subcategory 1A

Environmental hazards Not classified

Physical Hazards

Substances/mixtures corrosive to metal	Category 1

2.2 Label elements

Signal word
DANGER

Hazard Statements
H314 - Causes severe skin burns and eye damage
H290 - May be corrosive to metals

Precautionary statements
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P280 - Wear protective gloves and eye/face protection
P301 + P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing

Supplementary precautionary statements
P234 - Keep only in original container
P264 - Wash face, hands and any exposed skin thoroughly after handling
P363 - Wash contaminated clothing before reuse
P310 - Immediately call a POISON CENTER or doctor/physician
P390 - Absorb spillage to prevent material damage
P220 - Keep/Store away from combustible materials

Sodium hydroxide

2.3 Other hazards

Not classified as PBT/vPvB by current EU criteria

Australian statement of hazardous/dangerous nature
Classified as Hazardous according to the criteria of NOHSC.
HAZARDOUS SUBSTANCE. DANGEROUS GOODS.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Chemical Name	EC No	CAS No	Weight-%
Sodium hydroxide	215-185-5	[redacted]	30

Comments
The product contains other ingredients which do not contribute to the overall classification.

4. First Aid Measures

4.1 First aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Ingestion Do NOT induce vomiting. Rinse mouth. Risk of product entering the lungs on vomiting after ingestion. Never give anything by mouth to an unconscious person. Immediate medical attention is required.

Skin contact Promptly wash contaminated skin with soap or mild detergent and water. Promptly remove clothing if soaked through and wash as above. Burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Chemical burns must be treated by a physician.

Eye Contact Get immediate medical attention. Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first five minutes, then continue rinsing eye.

4.2. Most important symptoms and effects, both acute and delayed

General advice Seek medical attention for all burns, regardless how minor they may seem. The severity of the symptoms described will vary dependant of the concentration and the length of exposure. If adverse symptoms develop, the casualty should be transferred to hospital as soon as possible.

Symptoms

Inhalation Please see Section 11. Toxicological Information for further information.

Ingestion Please see Section 11. Toxicological Information for further information.

Skin contact Please see Section 11. Toxicological Information for further information.

Eye contact Please see Section 11. Toxicological Information for further information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Treat symptomatically.

5. Fire-Fighting Measures

5.1 Extinguishing media

Suitable extinguishing media
Water Fog, Alcohol Foam, CO_2, Dry Chemical.

Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture

Unusual fire and explosion hazards
Contact with metals may evolve flammable hydrogen gas.

Hazardous combustion products
Fire or high temperatures create: Heating or fire can release toxic gas.

5.3 Advice for firefighters

Special protective equipment for fire-fighters
As in any fire, wear self-contained breathing apparatus and full protective gear.

Special Fire-Fighting Procedures
Containers close to fire should be removed immediately or cooled with water.

Hazchem code ADG 2R

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Do not get on skin or clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist. Use personal protective equipment. See also section 8.

6.2 Environmental precautions

The product should not be allowed to enter drains, water courses or the soil.

Environmental exposure controls
Avoid release to the environment. Local authorities should be advised if significant spillages cannot be contained.

6.3 Methods and material for containment and cleaning up

Methods for containment
Prevent further leakage or spillage if safe to do so. Dike far ahead of liquid spill for later disposal.

Methods for cleaning up
Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13).

6.4 Reference to other sections

See section 13 for more information.

7. Handling and Storage

7.1 Precautions for safe handling

Handling
Handle in accordance with good industrial hygiene and safety practice. Do not get in eyes, on skin or on clothing. Do not breathe vapors or spray mist. Avoid spills and splashing during use.

Hygiene Measures
Use good work and personal hygiene practices to avoid exposure. Wash hands and face before breaks and immediately after handling the product Remove contaminated clothing Do not eat, drink or smoke when using this product

7.2 Conditions for safe storage, including any incompatibilities

Technical measures/precautions	Ensure adequate ventilation. Keep airborne concentrations below exposure limits.
Storage precautions	Keep containers tightly closed in a dry, cool and well-ventilated place Store between 15-25 deg. C (59-77 deg. F) Avoid extreme temperatures Store away from incompatibles, Strong acids Halogenated compounds Metals
Storage class	Corrosive storage.
Packaging materials	High density polyethylene (HDPE) drum or can

8. Exposure controls/personal protection

8.1 Control parameters

Exposure limits Because this product is a liquid, the dust-related Workplace Exposure Limits for the components do not apply.

, Component Information

Chemical Name	Arabic	Australia	Egypt
Sodium hydroxide	Not determined	2 mg/m³ Peak	2 mg/m³ Ceiling
Chemical Name	**India**	**Indonesian**	**Japan**
Sodium hydroxide	2 mg/m³ Ceiling	2 mg/m³ Ceiling	Not determined
Chemical Name	**Kazakhstan**	**Kuwait**	**New Zealand**
Sodium hydroxide	Not determined	2.0 mg/m³ STEL	2 mg/m³ Ceiling
Chemical Name	**Malaysia**	**Philippines**	**Russia**
Sodium hydroxide	2 mg/m³ Ceiling	2 mg/m³ TWA	Not determined
Chemical Name	**Thailand**	**Vietnam**	**Turkey**
Sodium hydroxide	2 mg/m³ TWA	Not determined	Not determined

Notes
No biological limit allocated

8.2 Exposure controls

All chemical Personal Protective Equipment (PPE) should be selected based on an assessment of both the chemical hazard present and the risk of exposure to those hazards. The PPE recommendations below are based on an assessment of the chemical hazards associated with this product. Where this product is used in a mixture with other products or fluids, additional hazards may be created and as such further assessment of risk may be required. The risk of exposure and need of respiratory protection will vary from workplace to workplace and should be assessed by the user in each situation.

Engineering Controls
Ensure adequate ventilation Mechanical ventilation or local exhaust ventilation is required.

Personal protective equipment

Eye protection Use eye protection according to EN 166, designed to protect against liquid splashes Tightly fitting safety goggles / Face-shield

Hand protection Wear chemically resistant gloves (tested to EN 374) in combination with 'basic' employee training Wear protective nitrile rubber gloves
Break through time >480 minutes
Glove thickness 0.35-0.4 mm
Be aware that liquid may penetrate the gloves. Frequent change is advisable.

Respiratory protection In case of insufficient ventilation wear suitable respiratory equipment Respirator with a vapor filter (EN 141) Chemical respirator with inorganic vapour cartridge (Grey B). At work in confined or poorly ventilated spaces, respiratory protection with air supply must be used.

Skin and body protection Wear appropriate personal protective clothing to prevent skin contact Eye wash and emergency shower must be available at the work place.

Hygiene Measures Wash hands before breaks and immediately after handling the product Remove and wash contaminated clothing before re-use

8.2.3 Environmental exposure controls

Environmental exposure Use appropriate containment to avoid environmental contamination See section 6 for more information

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Physical state	Liquid
Appearance	Clear
Odor	Odorless
Color	Colorless
Odor threshold	Not applicable

Property	Values	Remarks
pH	13.5	
pH @ dilution	No information available	
Melting / freezing point	8 °C / 46 °F	
Boiling point/range	115 °C / 239 °F	
Flash point		
Evaporation rate (BuAc =1)	No information available	
Flammability (solid, gas)	Not applicable	
Flammability Limit in Air		
Upper flammability limit	Not applicable	
Lower flammability limit	Not applicable	
Vapor pressure	No information available	
Vapor density	No information available	
Specific gravity	1.3	@20 °C
Bulk density	No information available	
Relative density	No information available	
Water solubility	Soluble in water	
Solubility in other solvents	No information available	
Autoignition temperature	Not applicable	
Decomposition temperature	No information available	
Kinematic viscosity	No information available	
Dynamic viscosity	75 mPa s	@ 20 °C
log Pow	No information available	

Explosive properties	Not applicable
Oxidizing properties	None known.

9.2 Other information

Pour point	No information available
Molecular weight	No information available
VOC content(%)	None
Density	No information available

Comments
The data listed above are typical physical and chemical properties and should not be construed as product specification.

10. Stability and Reactivity

10.1 Reactivity

Corrosive.

10.2 Chemical stability

Stable under normal temperature conditions and recommended use.

10.3 Possibility of Hazardous Reactions

Hazardous polymerization
Hazardous polymerization does not occur.

10.4 Conditions to avoid

Avoid extreme temperatures. Store at ambient conditions.

10.5 Incompatible materials

Strong acids. Halogenated compounds. Metals. Gives off hydrogen by reaction with metals.

10.6 Hazardous decomposition products

See Section 5.2.

11. Toxicological Information

11.1 Information on toxicological effects

Acute toxicity

Product information Causes severe skin burns and eye damage.

Inhalation Inhalation of corrosive fumes/gases may cause coughing, choking, headache, dizziness, and weakness for several hours. Pulmonary edema may occur with tightness in the chest, shortness of breath, bluish skin, decreased blood pressure, and increased heart rate.

Eye contact Causes burns. Causes serious eye damage.

Skin contact Corrosive. Causes burns.

Ingestion Can burn mouth, throat, and stomach.

Toxicology data for the components

Chemical Name	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium hydroxide	No data available	1350 mg/kg (Rabbit)	No data available

Sensitization This product does not contain any components suspected to be sensitizing.

Mutagenic effects This product does not contain any known or suspected mutagens.

Carcinogenicity This product does not contain any known or suspected carcinogens.

Reproductive toxicity This product does not contain any known or suspected reproductive hazards.

Routes of exposure Skin contact. Eye contact.

Routes of entry No route of entry noted.

Specific target organ toxicity - Single exposure Not classified

Specific target organ toxicity - Repeated exposure Not classified.

Aspiration hazard Not applicable.

Other information Key literature references and sources for data. See Section 16 for more information.

12. Ecological Information

12.1 Toxicity

The product component(s) are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

Toxicity to algae
See component information below.

Toxicity to fish
See component information below.

Toxicity to daphnia and other aquatic invertebrates
See component information below.

Toxicology data for the components

Chemical Name	Toxicity to fish	Toxicity to algae	Toxicity to daphnia and other aquatic invertebrates
Sodium hydroxide	= 45.4 mg/L LC50 Oncorhynchus mykiss 96 h	No information available	No information available

12.2 Persistence and degradability

This product is expected to be readily biodegradable.

12.3 Bioaccumulative potential

Does not bioaccumulate.

12.4 Mobility

Mobility
The product is water soluble, and may spread in water systems.

Mobility in soil
No information available.

12.5 Results of PBT and vPvB assessment

Not classified as PBT/vPvB by current EU criteria.

12.6 Other adverse effects.

None known.

12.7 Other information
Key literature references and sources for data. See Section 16 for more information.

13. Disposal considerations

13.1 Waste treatment methods

Waste from residues/unused products	Dispose of as special waste in compliance with local and national regulations.
Contaminated packaging	Empty containers should be taken for local recycling, recovery or waste disposal.

14. Transport information

14.1. UN number

UN/ID No. (ADR/RID/ADN/ADG)	UN1824
UN No. (IMDG/ANTAQ)	UN1824
UN No. (ICAO/ANAC)	UN1824

14.2. UN proper shipping name
SODIUM HYDROXIDE SOLUTION,

14.3 Hazard class(es)

ADR/RID/ADN/ADG Hazard class	8
IMDG/ANTAQ Hazard class	8
ICAO/ANAC Hazard class/division	8

14.4 Packing group

ADR/RID/ADN/ADG Packing group	PG II
IMDG/ANTAQ Packing group	PG II
ICAO/ANAC Packing group	PG II

14.5 Environmental hazard
No

14.6 Special precautions

Hazard identification no (ADR)	80
EmS (IMDG)	F-A, S-B

Emergency Action Code (EAC)	2R
Tunnel restriction code	(E)
Hazchem code ADG	2R

14.7 Transport in bulk according to Annex I/II of MARPOL 73/78 and the IBC Code
Please contact SDS@slb.com for info regarding transport in Bulk.

15. Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

The Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

Australian Standard for the Uniform Scheduling of Drugs and Poisons

Sodium hydroxide
Schedule 6
Schedule 5

Safe Work Australia.

Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP).

ADG Code – Australian Dangerous Goods Code

International inventories

USA (TSCA)	Complies
Canada (DSL)	Complies
Philippines (PICCS)	Complies
Japan (ENCS)	Complies
China (IECSC)	Complies
Australia (AICS)	Complies
Korean (KECL)	Complies
New Zealand (NZIoC)	Complies

16. Other Information

Prepared by	Global Regulatory Compliance - Chemicals (GRC - Chemicals) , Ingrid Helland
Supersedes Date:	03-Jun-2014
Revision date	08-Jun-2018
Version	5
This SDS has been revised in the following section(s)	1, 2, 8, 11, 15, 16 No changes with regard to classification have been made.

Key literature references and sources for data
www.ChemADVISOR.com
Supplier
National Chemical Inventories
National regulatory information
National occupational exposure limits

HMIS classification

Health	3
Flammability	0
Physical hazard	1
PPE	X

Disclaimer

The information contained herein is considered in good faith as reliable of the date issued and is based upon on measurements, tests or data derived from supplier's own study or furnished by others. In providing this SDS information, Supplier makes no express or implied warranties as to the information or product; merchantability or fitness of purpose; any express or implied warranty; or non-infringement of intellectual property rights; and supplier assumes no responsibility for any direct, special or consequential damages, results obtained, or the activities of others. To the maximum extent permitted by law, supplier's warranty obligations and buyer's sole remedies are as stated in separate agreement between the parties.

Appendix D.4 October 2024 Safety Data Sheets

HALLIBURTON

SAFETY DATA SHEET

BE-9

Revision Date: 06-Apr-2023 **Revision Number:** 3

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 7th Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BE-9

Other means of Identification

Synonyms None

Hazardous Material Number: HB006583

Recommended use of the chemical and restrictions on use

Recommended Use Biocide

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 7th Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Acute Aquatic Toxicity	Category 1 - H400
Chronic Aquatic Toxicity	Category 2 - H411

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H400 - Very toxic to aquatic life
H411 - Toxic to aquatic life with long lasting effects

Precautionary Statements

Prevention
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P391 - Collect spillage

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Tributyl tetradecyl phosphonium chloride	[redacted]

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Tributyl tetradecyl phosphonium chloride	[redacted]	5 - 10%	Acute Tox. 4 (H302) Acute Tox. 2 (H330) Skin Corr. 1B (H314) Eye Corr. 1 (H318) Aquatic Acute 1 (H400) Aquatic Chronic 1 (H410)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek

	prompt medical attention.
Skin	In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases. Do not allow runoff to enter waterways. Use water spray to cool fire exposed surfaces.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse. Do NOT consume food, drink, or tobacco in contaminated areas.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a cool well ventilated area. Keep container closed when not in use. Store away from direct sunlight. Store in a dry location. Store in a manner to prevent commingling with incompatible materials. Store away from alkalis. Store away from reducing agents. Store locked up.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Tributyl tetradecyl phosphonium chloride	[redacted]	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Neoprene gloves. (>= 8 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Wear impervious protective clothing, including boots, gloves, lab coat, apron, rain jacket, pants or coverall, as appropriate, to prevent skin contact.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Clear colorless
Odor: Slight **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	6 - 8
Freezing Point / Range	-8 - -10 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	100 °C / 212 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	0.95 - 1.0
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available

Explosive Properties No information available
Oxidizing Properties No information available

9.2. Other information
VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Reducing agents. Strong alkalis.
10.6. Hazardous decomposition products
Chlorine. Phosphorus acids. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tributyl tetradecyl phosphonium chloride	[redacted]	= 611 mg/kg (rat)	No data of sufficient quality are available	> 0.908 mg/L (rat, 4hr, mist)

Immediate, delayed and chronic health effects from exposure
Inhalation Causes severe respiratory irritation.
Eye Contact Causes severe eye irritation which may damage tissue.
Skin Contact Causes severe skin irritation with tissue destruction.
Ingestion Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
Lung disorders. Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Tributyl tetradecyl phosphonium chloride	[redacted]	Causes burns (Rabbit)

Substances	CAS Number	Serious eye damage/irritation

Tributyl tetradecyl phosphonium chloride	[redacted]	Causes severe eye irritation which may damage tissue. (Rabbit)

Substances	CAS Number	Skin Sensitization
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	Respiratory Sensitization
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Tributyl tetradecyl phosphonium chloride	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	Carcinogenic Effects
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	Reproductive toxicity
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	STOT - single exposure
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Substances	CAS Number	STOT - repeated exposure
Tributyl tetradecyl phosphonium chloride	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	Aspiration hazard
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available	LC50 (96 h) 0.46 mg/L (Oncorhynchus mykiss) LC50 (96 h) 0.06 mg/L (Lepomis macrochirus)	No information available	EC50 (48 h) 0.025 mg/L (Daphnia sp.)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Tributyl tetradecyl phosphonium chloride	[redacted]	(0% @ 28d)

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Tributyl tetradecyl phosphonium chloride	[redacted]	< 3

12.4. Mobility in soil

Substances	CAS Number	Mobility
Tributyl tetradecyl phosphonium chloride	[redacted]	No information available

Other adverse effects

Endocrine Disruptor Information
This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods
Disposal should be made in accordance with federal, state, and local regulations. Incineration recommended in approved incinerator according to federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging
Follow all applicable national or local regulations.

Environmental regulations
Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	UN2922
UN proper shipping name:	Corrosive Liquid, Toxic, N.O.S. (contains Tributyl Tetradecyl Phosphonium Chloride)
Transport Hazard Class(es):	8, (6.1)
Packing Group:	II
Environmental Hazards:	Marine Pollutant

IMDG/IMO

UN Number	UN2922
UN proper shipping name:	Corrosive Liquid, Toxic, N.O.S. (contains Tributyl Tetradecyl Phosphonium Chloride)
Transport Hazard Class(es):	8, (6.1)
Packing Group:	II
Environmental Hazards:	Marine Pollutant
EMS:	EmS F-A, S-B

IATA/ICAO

UN Number	UN2922
UN proper shipping name:	Corrosive Liquid, Toxic, N.O.S. (contains Tributyl Tetradecyl Phosphonium Chloride)
Transport Hazard Class(es):	8, (6.1)
Packing Group:	II
Environmental Hazards:	Marine Pollutant

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

Special precautions during transport
None

HazChem Code
2X

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.

Canadian Domestic Substances List (DSL) All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 06-Apr-2023

Revision Note
Update to Format

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H330 - Fatal if inhaled
H400 - Very toxic to aquatic life
H401 - Toxic to aquatic life
H410 - Very toxic to aquatic life with long lasting effects
H411 - Toxic to aquatic life with long lasting effects

Additional information: For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
NZ CCID

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This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

FE-2

Revision Date: 30-Apr-2020 **Revision Number:** 39

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name FE-2

Other means of Identification

Synonyms None

Hazardous Material Number: HM000682

Recommended use of the chemical and restrictions on use

Recommended Use Iron Control Agent

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Serious Eye Damage/Irritation	Category 2 - H319

Label elements, including precautionary statements

Hazard Pictograms

Signal Word WARNING

Hazard Statements: H319 - Causes serious eye irritation

Precautionary Statements

Prevention P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear eye protection/face protection

Response P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention

Storage None

Disposal None

Contains

Substances	**CAS Number**
Citric acid	[redacted]

Other hazards which do not result in classification

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Citric acid	[redacted]	60 - 100%	Eye Irrit. 2A (H319)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes eye irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from alkalis. Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Citric acid	[redacted]	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN

	149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection	Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Nitrile gloves. (>= 8 mm thickness) This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.
Skin Protection	Normal work coveralls.
Eye Protection	Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	2 - 2.2
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Upper flammability limit	65
Lower flammability limit	8
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.665
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	1000 °C / 1832 °F
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	192.13
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Strong alkalis. Strong oxidizers.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes eye irritation.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Citric acid	[redacted]	5400 mg/kg (Rat) 5790 mg/kg (Mouse) 11,700 mg/kg (Rat)	> 2000 mg/kg	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.

Eye Contact Causes eye irritation.

Skin Contact May cause mild skin irritation.

Ingestion Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

None known.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Citric acid	[redacted]	Not irritating to skin in rabbits.

Substances	CAS Number	Serious eye damage/irritation
Citric acid	[redacted]	Causes moderate eye irritation

Substances	CAS Number	Skin Sensitization
Citric acid	[redacted]	Patch test on human volunteers did not demonstrate sensitization properties

Substances	CAS Number	Respiratory Sensitization
Citric acid	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Citric acid	[redacted]	Did not show mutagenic effects in animal experiments

Substances	CAS Number	Carcinogenic Effects
Citric acid	[redacted]	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Citric acid	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal

		experiments.

Substances	CAS Number	STOT - single exposure
Citric acid	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	STOT - repeated exposure
Citric acid	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Citric acid	[redacted]	No adverse health effects are expected from swallowing.

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Citric acid	[redacted]	EC50 (72h) 18000 mg/L (Chlorella vulgaris) NOEC (8d) 425 mg/L (cell density) (Scenedesmus quadricauda) LOEC (8d) >80 mg/L (Microcystis aeruginosa)	LC50 (96h) 1516 mg/L (Lepomis macrochirus) LC50 (48h) 440 mg/L (Leuciscus idus melanotus) LC50 (96h) >100 mg/L (Pimephales promelas)	TT (72h) 485 mg/L (Entosiphon sulcatum)	TLM96 100-330 ppm (Crangon crangon) EC50 (24h) 1535 mg/L (Daphnia magna) LC50 (48h) 160 mg/L (Daphnia magna) EC50 (48h) >50 mg/L (Daphnia magna)

12.2. Persistence and degradability

Biodegradable.

Substances	CAS Number	Persistence and Degradability
Citric acid	[redacted]	Readily biodegradable (97% @ 28d)

12.3. Bioaccumulative potential

Does not bioaccumulate.

Substances	CAS Number	Bioaccumulation
Citric acid	[redacted]	-1.61 to -1.80

12.4. Mobility in soil

Substances	CAS Number	Mobility
Citric acid	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 30-Apr-2020

Revision Note

SDS sections updated:

2

Full text of H-Statements referred to under sections 2 and 3
H319 - Causes serious eye irritation

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

HYDROCHLORIC ACID

Revision Date: 11-Feb-2021 **Revision Number:** 51

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name HYDROCHLORIC ACID

Other means of Identification

Synonyms None

Hazardous Material Number: HM000911

Recommended use of the chemical and restrictions on use

Recommended Use Solvent

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Substances/mixtures corrosive to metal	Category 1 - H290

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H331 - Toxic if inhaled
H335 - May cause respiratory irritation

Precautionary Statements

Prevention
P103 - Read label before use
P234 - Keep only in original packaging.
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P390 - Absorb spillage to prevent material damage

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P406 - Store in corrosive resistant container with a resistant inner liner.

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Hydrochloric acid	[redacted]

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Hydrochloric acid	[redacted]	30 - 60%	Skin Corr. 1A (H314) Eye Corr. 1 (H318) STOT SE 3 (H335) Met. Corr. 1 (H290)

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, move victim to fresh air and seek medical attention.
Eyes	Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.
Skin	In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

May form explosive mixtures with strong alkalis. Decomposition in fire may produce harmful gases. Reaction with steel and certain other metals generates flammable hydrogen gas. Do not allow runoff to enter waterways.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Evacuate all persons from the area.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas. Consult local authorities.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Neutralize to pH of 6-8. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information
Store away from alkalis. Store in a cool well ventilated area. Keep container closed when not in use.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Hydrochloric acid	[redacted]	Not applicable	Ceiling: 2 ppm

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Acid gas respirator.

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Butyl rubber gloves. (>= 8 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Full protective chemical resistant clothing. Rubber boots.
Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Clear colorless
Odor: Pungent acrid **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	0.8
Freezing Point / Range	-46 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	110 °C / 230 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	26
Vapor Density	No data available
Specific Gravity	1.18
Water Solubility	Soluble in water

Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	36.5
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong alkalis.
10.6. Hazardous decomposition products
Flammable hydrogen gas. Chlorine. Hydrogen sulfide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrochloric acid	[redacted]	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation	Causes severe respiratory irritation.
Eye Contact	Causes eye burns
Skin Contact	Causes severe burns.
Ingestion	Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Prolonged, excessive exposure may cause erosion of the teeth.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Hydrochloric acid	[redacted]	Causes severe burns

Substances	CAS Number	Serious eye damage/irritation
Hydrochloric acid	[redacted]	Causes severe burns

Substances	CAS Number	Skin Sensitization
Hydrochloric acid	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Hydrochloric acid	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Hydrochloric acid	[redacted]	In vitro tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Hydrochloric acid	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	Reproductive toxicity
Hydrochloric acid	[redacted]	Embryo and fetotoxicity has been observed in female rats exposed to maternally toxic levels of hydrogen chloride (450 mg/m^3, 1hr.). When tested at maternally toxic doses, no adverse effects on fertility, teratogenicity, or development were observed.

Substances	CAS Number	STOT - single exposure
Hydrochloric acid	[redacted]	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Hydrochloric acid	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Hydrochloric acid	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Hydrochloric acid	[redacted]	No information available	LC50 282 mg/L (Gambusia affinis) LC50 20.5 mg/L (Lepomis macrochirus) LC50 (96h) 3.25 – 3.5 (pH) (Lepomis macrochirus)	EC50 (3h) >= 5 and <= 5.5 (pH) (Activated sludge, domestic)	EC50 (48 h) 4.92 mg/L (Daphnia magna)

12.2. Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

Substances	CAS Number	Persistence and Degradability
Hydrochloric acid	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Does not bioaccumulate.

Substances	CAS Number	Bioaccumulation
Hydrochloric acid	[redacted]	-2.65

12.4. Mobility in soil

Substances	CAS Number	Mobility
Hydrochloric acid	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	UN1789
UN proper shipping name:	Hydrochloric Acid Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	UN1789
UN proper shipping name:	Hydrochloric Acid Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable
EMS:	EmS F-A, S-B

IATA/ICAO

UN Number	UN1789
UN proper shipping name:	Hydrochloric Acid Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

Special precautions during transport

None

HazChem Code

2R

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or

Chemicals	assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
S6

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 11-Feb-2021

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/

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This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

BaraLube® Gold Seal

Revision Date: 05-Feb-2020 **Revision Number:** 29

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name BaraLube® Gold Seal

Other means of Identification

Synonyms None

Hazardous Material Number: HM003554

Recommended use of the chemical and restrictions on use

Recommended Use Lubricant

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton/Baroid Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion/Irritation	Category 2 - H315
Serious Eye Damage/Irritation	Category 2 - H319

Label elements, including precautionary statements

Hazard Pictograms

Signal Word WARNING

Hazard Statements:
H315 - Causes skin irritation
H319 - Causes serious eye irritation

Precautionary Statements

Prevention
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/eye protection/face protection

Response
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P362 + P364 - Take off contaminated clothing and wash before reuse
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention

Storage None

Disposal None

Contains

Substances	**CAS Number**
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]

Other hazards which do not result in classification

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	1 - 5%	Skin Corr. 1B (H314) Eye Corr. 1 (H318)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention.

Ingestion Rinse mouth with water many times. Get medical attention, if symptoms occur

Symptoms caused by exposure

Causes eye irritation. Causes skin irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

Do NOT spray pool fires directly with water. A solid stream of water directed into hot burning liquid can cause splattering.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation. Use appropriate protective equipment. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Dike far ahead of liquid spill for later disposal. Soak up with inert absorbent material. Pick up and transfer to properly labeled containers.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Ensure adequate ventilation. Use appropriate protective equipment. Avoid contact with eyes, skin, or clothing.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a well ventilated area.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Ensure adequate ventilation, especially in confined areas

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the

	selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls. Wear impervious protective clothing, including boots, gloves, lab coat, apron, rain jacket, pants or coverall, as appropriate, to prevent skin contact.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Amber
Odor:	Mild	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	4.5- 5.5 (5%)
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	> 93 °C / > 200 °F (PMCC)
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	0.936
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers. Strong acids. Strong alkalis.
10.6. Hazardous decomposition products
Carbon oxides. Oxides of sulfur.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes eye irritation. Causes skin irritation.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact Causes eye irritation.
Skin Contact Causes skin irritation.
Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

None known.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	Causes burns

Substances	CAS Number	Serious eye damage/irritation
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	Causes burns

Substances	CAS Number	Skin Sensitization
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	No information available

Substances	CAS Number	Respiratory Sensitization
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-,	[redacted]	No information available

mono-C10-14-alkyl ethers, phosphates		

Substances	CAS Number	Carcinogenic Effects
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	No information available

Substances	CAS Number	Reproductive toxicity
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	No information available

Substances	CAS Number	STOT - single exposure
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	No information available

Substances	CAS Number	STOT - repeated exposure
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	No information available

Substances	CAS Number	Aspiration hazard
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	No information available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, mono-C10-14-alkyl ethers, phosphates	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 05-Feb-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H314 - Causes severe skin burns and eye damage
H315 - Causes skin irritation
H318 - Causes serious eye damage
H319 - Causes serious eye irritation

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
OSHA
ECHA C&L

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

ACETIC ACID (50-80%)

Revision Date: 21-Jan-2020 **Revision Number:** 12

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name ACETIC ACID (50-80%)

Other means of Identification

Synonyms None

Hazardous Material Number: HM004412

Recommended use of the chemical and restrictions on use

Recommended Use Solvent

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Flammable liquids.	Category 4 - H227

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H227 - Combustible liquid
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage

Precautionary Statements

Prevention
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P264 - Wash face, hands and any exposed skin thoroughly after handling
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response
P301+ P330 + P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P370 + P378 - In case of fire: Use water spray for extinction

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Acetic acid	[redacted]

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Acetic acid	[redacted]	50 - 80%	Skin Corr. 1A (H314) Eye Corr. 1 (H318) Flam. Liq. 3 (H226)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, move victim to fresh air and seek medical attention.

Eyes Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods

	immediately. Get medical attention immediately.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Use water spray to cool fire exposed surfaces. Decomposition in fire may produce harmful gases. Do not allow runoff to enter waterways.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Neutralize to pH of 6-8. Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 24 months. Store locked up.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Acetic acid	[redacted]	TWA: 10 ppm TWA: 25 mg/m³ STEL: 15 ppm STEL: 37 mg/m³	TWA: 10 ppm STEL: 15 ppm

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Organic vapor/acid gas respirator.

Hand Protection Impervious rubber gloves.

Skin Protection Full protective chemical resistant clothing.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Clear

Odor: Acrid Vinegar **Odor Threshold:** 0.48 ppm

Property Remarks/ - Method	Values
pH:	2.4
Freezing Point / Range	16 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	71 - 91 °C / 160 - 196 °F
Flash Point	55 °C / 131 °F (PMCC)
Upper flammability limit	19.9%
Lower flammability limit	4%
Evaporation rate	No data available
Vapor Pressure	20.79 hPa @ 20 C
Vapor Density	2.1
Specific Gravity	1.05
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	-0.17
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	1.011 mm2/s @ 25 °C
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	60.6 (g/mole)
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Keep away from heat, sparks and flame.
10.5. Incompatible materials
Strong alkalis.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Acetic acid	[redacted]	No data available	1060 mg/kg-bw (rabbit)	11.4 mg/L (rat, 4 h, vapor)

Immediate, delayed and chronic health effects from exposure
Inhalation Causes severe respiratory irritation.
Eye Contact Causes eye burns
Skin Contact Causes skin burns which may not be immediately painful or visible.
Ingestion Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Prolonged, excessive exposure may cause erosion of the teeth.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Acetic acid	[redacted]	Extremely corrosive and destructive to tissue Skin, rabbit:

Substances	CAS Number	Serious eye damage/irritation
Acetic acid	[redacted]	Eye, rabbit: Causes serious eye damage

Substances	CAS Number	Skin Sensitization
Acetic acid	[redacted]	Not regarded as a sensitizer.

Substances	CAS Number	Respiratory Sensitization
Acetic acid	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects

Acetic acid	[redacted]	In vivo tests did not show mutagenic effects. In vitro tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Acetic acid	[redacted]	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Acetic acid	[redacted]	Did not show teratogenic effects in animal experiments. Animal testing did not show any effects on fertility.

Substances	CAS Number	STOT - single exposure
Acetic acid	[redacted]	May cause respiratory irritation. No information available

Substances	CAS Number	STOT - repeated exposure
Acetic acid	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Acetic acid	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

Product is not classified as hazardous to the environment.

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Acetic acid	[redacted]	EC50(72 h)=55.22 mg/L (Anabaena flos-aquae)	LC50(96 h)=251 mg/L (Gambusia affinis) LC50(96 h)=75 mg/L (Lepomis macrochirus)	NOAEC (16 h) =1150 mg/L (Pseudomonas putida)	EC50(48 h)=65 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Acetic acid	[redacted]	Readily biodegradable (99% @ 7d)

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Acetic acid	[redacted]	LogPow-0.17

12.4. Mobility in soil

Substances	CAS Number	Mobility
Acetic acid	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	UN2790
UN proper shipping name:	Acetic Acid Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	UN2790
UN proper shipping name:	Acetic Acid Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable
EMS:	EmS F-A, S-B

IATA/ICAO

UN Number	UN2790
UN proper shipping name:	Acetic Acid Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

2R

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number

S6

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 21-Jan-2020

Revision Note
SDS sections updated:
2
9
11

Full text of H-Statements referred to under sections 2 and 3
H226 - Flammable liquid and vapor
H227 - Combustible liquid
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

Product Trade Name: **SAND - PREMIUM BROWN**

Revision Date: 17-Jul-2018 **Revision Number:** 12

1. Identification

1.1. Product Identifier

Product Trade Name:	SAND - PREMIUM BROWN
Synonyms	None
Chemical Family	Sand
Internal ID Code	HM005279

1.2 Recommended use and restrictions on use

Application	Proppant
Uses advised against	No information available

1.3 Manufacturer's Name and Contact Details

Halliburton Energy Services, Inc.
645 - 7th Ave SW Suite 1800
Calgary, AB
T2P 4G8
Canada
Telephone: 1-403-231-9300

Manufacturer/Supplier
Halliburton Energy Services, Inc.
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Telephone: 1-281-871-6107

Prepared By Chemical Stewardship
Telephone: 1-281-871-6107
e-mail: fdunexchem@halliburton.com

1.4. Emergency telephone number

Emergency Telephone Number 1-866-519-4752 or 1-760-476-3962
Global Incident Response Access Code: 334305
Contract Number: 14012

2. Hazard Identification

2.1 Classification of the substance or mixture

Carcinogenicity	Category 1A - H350
Specific Target Organ Toxicity - (Repeated Exposure)	Category 1 - H372

2.2. Label Elements

Hazard Pictograms

Signal Word: Danger

Hazard Statements
H350 - May cause cancer by inhalation
H372 - Causes damage to organs through prolonged or repeated exposure if inhaled

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response
P308 + P313 - IF exposed or concerned: Get medical advice/attention
P314 - Get medical attention/advice if you feel unwell

Storage
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

2.3 Other hazards which do not result in classification
None known

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Canada	HMIRA Registry Number	Filing Date	Decision Granted Date
Crystalline silica, quartz	[redacted]	80 - 100%	Carc. 1A (H350) STOT RE 1 (H372)	Not applicable	Not applicable	Not applicable

The exact percentage (concentration) of the composition has been withheld as proprietary.

4. First aid measures

4.1. Description of first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water.

Ingestion Under normal conditions, first aid procedures are not required.

4.2 Most important symptoms/effects, acute and delayed
Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

4.3. Indication of any immediate medical attention and special treatment needed
Notes to Physician Treat symptomatically.

5. Fire-fighting measures

5.1. Extinguishing media

Suitable Extinguishing Media

None - does not burn.

Extinguishing media which must not be used for safety reasons

None known.

5.2 Specific hazards arising from the substance or mixture

Special exposure hazards in a fire

None anticipated

5.3 Special protective equipment and precautions for fire-fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust.
See Section 8 for additional information

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. Handling and Storage

7.1. Precautions for safe handling

Handling Precautions

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Product has a shelf life of 36 months.

8. Exposure Controls/Personal Protection

8.1 Occupational Exposure Limits

Substances	CAS Number	OSHA PEL-TWA	ACGIH TLV-TWA
Crystalline silica, quartz	[redacted]	TWA: 50 µg/m^3	TWA: 0.025 mg/m^3

8.2 Appropriate engineering controls

Engineering Controls Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

8.3 Individual protection measures, such as personal protective equipment

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Wear a NIOSH certified, European Standard EN 149 (FFP2/FFP3), AS/NZS 1715, or equivalent respirator when using this product.
Hand Protection	Normal work gloves.
Skin Protection	Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	Brown
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	No data available
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Flammability (solid, gas)	No data available
Upper flammability limit	No data available
Lower flammability limit	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	2.63 - 2.67
Water Solubility	Insoluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	65 g/mol
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions
Will Not Occur

10.4. Conditions to avoid
None anticipated

10.5. Incompatible materials
Hydrofluoric acid.

10.6. Hazardous decomposition products
Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).

11. Toxicological Information

11.1 Information on likely routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

11.2 Symptoms related to the physical, chemical and toxicological characteristics

Acute Toxicity

Inhalation Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).

Eye Contact May cause mechanical irritation to eye.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2). There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

11.3 Toxicity data

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Crystalline silica, quartz	[redacted]	> 15000 mg/kg (human)	No data available	No data available

Substances	CAS Number	Skin corrosion/irritation
Crystalline silica, quartz	[redacted]	Non-irritating to the skin

Substances	CAS Number	Serious eye damage/irritation
Crystalline silica, quartz	[redacted]	Non-irritating to the eye

Substances	CAS Number	Skin Sensitization
Crystalline silica, quartz	[redacted]	No information available.

Substances	CAS Number	Respiratory Sensitization
Crystalline silica, quartz	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Crystalline silica, quartz	[redacted]	Not regarded as mutagenic.

Substances	CAS Number	Carcinogenic Effects
Crystalline silica, quartz	[redacted]	Contains crystalline silica which may cause silicosis, a delayed and progressive lung disease. The IARC and NTP have determined there is sufficient evidence in humans of the carcinogenicity of crystalline silica with repeated respiratory exposure.

Substances	CAS Number	Reproductive toxicity
Crystalline silica, quartz	[redacted]	No information available

Substances	CAS Number	STOT - single exposure
Crystalline silica, quartz	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	STOT - repeated exposure
Crystalline silica, quartz	[redacted]	Causes damage to organs through prolonged or repeated exposure if inhaled: (Lungs)

Substances	CAS Number	Aspiration hazard
Crystalline silica, quartz	[redacted]	Not applicable

12. Ecological Information

12.1. Toxicity

Product Ecotoxicity Data

No data available

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Crystalline silica, quartz	[redacted]	EC50 (72 h) =440 mg/L (Selenastrum capricornutum)(similar substance)	LL0 (96 h) =10000 mg/L (Danio rerio)(similar substance)	No information available	LL50 (24 h) >10000 mg/L (Daphnia magna)(similar substance)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Crystalline silica, quartz	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Crystalline silica, quartz	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Crystalline silica, quartz	[redacted]	No information available

12.5 Other adverse effects
No information available

13. Disposal Considerations

13.1. Waste treatment methods
Disposal methods Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

14. Transport Information

Canadian TDG
UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

US DOT
UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IMDG/IMO
UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IATA/ICAO
UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable
Special Precautions for User None

15. Regulatory Information

Canadian Regulations
Canadian Domestic Substances List (DSL) All components listed on inventory or are exempt.

US Regulations

US TSCA Inventory All components listed on inventory or are exempt.

TSCA Significant New Use Rules - S5A2

Substances	CAS Number	TSCA Significant New Use Rules - S5A2
Crystalline silica, quartz	[redacted]	Not applicable

EPA SARA Title III Extremely Hazardous Substances

Substances	CAS Number	EPA SARA Title III Extremely Hazardous Substances
Crystalline silica, quartz	[redacted]	Not applicable

EPA SARA (311,312) Hazard Class

Specific target organ toxicity (single or repeated exposure)
Carcinogenicity

EPA SARA (313) Chemicals

Substances	CAS Number	Toxic Release Inventory (TRI) - Group I	Toxic Release Inventory (TRI) - Group II
Crystalline silica, quartz	[redacted]	Not applicable	Not applicable

EPA CERCLA/Superfund Reportable Spill Quantity

Substances	CAS Number	CERCLA RQ
Crystalline silica, quartz	[redacted]	Not applicable

EPA RCRA Hazardous Waste Classification

If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0
HMIS Ratings: Health 0*, Flammability 0, Reactivity 0

16. Other information

Preparation Information

Prepared By Chemical Stewardship
Telephone: 1-281-871-6107
e-mail: fdunexchem@halliburton.com

Revision Date: 17-Jul-2018

Reason for Revision SDS sections updated:
2

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key or legend to abbreviations and acronyms used in the safety data sheet

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
ErC50 – Effective Concentration growth rate 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram

mg/L – milligram/liter
NIOSH – National Institute for Occupational Safety and Health
NTP – National Toxicology Program
OEL – Occupational Exposure Limit
PEL – Permissible Exposure Limit
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
UN – United Nations
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
OSHA
ECHA C&L

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

CAUSTIC SODA LIQUID

Revision Date: 30-Apr-2020 **Revision Number:** 9

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name CAUSTIC SODA LIQUID

Other means of Identification

Synonyms None

Hazardous Material Number: HM005652

Recommended use of the chemical and restrictions on use

Recommended Use pH Control

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Skin Corrosion/Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Substances/mixtures corrosive to metal.	Category 1 - H290

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Precautionary Statements

Prevention
P103 - Read label before use
P234 - Keep only in original packaging.
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear protective gloves/eye protection/face protection
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P280 - Wear eye protection/face protection

Response
P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P390 - Absorb spillage to prevent material damage

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up
P406 - Store in corrosive resistant container with a resistant inner liner.

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Sodium hydroxide	[redacted]

Other hazards which do not result in classification
None known

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Sodium hydroxide	[redacted]	30 - 60%	Skin Corr. 1A (H314) Eye Corr. 1 (H318) STOT SE 3 (H335) Met. Corr. 1 (H290)

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, move victim to fresh air and seek medical attention.
Eyes	Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.
Skin	Remove contaminated clothing and launder before reuse. Destroy or properly dispose of contaminated shoes. In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

All standard fire fighting media

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

May form explosive mixtures with strong acids. Reaction with steel and certain other metals generates flammable hydrogen gas.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Contain spill with sand or other inert materials. Neutralize to pH of 6-8. Scoop up and remove. Isolate spill and stop leak where safe.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information
Store away from acids. Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 12 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Sodium hydroxide	[redacted]	Not applicable	Ceiling: 2 mg/m^3

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Butyl rubber gloves. (>= 8 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Full protective chemical resistant clothing.
Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.
Other Precautions Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls No information available

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Clear colorless
Odor: Odorless **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	14
Freezing Point / Range	12 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	144 °C / 291 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	13 mmHg
Vapor Density	No data available
Specific Gravity	1.52

Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	40
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong acids. Peroxides. Halogenated compounds. Amphoteric metals such as aluminum, magnesium, lead, tin, or zinc.
10.6. Hazardous decomposition products
None known.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause respiratory irritation.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium hydroxide	[redacted]	140 - 340 mg/kg (Rat)	1350 mg/kg (Rabbit)	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation	Causes severe respiratory burns.
Eye Contact	Causes severe eye burns.
Skin Contact	Causes severe burns.
Ingestion	Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Prolonged, excessive exposure may cause erosion of the teeth.

Exposure Levels
No data available

Interactive effects
Skin disorders.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation
Sodium hydroxide	[redacted]	Causes severe burns

Substances	CAS Number	Serious eye damage/irritation
Sodium hydroxide	[redacted]	Causes severe eye burns. (Rabbit)

Substances	CAS Number	Skin Sensitization
Sodium hydroxide	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Sodium hydroxide	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Sodium hydroxide	[redacted]	Did not show mutagenic effects in animal experiments In vitro tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Sodium hydroxide	[redacted]	No data of sufficient quality are available.

Substances	CAS Number	Reproductive toxicity
Sodium hydroxide	[redacted]	No information available

Substances	CAS Number	STOT - single exposure
Sodium hydroxide	[redacted]	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Sodium hydroxide	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. Not applicable due to corrosivity of the substance.

Substances	CAS Number	Aspiration hazard
Sodium hydroxide	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Product Ecotoxicity Data

Product is not classified as hazardous to the environment.

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium hydroxide	[redacted]	No information available	LC50(48h) 189 mg/L (Leuciscus idus melanotus) LLC50(48h) 189 mg/L (Leuciscus melanotus) LC50(24h) 145 mg/L (Poecilia reticulate) LC50(96h) 125 mg/L (Gambusia affinis) LOEL(150 d) = 25 mg/L (Lebistes reticulatus)	No information available	EC50 (48h) 40.4 mg/L (Ceriodaphnia sp.)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Sodium hydroxide	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Sodium hydroxide	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Sodium hydroxide	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	UN1824
UN proper shipping name:	Sodium Hydroxide Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	UN1824
UN proper shipping name:	Sodium Hydroxide Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable
EMS:	EmS F-A, S-B

IATA/ICAO

UN Number	UN1824
UN proper shipping name:	Sodium Hydroxide Solution
Transport Hazard Class(es):	8
Packing Group:	II
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

2R

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AICS or are subject to a relevant exemption, permit, or assessment certificate.

New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 30-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H290 - May be corrosive to metals
H314 - Causes severe skin burns and eye damage
H318 - Causes serious eye damage
H335 - May cause respiratory irritation

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-13001

Revision Date: 10-Feb-2021 **Revision Number:** 13

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-13001

Other means of Identification

Synonyms None

Hazardous Material Number: HM007646

Recommended use of the chemical and restrictions on use

Recommended Use Concentrate

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Acute inhalation toxicity - dust/mist	Category 4
Serious Eye Damage/Irritation	Category 1 - H318
Reproductive Toxicity	Category 2 - H361
Specific Target Organ Toxicity - (Single Exposure)	Category 3 - H335
Acute Aquatic Toxicity	Category 3 - H402

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:
H302 - Harmful if swallowed
H318 - Causes serious eye damage
H332 - Harmful if inhaled
H335 - May cause respiratory irritation
H361 - Suspected of damaging fertility or the unborn child
H402 - Harmful to aquatic life

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P271 - Use only outdoors or in a well-ventilated area
P280 - Wear eye protection/face protection
P281 - Use personal protective equipment as required

Response
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P312 - Call a POISON CENTER and doctor/physician if you feel unwell.
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P308 + P313 - IF exposed or concerned: Get medical advice/attention

Storage
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P405 - Store locked up

Disposal
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Sodium perborate tetrahydrate	[redacted]

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	**CAS Number**	**PERCENT (w/w)**	**GHS Classification - Australia**
Sodium perborate tetrahydrate	[redacted]	60 - 100%	Acute Tox. 4 (H302) Acute Tox. 4 (H332) Eye Corr. 1 (H318)

			Repr. 2 (H361) STOT SE 3 (H335) Aquatic Acute 3 (H402)

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, move victim to fresh air and seek medical attention.
Eyes	Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.
Skin	Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes eye irritation. May cause respiratory irritation. Harmful if swallowed. Harmful if inhaled. Potential reproductive hazard. May cause birth defects.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases. Releases oxygen at high temperatures.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Use appropriate protective equipment. Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from combustibles. Store in a cool, dry location. Store locked up.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Sodium perborate tetrahydrate	[redacted]	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)

Hand Protection Impervious rubber gloves.

Skin Protection Rubber apron.

Eye Protection Dust proof goggles.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Powder **Color** White

Odor: Odorless **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	10.2 (1%)
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	130 °C / 266 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	6.2 mmHg
Vapor Density	No data available
Specific Gravity	0.82
Water Solubility	Partly soluble
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Molecular Weight	153.86 g/mol
VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Heating may cause a fire
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
Avoid contact with organic materials.
10.5. Incompatible materials
Organic matter. All flammables, especially petroleum products, asphalt & other volatile flammables. Metal salts such as aluminum chloride. Contact with water.
10.6. Hazardous decomposition products
Oxygen.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes eye irritation. May cause respiratory irritation. Harmful if swallowed. Harmful if inhaled. Potential reproductive hazard. May cause birth defects.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Sodium perborate tetrahydrate	[redacted]	1800 mg/kg (Rat)	> 2000 mg/kg (Rabbit) (similar substance)	1.164 mg/L (Rat) 4h

Immediate, delayed and chronic health effects from exposure

Inhalation	Harmful if inhaled. May cause respiratory irritation. May be absorbed through inhalation contributing to symptoms listed under ingestion.
Eye Contact	Causes serious eye damage.
Skin Contact	Causes mild skin irritation.
Ingestion	Harmful if swallowed. Irritation of the mouth, throat, and stomach. May cause abdominal pain, vomiting, nausea, and diarrhea.
Chronic Effects/Carcinogenicity	Prolonged or repeated exposure may cause gastrointestinal effects and muscular dysfunction. Prolonged or repeated exposure may cause blood forming system, nervous, urinary tract and reproductive system damage.

Exposure Levels
No data available

Interactive effects
Skin disorders. None known.

Data limitations
No data available

Substances	CAS Number	Skin corrosion/irritation

Sodium perborate tetrahydrate	[redacted]	Not irritating to skin in rabbits.

Substances	CAS Number	Serious eye damage/irritation
Sodium perborate tetrahydrate	[redacted]	Causes severe eye irritation (Rabbit)

Substances	CAS Number	Skin Sensitization
Sodium perborate tetrahydrate	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)

Substances	CAS Number	Respiratory Sensitization
Sodium perborate tetrahydrate	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Sodium perborate tetrahydrate	[redacted]	While some in vitro tests were positive and/or equivocal, in vivo results were negative. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Sodium perborate tetrahydrate	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Sodium perborate tetrahydrate	[redacted]	Experiments have shown reproductive toxicity effects on laboratory animals

Substances	CAS Number	STOT - single exposure
Sodium perborate tetrahydrate	[redacted]	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Sodium perborate tetrahydrate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Sodium perborate tetrahydrate	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Sodium perborate tetrahydrate	[redacted]	EC50 (96h) 19 mg/L (S. subspicatus)	LC50 (96h) 51 mg/L (Danio rerio) LOAEL (72h) 400 mg/L (Brachydanio rerio)	NOEC (3wks) 1.4 mg/L (Multi-species)	EC50 (48h) 30 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Sodium perborate tetrahydrate	[redacted]	Readily biodegradable (86% @ 48h) (similar substances)

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Sodium perborate tetrahydrate	[redacted]	0.175 (similar substances) BCF 0.1 - 1.25 (similar substances)

12.4. Mobility in soil

Substances	CAS Number	Mobility
Sodium perborate tetrahydrate	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory All components are listed on the AIIC or are subject to a relevant exemption, permit, or

	assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 10-Feb-2021

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed
H318 - Causes serious eye damage
H332 - Harmful if inhaled
H335 - May cause respiratory irritation
H361 - Suspected of damaging fertility or the unborn child
H402 - Harmful to aquatic life

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight

d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET
DCA-14003

This is a translation of the country-specific safety data sheet into a language other than that required by law. This document does not replace the safety data sheet provided according to Regulation (EC) No 1907/2006.

Revision Date: 29-Dec-2022 **Revision Number:** 14
Preparation Date 29-Dec-2022 **Internal ID Code** HM007651

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product Identifier

Product Name DCA-14003
Internal ID Code HM007651

Other means of identification

Pure substance/mixture Substance

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use Buffer

Sector of uses SU2 - Mining, (including offshore industries)
Product category(ies) PC14 - Metal surface treatment products, including galvanic and electroplating products
Process categories PROC4 - Use in batch and other process (synthesis) where opportunity for exposure arises
Uses advised against Consumer use

1.3. Details of the supplier of the safety data sheet

Halliburton BV
Columbusstraat 19
7825VP
Emmen
Netherlands
www.halliburton.com

For further information, please contact:
E-mail Address: fdunexchem@halliburton.com

1.4. Emergency telephone number
+44 8 08 189 0979 / 1-760-476-3961
Global Incident Response Access Code: 334305
Contract Number: 14012

Emergency telephone - Article 45 - (EC)1272/2008	
Austria	Poison Information Centre (AT): +43-(0)1-406 43 43
Belgium	Poison center (BE): +32 70 245 245
Bulgaria	Bulgarian poison centre: +359 2 915-44-09 or +359 2 915-43-46
Croatia	Centar za kontrolu otrovanja (CKO): (+385 1) 23-48-342 (Poison Control Center (PCC) - Institute for Medical Research and Occupational Health)
Cyprus	1401
Czech Republic	+420 224 919 293; +420 224 915 402
Denmark	Poison Control Hotline (DK): +45 82 12 12 12
Estonia	16662 (Local Poison Information Centre); (+372) 626 93 90 (International Poison Information Centre)
Europe	112
Finland	Poison Information Centre (FI):+358 9 471 977
France	ORFILA (FR): + 01 45 42 59 59
Germany	Poison Center Berlin (DE): +49 030 30686 790

Greece	+30 210 779 3777
Hungary	+36 (06) 80 201-199
Iceland	543 2222 / 543 1000
Ireland	National Poisons Information Centre (IE): +353 1 8379964
Italy	Poison Center, Milan (IT): +39 02 6610 1029
Latvia	(+371) 67042473 (International number for the National Toxicology Centre)
Lithuania	+370 (85) 2362052
Luxembourg	(+352) 8002 5500
Malta	2122 4071
Netherlands	National Poisons Information Center (NL): +31 30 274 88 88 (NB: this service is only available to health professionals)
Norway	Poisons Information (NO):+ 47 22 591300
Poland	Poison Control and Information Centre, Warsaw (PL): +48 22 619 66 54; +48 22 619 08 97
Portugal	CIAV - Centro de Informação Antivenenos (Portuguese Poison Centre): + 351 213 303 271
Romania	+40 21 318 36 06
Slovakia	+421 2 4854 4511
Slovenia	112
Spain	Poison Information Service (ES): +34 91 562 04 20
Sweden	Poisons Information Center (SV):+46 8 33 12 31
Switzerland	Poison Center: Tel 145; +41 44 251 51 51
Turkey	Ulusal Zehir Danisma Merkezi (UZEM) :114 Acil Saglik Hizmetleri : 112
United Kingdom	NHS Direct (UK): +44 0845 46 47

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Regulation (EC) No 1272/2008

Not classified

Additional information: No information available

For full text of Hazard- and EU Hazard-statements: see SECTION 16.

2.2. Label Elements

Not classified

Hazard Pictograms

Signal Word: **None**

Hazard Statements:

Not Classified

Precautionary Statements:

None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Additional information: No information available

2.3. Other Hazards

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

Endocrine Disruptor Information This product does not contain any known or suspected endocrine disruptors

Substances	CAS Number	EU - REACH (1907/2006) - Article 59(1) - Candidate List of Substances of Very High Concern (SVHC) for Authorisation	EU - REACH (1907/2006) - Endocrine Disruptor Assessment List of Substances	Endocrine disrupting properties in accordance with the criteria set out in Commission Delegated Regulation (EU) 2017/2100(3) or Commission Regulation (EU) 2018/605(4)
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	-	-	-

SECTION 3: Composition/information on ingredients

3.1. Substances Substance

Substances	EINECS	CAS Number	REACH Reg. No	PERCENT (w/w)	EU - CLP Substance Classification
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	NA	-	60 - 100%	

Substances	EINECS	PERCENT (w/w)	Specific concentration limit (SCL)	M-Factor	M-Factor (long-term)
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	-	-	-

Classification according to Regulation (EC) No. 1272/2008 [CLP]

For the full text of the H-phrases mentioned in this Section, see Section 16

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Rat = Rat, Rabbit = Rabbit, dust = dust

This product does not contain candidate substances of very high concern at a concentration >=0.1% (Regulation (EC) No. 1907/2006 (REACH), Article 59)

Additional information: No information available

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation	If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes	In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Ingestion	Under normal conditions, first aid procedures are not required.
Protection of First-aiders	No information available.

4.2. Most important symptoms and effects, both acute and delayed
No significant hazards expected.

4.3. Indication of any immediate medical attention and special treatment needed
Notes to Physician Treat symptomatically

SECTION 5: Firefighting measures

5.1. Extinguishing media
Suitable Extinguishing Media
All standard fire fighting media
Extinguishing media which must not be used for safety reasons
None known.

5.2. Special hazards arising from the substance or mixture
Special exposure hazards in a fire
None anticipated

5.3. Advice for firefighters
Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing.
See Section 8 for additional information.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

6.4. Reference to other sections
See Section 8 and 13 for additional information.

SECTION 7: Handling and storage

7.1. Precautions for safe handling
Avoid creating or inhaling dust. Ensure adequate ventilation. Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Store away from acids. Store in a dry location.

7.3. Specific end use(s)
Exposure scenario No information available
Other Guidelines No information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters
Exposure Limits

Substances	CAS Number	EU	UK	Netherlands	France
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable	Not applicable	Not applicable

Substances	CAS Number	Germany	Spain	Portugal	Finland
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable	Not applicable	Not applicable

Substances	CAS Number	Austria	Ireland	Switzerland	Norway
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable	Not applicable	Not applicable

Substances	CAS Number	Italy	Poland	Hungary	Czech Republic
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable	Not applicable	Not applicable

Substances	CAS Number	Denmark	Romania	Croatia	Cyprus
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable	Not applicable	Not applicable

Derived No Effect Level (DNEL) No information available
Worker

General Population

Predicted No Effect Concentration (PNEC) No information available.

8.2. Exposure controls
Engineering Controls A well ventilated area to control dust levels. Local exhaust ventilation should be used in areas without good cross ventilation.
Personal protective equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an

	industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Not normally needed. But if significant exposures are possible then the following respirator is recommended: Dust/mist respirator. (N95, P2/P3)
Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.

Environmental Exposure Controls Do not allow material to contaminate ground water system.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical State: Solid
Odor: Odorless

Color White
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	8
Freezing Point / Range	No data available
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Flammability (solid, gas)	No data available
Upper flammability limit	No data available
Lower flammability limit	No data available
Evaporation rate	No data available
Vapor Pressure	No data available
Relative Vapor Density	No data available
Relative Density	1.87
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

Pour Point / Range	No data available
VOC Content (%)	No data available
9.2.1 Information with regard to physical hazard classes	No information available
9.2.2. Other safety characteristics	No information available

SECTION 10: Stability and reactivity

10.1. Reactivity
Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions
Will Not Occur

10.4. Conditions to avoid
None anticipated

10.5. Incompatible materials
Strong acids.

10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute Toxicity

Inhalation	May cause mild respiratory irritation.
Eye Contact	May cause mechanical irritation to eye.
Skin Contact	None known.
Ingestion	None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No data available	No data available	No data available

Rat = Rat, Rabbit = Rabbit, dust = dust

11.2 Information on other hazards

11.2.1 Endocrine disrupting properties

Endocrine Disruptor Information This product does not contain any known or suspected endocrine disruptors

11.2.2 Other Information

Other Adverse Effects No information available

SECTION 12: Ecological information

12.1. Toxicity

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

growth rate = growth rate, similar substance = similar substance, activated sludge = activated sludge, reproduction = reproduction

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Bioaccumulative Potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.5. Results of PBT and vPvB assessment

This substance is not considered to be persistent, bioaccumulating nor toxic (PBT). This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

Substances	PBT and vPvB assessment
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Not applicable

12.6 Endocrine disrupting properties

Endocrine Disruptor Information This product does not contain any known or suspected endocrine disruptors

12.7 Other adverse effects

No information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Disposal methods Bury in a licensed landfill according to federal, state, and local regulations.
Contaminated Packaging Follow all applicable national or local regulations.

SECTION 14: Transport information

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

ADN

UN Number	Not restricted
UN proper shipping name:	Not restricted
Packing Group	Not applicable
Environmental Hazards:	Not applicable

ADR/RID

UN Number	Not restricted
UN proper shipping name:	Not restricted
Packing Group	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

14.1. UN Number Not restricted

14.2. UN proper shipping name: Not restricted

14.3.

14.4. Packing Group Not applicable

14.5. Environmental Hazards: Not applicable

14.6. Special Precautions for User None

14.7. Maritime transport in bulk according to IMO instruments No information available

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

International Inventories

US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Legend

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

Denmark PR No.: 4076257

Germany, Water Endangering Classes (WGK) WGK 1: Low hazard to waters.

Take note of Directive 92/85/EEC regarding maternity protection or stricter national regulations, where applicable.
Take note of Directive 94/33/EC on the protection of young people at work or stricter national regulations, where applicable.

Substances	CAS Number	Seveso III	TA LUFT
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Substances	CAS Number	REACH (1907/2006) - Annex XVII - Restrictions on Certain Dangerous Substances	REACH (1907/2006) - Annex XIV - Substances Subject to Authorization
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

15.2. Chemical safety assessment
No information available

SECTION 16: Other information

Full text of H-Statements referred to under sections 2 and 3
None

Key or legend to abbreviations and acronyms used in the safety data sheet
bw – body weight
CAS – Chemical Abstracts Service
CLP – REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Classification, Labelling and Packaging of substances and mixtures
EC – European Commission
EC10 – Effective Concentration 10%
EC50 – Effective Concentration 50%
EEC – European Economic Community
ErC50 – Effective Concentration growth rate 50%
IBC Code – International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL0 – Lethal Loading 0%
LL50 – Lethal Loading 50%
MARPOL – International Convention for the Prevention of Pollution from Ships
mg/kg – milligram/kilogram
mg/L – milligram/liter
NIOSH – National Institute for Occupational Safety and Health
NOEC – No Observed Effect Concentration
NTP – National Toxicology Program
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
PC – Chemical Product category
PEL – Permissible Exposure Limit
ppm – parts per million
PROC – Process category
REACH – REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals

This is a translation of the country-specific safety data sheet into a language other than that required by law. This document does not replace the safety data sheet provided according to Regulation (EC) No 1907/2006.

STEL – Short Term Exposure Limit
SU – Sector of Use category

Key literature references and sources for data
www.ChemADVISOR.com/

Revision Date:	29-Dec-2022
Reason for Revision	Update to Format

This is a translation of the country-specific safety data sheet into a language other than that required by law. This document does not replace the safety data sheet provided according to Regulation (EC) No 1907/2006.

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-17001

Revision Date: 11-Oct-2022 **Revision Number:** 27

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 7th Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-17001

Other means of Identification

Synonyms None

Hazardous Material Number: HM007659

Recommended use of the chemical and restrictions on use

Recommended Use Corrosion Inhibitor

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 7th Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Acute toxicity - Dermal	Category 4 - H312
Skin Corrosion/Irritation	Category 2 - H315
Serious Eye Damage/Irritation	Category 1 - H318
Skin Sensitization	Category 1 - H317
Specific Target Organ Toxicity - (Single Exposure)	Category 1 - H370
Specific Target Organ Toxicity - (Repeated Exposure)	Category 2 - H373
Acute Aquatic Toxicity	Category 2 - H401

Chronic Aquatic Toxicity	Category 3 - H412
Flammable liquids.	Category 3 - H226

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements:

H226 - Flammable liquid and vapor
H302 - Harmful if swallowed
H312 - Harmful in contact with skin
H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H370 - Causes damage to organs
H373 - May cause damage to organs through prolonged or repeated exposure
H401 - Toxic to aquatic life
H412 - Harmful to aquatic life with long lasting effects

Precautionary Statements

Prevention

P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233 - Keep container tightly closed
P240 - Ground and bond container and receiving equipment.
P241 - Use explosion-proof electrical/ventilating/lighting/equipment
P242 - Use only non-sparking tools
P243 - Take action to prevent static discharges.
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P272 - Contaminated work clothing should not be allowed out of the workplace
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P281 - Use personal protective equipment as required
P280 - Wear protective gloves.
P261 - Avoid breathing dust/fume/gas/mist/vapors/spray
P280 - Wear eye protection/face protection

Response

P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P312 - Call a POISON CENTER and doctor/physician if you feel unwell.
P362 + P364 - Take off contaminated clothing and wash before reuse
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes.

Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
P307 + P311 - IF exposed: Call a POISON CENTER or doctor/physician
P314 - Get medical attention/advice if you feel unwell
P370 + P378 - In case of fire: Use water spray for extinction
P312 - Call a POISON CENTER/doctor/physician if you feel unwell
P363 - Wash contaminated clothing before reuse
P332 + P313 - If skin irritation occurs: Get medical advice/attention
P333 + P313 - If skin irritation or rash occurs: Get medical advice/attention
P391 - Collect spillage
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].

Storage P403 + P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up

Disposal P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Diethylene glycol	[redacted]
Cinnamaldehyde	[redacted]
Amine oxides, cocoalkyldimethyl	[redacted]
Methanol	[redacted]
Benzaldehyde	[redacted]
Alcohols, C12-16, ethoxylated	[redacted]
Sodium iodide	[redacted]

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Diethylene glycol	[redacted]	30 - 60%	Acute Tox. 4 (H302) STOT RE 2 (H373)
Cinnamaldehyde	[redacted]	30 - 60%	Acute Tox. 4 (H312) Skin Irrit. 2 (H315) Skin Sens. 1 (H317) Aquatic Acute 2 (H401)
Amine oxides, cocoalkyldimethyl	[redacted]	10 - 30%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 1 (H400) Aquatic Chronic 3 (H412)
Methanol	[redacted]	10 - 30%	Acute Tox. 3 (H301) Acute Tox. 3 (H311) Acute Tox. 3 (H331) STOT SE 1 (H370) Flam. Liq. 2 (H225)
Benzaldehyde	[redacted]	5 - 10%	Acute Tox. 4 (H302) Acute Tox. 4 (H332) Aquatic Acute 2 (H401) Flam. Liq. 4 (H227)
Alcohols, C12-16, ethoxylated	[redacted]	1 - 5%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 1 (H400) Aquatic Chronic 3 (H412)
Sodium iodide	[redacted]	1 - 5%	Skin Irrit. 2 (H315)

			Eye Irrit. 2 (H319) STOT SE 3 (H335) STOT RE 1 (H372)

4. First aid measures

Description of necessary first aid measures

Inhalation	If inhaled, move victim to fresh air and seek medical attention.
Eyes	Immediately flush eyes with large amounts of water for at least 30 minutes. Seek prompt medical attention.
Skin	In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure

Causes severe eye irritation which may damage tissue. Harmful if swallowed. Harmful in contact with skin. Causes skin irritation. May cause allergic skin reaction. Causes serious eye damage. Causes damage to organs. May cause damage to organs through prolonged or repeated exposure. May cause damage to internal organs.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Carbon dioxide, dry chemical, foam.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

May be ignited by heat, sparks or flames Use water spray to cool fire exposed surfaces. Closed containers may explode in fire. Decomposition in fire may produce harmful gases. Runoff to sewer may cause fire or explosion hazard.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Use appropriate protective equipment. Wear self-contained breathing apparatus in enclosed areas. Remove sources of ignition. All equipment used when handling the product must be grounded. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Remove ignition sources and work with non-sparking tools. Dike far ahead of liquid spill for later disposal. Soak up with inert absorbent material. Pick up and transfer to properly labeled containers.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid breathing vapors. Avoid contact with eyes, skin, or clothing. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment. Ensure adequate ventilation. Remove sources of ignition. Ground and bond containers when transferring from one container to another.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Keep from heat, sparks, and open flames. Store in a well ventilated area. Store locked up. Keep container closed when not in use. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Diethylene glycol	[redacted]	TWA: 23 ppm TWA: 100 mg/m^3	Not applicable
Cinnamaldehyde	[redacted]	Not applicable	Not applicable
Amine oxides, cocoalkyldimethyl	[redacted]	Not applicable	Not applicable
Methanol	[redacted]	TWA: 200 ppm TWA: 262 mg/m^3 STEL: 250 ppm STEL: 328 mg/m^3	TWA: 200 ppm STEL: 250 ppm
Benzaldehyde	[redacted]	Not applicable	Not applicable
Alcohols, C12-16, ethoxylated	[redacted]	Not applicable	Not applicable
Sodium iodide	[redacted]	Not applicable	TWA: 0.01 ppm

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Positive pressure self-contained breathing apparatus if methanol is released.

Hand Protection Chemical-resistant protective gloves (EN 374) Suitable materials for longer, direct contact (recommended: protection index 6, corresponding to > 480 minutes permeation time as per EN 374): Butyl rubber gloves. (>= 8 mm thickness)
This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Wear protective clothing impervious to the chemical substance, including boots, gloves, lab coat, apron, rainjacket, pants or coverall, as appropriate, to prevent skin contact. Rubber apron.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists. (EN-166)

Other Precautions Eyewash fountains and safety showers must be easily accessible.
Environmental Exposure Controls Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Yellow-orange
Odor: Cinnamon **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	6.85 (10%)
Freezing Point / Range	-21 °C
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	28.9 °C / 84 °F (PMCC)
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.015
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Reacts with acids to form toxic nitrogen oxide.
10.4. Conditions to avoid
Keep away from heat, sparks and flame.
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Ammonia. Oxides of nitrogen. Hydrocarbons. Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
Causes severe eye irritation which may damage tissue. Harmful if swallowed. Harmful in contact with skin. Causes skin irritation. May cause allergic skin reaction. Causes serious eye damage. Causes damage to organs. May cause damage to organs through prolonged or repeated exposure. May cause damage to internal organs.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Diethylene glycol	[redacted]	12565 - 19600 mg/kg (Rat)	11890 - 13300 mg/kg (Rabbit)	> 4.6 mg/L (Rat) 4h
Cinnamaldehyde	[redacted]	2220 mg/kg (rat)	620 mg/kg (rabbit)	No data available
Amine oxides, cocoalkyldimethyl	[redacted]	846 - 3873 mg/kg (Rat) 1000-1250 mg/kg (Rat)	4290 mg/kg (Rabbit)	No data available
Methanol	[redacted]	300 mg/kg-bw (human) < 790 to 13,000 mg/kg (rat)	1000 mg/kg-bw (human) 17,100 mg/kg (rabbit)	10 mg/L (human, vapor, 4h)
Benzaldehyde	[redacted]	1430 mg/kg (rat)	No information available	>1 <5 mg/L air (Rat, 4h, mist)
Alcohols, C12-16, ethoxylated	[redacted]	1600 mg/kg	2011 mg/kg-bw (rabbit)	No data available
Sodium iodide	[redacted]	4340 mg/kg (Rat) 3118 mg/kg (Rats) (Similar substance)	No data available	LCLo: 50000 mg/m^3 (Mouse) 2h

Immediate, delayed and chronic health effects from exposure

Inhalation May cause respiratory irritation. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.

Eye Contact Causes severe eye irritation which may damage tissue.

Skin Contact Harmful in contact with skin. Causes skin irritation. May cause an allergic skin reaction.

Ingestion Harmful if swallowed. May cause central nervous system depression including headache, dizziness, drowsiness, muscular weakness, incoordination, slowed reaction time, fatigue blurred vision, slurred speech, giddiness, tremors and convulsions. Ingestion may result in blindness.

Chronic Effects/Carcinogenicity Prolonged or repeated exposure can cause delayed kidney damage.

Exposure Levels

No data available

Interactive effects

Skin disorders. Eye ailments.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Diethylene glycol	[redacted]	Non-irritating to the skin (Rabbit)
Cinnamaldehyde	[redacted]	Causes severe irritation and or burns (human)
Amine oxides, cocoalkyldimethyl	[redacted]	Skin, rabbit: Causes moderate skin irritation.
Methanol	[redacted]	Non-irritating to the skin (Rabbit)
Benzaldehyde	[redacted]	Non-irritating to the skin (Rabbit)
Alcohols, C12-16, ethoxylated	[redacted]	Causes skin irritation.
Sodium iodide	[redacted]	Moderate dermal irritant (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Diethylene glycol	[redacted]	Non-irritating to the eye (Rabbit)
Cinnamaldehyde	[redacted]	Mild eye irritant. (human) (8 % solution)
Amine oxides, cocoalkyldimethyl	[redacted]	Corrosive to eyes
Methanol	[redacted]	Non-irritating to the eye (Rabbit)
Benzaldehyde	[redacted]	Non-irritating to the eye (Rabbit)
Alcohols, C12-16, ethoxylated	[redacted]	Causes severe eye irritation which may damage tissue.
Sodium iodide	[redacted]	Moderately irritating to the eyes (Rabbit)

Substances	CAS Number	Skin Sensitization
Diethylene glycol	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)
Cinnamaldehyde	[redacted]	Skin sensitizer in guinea pig.

Amine oxides, cocoalkyldimethyl	[redacted]	No information available
Methanol	[redacted]	Did not cause sensitization on laboratory animals (guinea pig)
Benzaldehyde	[redacted]	Not sensitizing in Guinea Pigs (Guinea Pig Maximisation Test and Open Epicutaneous Test, Sensitizing in Draize Test and Freund's Complete Adjuvant Test)
Alcohols, C12-16, ethoxylated	[redacted]	Did not cause sensitization on laboratory animals
Sodium iodide	[redacted]	Patch test on human volunteers did not demonstrate sensitization properties

Substances	CAS Number	Respiratory Sensitization
Diethylene glycol	[redacted]	No information available
Cinnamaldehyde	[redacted]	No information available
Amine oxides, cocoalkyldimethyl	[redacted]	No information available
Methanol	[redacted]	No information available
Benzaldehyde	[redacted]	No information available
Alcohols, C12-16, ethoxylated	[redacted]	No information available
Sodium iodide	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Diethylene glycol	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects.
Cinnamaldehyde	[redacted]	In vitro tests did not show mutagenic effects.
Amine oxides, cocoalkyldimethyl	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)
Methanol	[redacted]	The weight of evidence from available in vitro and in vivo studies indicates that this substance is not expected to be mutagenic.
Benzaldehyde	[redacted]	Not mutagenic in AMES Test. Negative in the chromosomal aberration assay In vitro tests have shown mutagenic effects In vivo tests did not show mutagenic effects.
Alcohols, C12-16, ethoxylated	[redacted]	Not regarded as mutagenic.
Sodium iodide	[redacted]	In vitro tests did not show mutagenic effects. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Diethylene glycol	[redacted]	Did not show carcinogenic effects in animal experiments (Rat)
Cinnamaldehyde	[redacted]	No information available
Amine oxides, cocoalkyldimethyl	[redacted]	No information available
Methanol	[redacted]	No data of sufficient quality are available.
Benzaldehyde	[redacted]	Did not show carcinogenic effects in animal experiments (Rat)
Alcohols, C12-16, ethoxylated	[redacted]	Not regarded as carcinogenic.
Sodium iodide	[redacted]	No information available

Substances	CAS Number	Reproductive toxicity
Diethylene glycol	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.
Cinnamaldehyde	[redacted]	Did not show teratogenic effects in animal experiments.
Amine oxides, cocoalkyldimethyl	[redacted]	Did not show teratogenic effects in animal experiments. When tested at maternally toxic doses, no adverse effects on teratogenicity or development were observed.
Methanol	[redacted]	Based on available data, the classification criteria are not met. Experiments have shown reproductive toxicity effects on laboratory animals
Benzaldehyde	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)
Alcohols, C12-16, ethoxylated	[redacted]	Not regarded as a reproductive and developmental toxicant.
Sodium iodide	[redacted]	Animal testing did not show any effects on fertility.

Substances	CAS Number	STOT - single exposure
Diethylene glycol	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Cinnamaldehyde	[redacted]	No information available
Amine oxides, cocoalkyldimethyl	[redacted]	May cause respiratory irritation.
Methanol	[redacted]	May cause disorder and damage to the Central Nervous System (CNS)
Benzaldehyde	[redacted]	May cause respiratory irritation.
Alcohols, C12-16, ethoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.

Sodium iodide	[redacted]	No information available

Substances	CAS Number	STOT - repeated exposure
Diethylene glycol	[redacted]	Causes damage to organs through prolonged or repeated exposure: Kidney
Cinnamaldehyde	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Amine oxides, cocoalkyldimethyl	[redacted]	No data of sufficient quality are available.
Methanol	[redacted]	Causes damage to organs through prolonged or repeated exposure: Central Nervous System (CNS)
Benzaldehyde	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Alcohols, C12-16, ethoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Sodium iodide	[redacted]	Causes damage to organs through prolonged or repeated exposure: (Thyroid)

Substances	CAS Number	Aspiration hazard
Diethylene glycol	[redacted]	No information available
Cinnamaldehyde	[redacted]	Not applicable
Amine oxides, cocoalkyldimethyl	[redacted]	No information available
Methanol	[redacted]	Not applicable
Benzaldehyde	[redacted]	Not applicable
Alcohols, C12-16, ethoxylated	[redacted]	Not applicable
Sodium iodide	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Diethylene glycol	[redacted]	TGK (8d) 2700 mg/L (Scenedesmus quadricauda)	LC50 75200 mg/L (Pimephales promelas)	EC20 (30m) > 1995 mg/L (domestic activated sludge)	EC50 84000 mg/L (Daphnia magna) EC50 >10000 mg/L (Daphnia magna)
Cinnamaldehyde	[redacted]	EC50 (72 h) 2.1 mg/L (Skeletonema costatum)	LC50 (96 h) 2.38 mg/L (Scophthalmus maximus)	IC50 (48h) 131.2 mg/L (Tetrahymena pyriformis)	LC50 (48 h) 1.4 mg/L (Acartia tonsa)
Amine oxides, cocoalkyldimethyl	[redacted]	ErC50 (72h) 0.29 mg/L (Selenastrum capricornutum) ErC50 (72h) 0.0235 mg/L (Scendesmus subspicatus) (similar substance)	LC50 (96h) 1.0–3.4 mg/L (Brachydanio rerio) LC50 (96h) 13.0 (Salmo gairdneri) LC50 (96h) 0.1-1 mg/L (Brachydanio rerio)	EC50 (3h) 240 mg/L (Pseudomonas putida) EC50 (3h) 13 mg/L (Activated sludge)	EC50 (48h) 2.9 mg/L (Daphnia magna) EC50 (48h) 0.083 mg/L (Daphnia magna) (similar substance)
Methanol	[redacted]	EC50 (96 h) =22000 mg/L (Pseudokirchnerella subcapitata) NOEC (8 d) =8000 mg/L (Scenedesmus quadricauda)	LC50(96 h)=15400 mg/L (Lepomis macrochirus) EC50 (200h)=14536 mg/L (Oryzias latipes)	No information available	NOEC(21 d)=208 mg/L (Daphnia magna) EC50 (48h)=22200 mg/L (Daphnia obtuse)
Benzaldehyde	[redacted]	NOEC (8d) 20 mg/L (Microcystis aeruginosa) NOEC (8d) 132 mg/L	LC50 (96 h) 1.07 mg/L (Lepomis macrochirus)	IC50 (3 h) 740 mg/L (Activated sludge)	EC50 (24 h) 50 mg/L (Daphnia magna)
Alcohols, C12-16, ethoxylated	[redacted]	EC50 0.7 mg/L (Selenastrum capricornutum)	No information available	No information available	0.39 mg/L (Daphnia Magna)
Sodium iodide	[redacted]	7 d Tox threshold: 2370 mg/L (Scenedesmus quadricauda, biomass) EC50(72h): 2588.7 mg/L (Skeletonema costatum)	LC50(96h): 3780 mg/L (Oncorhynchus mykiss) LC50(96h): > 100 mg/L (Scopthalmus maximus)	No information available	EC50(48h): 1.27 mg/L (Daphnia magna) EC50(48h): 575 mg/L (Acartia tonsa)

12.2. Persistence and degradability

No data is available on the product itself

Substances	CAS Number	Persistence and Degradability
Diethylene glycol	[redacted]	Readily biodegradable (90-100% @ 28d)

Cinnamaldehyde	[redacted]	Predicted to be readily biodegradable.
Amine oxides, cocoalkyldimethyl	[redacted]	Readily biodegradable (81% @ 28d)
Methanol	[redacted]	Readily biodegradable (95% @ 20d)
Benzaldehyde	[redacted]	Readily biodegradable (>=95% @ 28d)
Alcohols, C12-16, ethoxylated	[redacted]	No information available
Sodium iodide	[redacted]	Not applicable

12.3. Bioaccumulative potential

No data is available on the product itself

Substances	CAS Number	Bioaccumulation
Diethylene glycol	[redacted]	BCF: 100 (Leuciscus idus melanotus)
Cinnamaldehyde	[redacted]	Log Pow =1.4
Amine oxides, cocoalkyldimethyl	[redacted]	Log Kow = 7.5
Methanol	[redacted]	Not Bioaccumulative; BCF=1
Benzaldehyde	[redacted]	Log Pow =1.1
Alcohols, C12-16, ethoxylated	[redacted]	No information available
Sodium iodide	[redacted]	-1.301

12.4. Mobility in soil

Substances	CAS Number	Mobility
Diethylene glycol	[redacted]	No information available
Cinnamaldehyde	[redacted]	No information available
Amine oxides, cocoalkyldimethyl	[redacted]	No information available
Methanol	[redacted]	No information available
Benzaldehyde	[redacted]	No information available
Alcohols, C12-16, ethoxylated	[redacted]	No information available
Sodium iodide	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Incineration recommended in approved incinerator according to federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Disposal of any contaminated packaging

Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Methanol)
Transport Hazard Class(es): 3
Packing Group: III
Environmental Hazards: Not applicable

IMDG/IMO

UN Number UN1993
UN proper shipping name: Flammable Liquid, N.O.S. (Contains Methanol)

Transport Hazard Class(es):	3
Packing Group:	III
Environmental Hazards:	Not applicable
EMS:	EmS F-E, S-E

IATA/ICAO

UN Number	UN1993
UN proper shipping name:	Flammable Liquid, N.O.S. (Contains Methanol)
Transport Hazard Class(es):	3
Packing Group:	III
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

Special precautions during transport
None

HazChem Code
•3Y

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 11-Oct-2022

Revision Note
SDS sections updated:
2
16

Full text of H-Statements referred to under sections 2 and 3
H225 - Highly flammable liquid and vapor
H226 - Flammable liquid and vapor
H301 - Toxic if swallowed
H302 - Harmful if swallowed
H311 - Toxic in contact with skin
H312 - Harmful in contact with skin

H315 - Causes skin irritation
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H319 - Causes serious eye irritation
H331 - Toxic if inhaled
H332 - Harmful if inhaled
H335 - May cause respiratory irritation
H370 - Causes damage to organs
H372 - Causes damage to organs through prolonged or repeated exposure
H373 - May cause damage to organs through prolonged or repeated exposure
H400 - Very toxic to aquatic life
H401 - Toxic to aquatic life
H412 - Harmful to aquatic life with long lasting effects

Additional information: For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-19001

Revision Date: 12-Feb-2021 **Revision Number:** 23

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-19001

Other means of Identification

Synonyms None

Hazardous Material Number: HM007662

Recommended use of the chemical and restrictions on use

Recommended Use Crosslinker

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Reproductive Toxicity	Category 1B - H360

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements: H360 - May damage fertility or the unborn child

Precautionary Statements

Prevention
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P281 - Use personal protective equipment as required

Response P308 + P313 - IF exposed or concerned: Get medical advice/attention

Storage P405 - Store locked up

Disposal P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	**CAS Number**
Disodium octaborate tetrahydrate	[redacted]

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Disodium octaborate tetrahydrate	[redacted]	60 - 100%	Repr. 1B (H360)

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

Skin Wash with soap and water. Get medical attention if irritation persists.

Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Potential reproductive hazard. May cause birth defects.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

None anticipated

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. Evacuate all persons from the area.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Avoid creating or inhaling dust. Ensure adequate ventilation. Avoid contact with eyes, skin, or clothing. Use appropriate protective equipment.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a cool, dry location. Product has a shelf life of 60 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Disodium octaborate tetrahydrate	[redacted]	Not applicable	TWA: 2 mg/m^3 STEL: 6 mg/m^3

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN

	149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional. Dust/mist respirator. (N95, P2/P3)
Hand Protection	Impervious rubber gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Dust proof goggles.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	White
Odor:	Odorless	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	7.3
Freezing Point / Range	No data available
Melting Point / Range	> 1000 °C
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	9.9E-17 pa @ 25°C
Vapor Density	No data available
Specific Gravity	1.7
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
None known.
10.6. Hazardous decomposition products
None known.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure	Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Potential reproductive hazard. May cause birth defects.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Disodium octaborate tetrahydrate	[redacted]	>2600 mg/kg-bw (Rat) (similar substance)	>2000 mg/kg-bw (rabbit) (similar substance)	>2.12 mg/L (rat) (4h) (similar substance)

Immediate, delayed and chronic health effects from exposure

Inhalation May cause respiratory irritation.

Eye Contact May cause mild eye irritation.

Skin Contact Non-irritating to the skin

Ingestion May cause abdominal pain, vomiting, nausea, and diarrhea.

Chronic Effects/Carcinogenicity Prolonged or repeated exposure may cause reproductive system damage. Prolonged or repeated exposure may cause embryo and fetus toxicity.

Exposure Levels

No data available

Interactive effects

None known.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Disodium octaborate tetrahydrate	[redacted]	Not irritating to skin in rabbits. (similar substances)

Substances	CAS Number	Serious eye damage/irritation
Disodium octaborate tetrahydrate	[redacted]	Eye, rabbit: Causes moderate eye irritation Non-irritating to rabbit's eye

Substances	CAS Number	Skin Sensitization
Disodium octaborate tetrahydrate	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)

Substances	CAS Number	Respiratory Sensitization
Disodium octaborate tetrahydrate	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Disodium octaborate tetrahydrate	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Disodium octaborate tetrahydrate	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Disodium octaborate tetrahydrate	[redacted]	May impair fertility May cause birth defects (similar substances)

Substances	CAS Number	STOT - single exposure
Disodium octaborate tetrahydrate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	STOT - repeated exposure
Disodium octaborate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar

tetrahydrate		substances)

Substances	CAS Number	Aspiration hazard
Disodium octaborate tetrahydrate	[redacted]	Not applicable

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Disodium octaborate tetrahydrate	[redacted]	EC10(3 d)=96.5 mg/L (Pseudokirchneriella subcapitata)	LC50(96 h)=314.6 mg/L (Pimephales promelas) NOEC(34 d)=25.2 mg/L (Danio rerio)	EC50(3 h)>39371 mg/L (activated sludge)	NOEC(21 d)=42.5 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Disodium octaborate tetrahydrate	[redacted]	The methods for determining biodegradability are not applicable to inorganic substances.

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Disodium octaborate tetrahydrate	[redacted]	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility
Disodium octaborate tetrahydrate	[redacted]	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 12-Feb-2021

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H360Df - May damage the unborn child. Suspected of damaging fertility

Additional information For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact

Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
OSHA
ECHA C&L

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-25005

Revision Date: 17-Apr-2020 **Revision Number:** 14

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-25005

Other means of Identification

Synonyms None

Hazardous Material Number: HM007672

Recommended use of the chemical and restrictions on use

Recommended Use Gelling Agent

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Non-Hazardous according to the criteria of the 3rd Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified

Label elements, including precautionary statements

Hazard Pictograms

Signal Word Not Hazardous

Hazard Statements: Not Classified

Precautionary Statements

Prevention None
Response None
Storage None
Disposal None

Contains

Substances	**CAS Number**
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA

Other hazards which do not result in classification
This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).
This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	60 - 100%	Not classified

4. First aid measures

Description of necessary first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.
Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin Wash with soap and water. Get medical attention if irritation persists.
Ingestion Under normal conditions, first aid procedures are not required.

Symptoms caused by exposure
No significant hazards expected.

Medical Attention and Special Treatment
Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

Specific hazards arising from the chemical
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases. Organic dust in the presence of an ignition source can be explosive in high concentrations. Good housekeeping practices are required to minimize this potential.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid creating and breathing dust. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation.

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Scoop up and remove.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Avoid creating or inhaling dust. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse. Use appropriate protective equipment.
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities
Storage Information
Store away from oxidizers. Store in a cool, dry location. Product has a shelf life of 24 months.
Other Guidelines
No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring
Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls	Use in a well ventilated area.

Personal protective equipment (PPE)

Personal Protective Equipment	If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.
Respiratory Protection	Not normally needed. But if significant exposures are possible then the following respirator is recommended: Dust/mist respirator. (N95, P2/P3)
Hand Protection	Normal work gloves.
Skin Protection	Normal work coveralls.
Eye Protection	Wear safety glasses or goggles to protect against exposure.
Other Precautions	None known.
Environmental Exposure Controls	Do not allow material to contaminate ground water system.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Solid	**Color**	Off white
Odor:	Bean	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	6.5-7.5
Freezing Point / Range	No data available
Melting Point / Range	No data available
Pour Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	> 93 °C / > 200 °F Cleveland Open Cup (COC)
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.42 - 1.47
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity
Not expected to be reactive.
10.2. Chemical stability
Stable
10.3. Possibility of hazardous reactions
Will Not Occur
10.4. Conditions to avoid
None anticipated
10.5. Incompatible materials
Strong oxidizers.
10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide.

11. Toxicological Information

Information on routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure
Most Important Symptoms/Effects
No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Contains no hazardous substances in concentrations above cut-off values according to the competent	NA	No data available	No data available	No data available

authority				

Immediate, delayed and chronic health effects from exposure

Inhalation May cause mild respiratory irritation.
Eye Contact May cause mild eye irritation.
Skin Contact None known.
Ingestion None known.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels
No data available

Interactive effects
None known.

Data limitations
No data available

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available	No information available	No information available	No information available

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.3. Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.4. Mobility in soil

Substances	CAS Number	Mobility

Contains no hazardous substances in concentrations above cut-off values according to the competent authority	NA	No information available

12.6. Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Bury in a licensed landfill according to federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IMDG/IMO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Special precautions during transport

None

HazChem Code

None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

16. Other information

Date of preparation or review

Revision Date: 17-Apr-2020

Revision Note
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
None

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-32002

Revision Date: 07-Feb-2018 **Revision Number:** 19

1. Identification

Product Name

Product Trade Name: DCA-32002

Other Names

Synonyms None

Hazardous Material Number: HM007683

Recommended Use

Recommended Use Surfactant

Uses advised against No information available

Company Name, Address and Contact Details

Manufacturer/Supplier Halliburton New Zealand
1 Paraite Rd,
Bell Block, New Plymouth
New Zealand Registration No.: 824207

E-mail Address fdunexchem@halliburton.com

Emergency Telephone Number +64 800 451719
Global Incident Response Access Code: 334305
Contract Number: 14012

New Zealand National Poisons Centre 0800 764 766 (24 hours)

2. Hazards Identification

Statement of Hazardous Nature

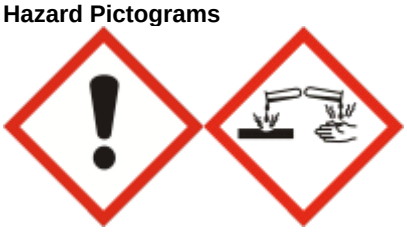
Classified as hazardous according to criteria in the Hazardous Substances (Minimum Degrees of Hazard) Regulation 2001;
Not Classified as dangerous good according to NZS 5433:2012, UN, IMDG or IATA

Classification

6.1D (Oral) Substances that are acutely toxic - Harmful
6.3A Irritating to the skin
8.3A Corrosive to ocular tissue
9.1B Ecotoxic in the aquatic environment

Hazard and Precautionary Statements

Hazard Pictograms



Signal Word Danger

Hazard Statements H302 - Harmful if swallowed
H315 - Causes skin irritation
H318 - Causes serious eye damage
H401 - Toxic to aquatic life

Precautionary Statements

Prevention	P101 - If medical advice is needed, have product container or label at hand P102 - Keep out of reach of children P103 - Read label before use P104 - Read Safety Data Sheet before use. P264 - Wash face, hands and any exposed skin thoroughly after handling P270 - Do not eat, drink or smoke when using this product P280 - Wear protective gloves/eye protection/face protection
Response	P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell P330 - Rinse mouth P331 - Do NOT induce vomiting P302 + P352 - IF ON SKIN: Wash with plenty of water. P332 + P313 - If skin irritation occurs: Get medical advice/attention P362 + P364 - Take off contaminated clothing and wash before reuse P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing P310 - Immediately call a POISON CENTER or doctor/physician
Storage	None
Disposal	P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

Contains

Substances	CAS Number	Substance HSNO Classification
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	6.1D (oral) 6.3A 8.3A 9.1B
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	6.1D (oral) 6.3A 8.3A 9.1B

2.3. Other Hazards

This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

3. Composition/Information on Ingredients

Substances	CAS Number	PERCENT (w/w)
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	60 - 100%
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	10 - 30%

4. First Aid Measures

Requirements for First Aid or Medical Care

Inhalation	Under normal conditions, first aid procedures are not required.
Eyes	Immediately flush eyes with large amounts of water for at least 15 minutes. Get immediate medical attention.
Skin	Wash with soap and water. Get medical attention if irritation persists.
Ingestion	Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Workplace Facilities Required

None

Relation to Health Effect

Most Important Symptoms/Effects

Causes severe eye irritation which may damage tissue. Causes skin irritation. Harmful if swallowed.

Medical Attention and Special Treatment

Notes to Physician

Treat symptomatically

5. Fire-fighting measures

Type of Hazard
Flammability Hazard
Non-flammable

5.1. Extinguishing media
Suitable Extinguishing Media
Water fog, carbon dioxide, foam, dry chemical.
Extinguishing media which must not be used for safety reasons
None known.

HAZCHEM Code
Hazchem Code: •3Z

Special Protective Equipment and Precautions for Fire Fighters
Special protective equipment for firefighters
Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.
Special exposure hazards in a fire
Decomposition in fire may produce harmful gases.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures
Use appropriate protective equipment. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.
See Section 8 for additional information

6.2. Environmental precautions
Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up
Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove.

6.4. Reference to other sections
See Section 8 and 13 for additional information.

7. Handling and storage

7.1. Precautions for safe handling
Handling Precautions
Avoid contact with eyes, skin, or clothing. Wash hands after use. Avoid breathing vapors. Ensure adequate ventilation. Slippery when wet. Launder contaminated clothing before reuse. Use appropriate protective equipment.

Handling Practices
Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice.

Approved Handlers
This product does NOT require an approved handler.

7.2. Conditions for safe storage, including any incompatibilities
Store away from oxidizers. Keep container closed when not in use. Keep from heat, sparks, and open flames. Product has a shelf life of 24 months.

Store Site Requirements
No special controls required

Packaging
No special packaging required

8. Exposure Controls/Personal Protection

Workplace Exposure Standards
Exposure Limits

Substances	CAS Number	New Zealand WES	ACGIH TLV-TWA
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Not applicable	Not applicable
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Not applicable	Not applicable

Engineering Controls

Engineering Controls None known.

Personal Protective Equipment (PPE)

Respiratory Protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

Hand Protection Impervious rubber gloves. Polyvinylchloride gloves.
Skin Protection Normal work coveralls.
Eye Protection Wear safety glasses or goggles to protect against exposure.
Other Precautions None known.
Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Yellow
Odor: Mild **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	6.5 (1%)
Freezing Point / Range	-3 °C
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	240 °C / 464 °F PMCC
Evaporation rate	No data available
Vapor Pressure	No data available
Vapor Density	> 10
Specific Gravity	0.98
Water Solubility	Soluble in water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.2. Chemical stability

Stable

10.4. Conditions to avoid

None anticipated

10.5. Incompatible materials

Strong oxidizers. Strong acids. Strong alkalis.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide.

Hazardous Reactions

Hazardous Polymerization: Will Not Occur

11. Toxicological Information

Health Effect from Likely Routes of Exposure
Acute Toxicity

Inhalation May cause mild respiratory irritation.
Eye Contact Causes severe eye irritation which may damage tissue.
Skin Contact Causes skin irritation.
Ingestion Harmful if swallowed. Irritation of the mouth, throat, and stomach.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Toxicity Data

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	600 mg/kg (Rat) (similar substance)	> 5200 mg/kg (Rabbit) (similar substance)	> 0.22 mg/L (saturated concentration) (Rat) (similar substance)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	600 mg/kg (Rat) (similar substance)	> 5200 mg/kg (Rabbit) (similar substance)	>0.22 mg/L (saturated concentration) (Rat) (similar substance)

Substances	CAS Number	Skin corrosion/irritation
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Causes skin irritation. (Rabbit) (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Causes skin irritation. (Rabbit) (similar substances)

Substances	CAS Number	Serious eye damage/irritation
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Causes severe eye irritation (Rabbit) (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Causes severe eye irritation (Rabbit) (similar substances)

Substances	CAS Number	Skin Sensitization
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)

Substances	CAS Number	Respiratory Sensitization
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	No information available
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	No information available

Substances	CAS Number	Mutagenic Effects
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Did not show carcinogenic or teratogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Animal testing did not show any effects on fertility.
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Animal testing did not show any effects on fertility.

Substances	CAS Number	STOT - single exposure
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	STOT - repeated exposure
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	Aspiration hazard
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	No adverse health effects are expected from swallowing.
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	No adverse health effects are expected from swallowing.

12. Ecological Information

12.1. Toxicity

Product Ecotoxicity Data

No data available

Algae Toxicity ErC50 (72h): 2.58 - 3.44 mg/L (Desmodesmus subspicatus)

Acute Crustaceans Toxicity: EC50(48h): 1.45 - 1.79 mg/L (Daphnia magna)

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	EC50 (72h) 0.75 mg/L (Pseudokirchnerella subcapitata) (similar substance) EC50 (96h) 0.7 mg/L (Pseudokirchneriella subapitata) (similar substance) CD10 8 mg/L (Pseudokirchneriella subapitata) EC10 2 mg/L (Brachionus calyciflorus)	LC50 (96h) 0.59 mg/L (Pleuronectes platessa) (similar substance) LC50 (96) 1.4 mg/L (Pimephales promelas) (similar substance) NOEC 4.4 mg/L (Pimephales promelas, juvenile)	ErC50 (16.9h) > 10 g/L (growth inhibition) (Pseudomonas putida) (similar substance)	EC50 (48h) 0.14 mg/L (Daphnia magna) (similar substance) EC50 (48h) 0.39 mg/L (Cerodaphnia dubia) (similar substance)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	EC50 (72h) 0.75 mg/L (Pseudokirchnerella subcapitata) (similar substance) ErC50 (48h) 0.7 mg/L (Skeletonema costatum) EC10 9.79 mg/L (Selenastrum capricornutum) (similar substance) ErC50 1.1 mg/L (Scenedesmus subspicatus) (similar substance)	LC50 (96h) 0.59 mg/L (Pleuronectes platessa) (similar substance) LC50 (96h) 1.6 mg/L (Pimephales promelas) (similar substace) LC50 (96h) 3 mg/L (Brachydanio rerio) (similar substance)	ErC50 (16.9h) > 10 g/L (Pseudomonas putida) (similar substance)	EC50 (48h) 0.14 mg/L (Daphnia magna) (similar substance) EC50 (48h) 02 mg/L (Daphnia magna) (similar substance)

12.2. Persistence and degradability

Readily biodegradable

Substances	CAS Number	Persistence and Degradability
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Readily biodegradable (60% @ 28d)

		(similar substances)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Readily biodegradable (84% @ 28d) (similar substances)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	Log Pow: 4.3 - 5.36 (estimated) BCF: 1.1 - 1.8 (fish, estimated)
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	Log Pow: 4.3 - 5.36 (estimated) BCF: 1.1 - 1.8 (fish, estimated)

12.4. Mobility in soil

Substances	CAS Number	Mobility
Alcohols, C6-C12, ethoxylated propoxylated	[redacted]	KOC = >4
Alcohols, C10-C16, ethoxylated propoxylated	[redacted]	KOC = >4

Ecotoxicity Hazard Statements
Very toxic to aquatic life
Toxic to aquatic life with long lasting effects

12.6. Other adverse effects
Endocrine Disruptor Information
This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

13.1. Waste treatment methods

Disposal methods Disposal should be made in accordance with federal, state, and local regulations.

Contaminated Packaging Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

14. Transport Information

IMDG/IMO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

NZ 5433.1999

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable

IATA/ICAO

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable

Special Precautions for User None
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable

15. Regulatory Information

New Zealand Inventory of Chemicals All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.

HSNO Approval Number HSR002503

Group Name	Additives, Process Chemicals and Raw Materials (Subsidiary hazard HSR002503)
HSNO Controls	Refer to the NZ EPA website for more information: http://www.epa.govt.nz
Approved Handlers	Not Applicable
Poisons Schedule:	None Allocated

16. Other information

Additional information

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key or legend to abbreviations and acronyms used in the safety data sheet
bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
MARPOL – International Convention for the Prevention of Pollution from Ships
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
ppm – parts per million
TWA – Time-Weighted Average
VOC – Volatile Organic Carbon
C - Celsius
IATA/ICAO - International Air Transport Association / International Civil Aviation Organization
IMDG/IMO - International Maritime Dangerous Goods / International Maritime Organization
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

Revision Date: 07-Feb-2018
Revision Note
SDS sections updated:
2
14

Disclaimer Statement
This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

SAFETY DATA SHEET

DCA-23003

Revision Date: 16-Jun-2023 **Revision Number:** 21

1. Product Identifier & Identity for the Chemical

Statement of Hazardous Nature Hazardous according to the criteria of the 7th Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

1.1. Product Identifier

Product Name DCA-23003

Other means of Identification

Synonyms None

Hazardous Material Number: HM008080

Recommended use of the chemical and restrictions on use

Recommended Use Friction Reducer

Uses advised against No information available

Supplier's name, address and phone number

Manufacturer/Supplier Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 1 800 686 951
Fax Number: 61 (08) 9455 5300

E-mail Address fdunexchem@halliburton.com

Emergency phone number

+ 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre

24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

2. Hazard Identification

Statement of Hazardous Nature Hazardous according to the criteria of the 7th Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

Classification of the hazardous chemical

Not classified	
Serious Eye Damage/Irritation	Category 1 - H318

Label elements, including precautionary statements

Hazard Pictograms

Signal Word DANGER

Hazard Statements: H318 - Causes serious eye damage

Precautionary Statements

Prevention P280 - Wear eye protection/face protection
Response P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/physician
Storage None
Disposal None

Contains

Substances	**CAS Number**
Hydrotreated light petroleum distillate	[redacted]
Sodium diacetate	[redacted]
Ethoxylated alcohol	Proprietary

Other hazards which do not result in classification
This mixture contains no substance considered to be persistent, bioaccumulating nor toxic (PBT).
This mixture contains no substance considered to be very persistent nor very bioaccumulating (vPvB).

For the full text of the H-phrases mentioned in this Section, see Section 16

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Australia
Hydrotreated light petroleum distillate	[redacted]	10 - 30%	Asp. Tox. 1 (H304)
Sodium diacetate	[redacted]	1 - 5%	Eye Corr. 1 (H318)
Ethoxylated alcohol	Proprietary	1 - 5%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 2 (H401) Aquatic Chronic 3 (H412)

4. First aid measures

Description of necessary first aid measures
Inhalation If inhaled, move victim to fresh air and seek medical attention.
Eyes In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.
Skin Wash with soap and water. Get medical attention if irritation persists. Remove contaminated clothing and launder before reuse.
Ingestion Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

Symptoms caused by exposure
Causes serious eye damage. Causes severe eye irritation which may damage tissue. No significant hazards

expected.

Medical Attention and Special Treatment

Notes to Physician Treat symptomatically

5. Fire Fighting Measures

Suitable extinguishing equipment

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Specific hazards arising from the chemical

Special exposure hazards in a fire

Product is not expected to burn unless all the water is boiled away. Decomposition in fire may produce harmful gases. Use water spray to cool fire exposed surfaces.

Special protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Use appropriate protective equipment. Spills of this product are very slippery. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Ensure adequate ventilation.

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Isolate spill and stop leak where safe. Contain spill with sand or other inert materials. Scoop up and remove. Do NOT spread spilled product with water.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Use appropriate protective equipment. Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Avoid breathing mist. Ensure adequate ventilation. Wash hands after use. Launder contaminated clothing before reuse.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store away from oxidizers. Store in a cool well ventilated area. Keep container closed when not in use. Store at temperatures between 40 and 90 F (5 and 35 C). Keep from freezing. Product has a shelf life of 6 months.

Other Guidelines

No information available

8. Exposure Controls/Personal Protection

Control parameters - exposure standards, biological monitoring

Exposure Limits

Substances	CAS Number	Australia NOHSC	ACGIH TLV-TWA
Hydrotreated light petroleum distillate	[redacted]	Not applicable	Not applicable
Sodium diacetate	[redacted]	Not applicable	Not applicable

Ethoxylated alcohol	Proprietary	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area. Personal protective equipment must be CE marked and should be selected in collaboration with the supplier of such equipment.
The recommended protective equipment and the specified standards are indicative. Standards should be of the latest version.
Risk assessment of the actual workplace / operation (actual risk) may result in other protective measures.
The suitability and durability of the protective equipment will depend on the application.

Personal protective equipment (PPE)

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

Respiratory Protection Not normally needed. But if significant exposures are possible then the following respirator is recommended:
Organic vapor respirator with a dust/mist filter. (A2P2/P3)

Hand Protection Impervious rubber gloves. Manufacturer's directions for use should be observed because of great diversity of types.

Skin Protection Normal work coveralls.

Eye Protection Chemical goggles; also wear a face shield if splashing hazard exists.

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls Do not allow material to contaminate ground water system. Prevent product from entering drains. Do not flush into surface water or sanitary sewer system. Avoid subsoil penetration

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State: Liquid **Color** Off white
Odor: Hydrocarbon **Odor Threshold:** No information available

Property Remarks/ - Method	Values
pH:	5 - 8
Freezing Point / Range	No data available
Melting Point / Range	< 5 °C / < 41 °F
Pour Point / Range	No data available
Boiling Point / Range	> 100 °C / 212 °F
Flash Point	No data available
Evaporation rate	No data available
Vapor Pressure	17.25 mmHg
Vapor Density	No data available
Specific Gravity	1.0 - 1.1
Water Solubility	Miscible with water
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	> 20.5 mm2/s
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%) No data available

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability

Stable

10.3. Possibility of hazardous reactions

Will Not Occur

10.4. Conditions to avoid

Freezing conditions.

10.5. Incompatible materials

Strong oxidizers.

10.6. Hazardous decomposition products

Carbon monoxide and carbon dioxide. Oxides of nitrogen. Hydrogen cyanide.

11. Toxicological Information

Information on routes of exposure

Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Causes serious eye damage. Causes severe eye irritation which may damage tissue. No significant hazards expected.

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Hydrotreated light petroleum distillate	[redacted]	5000 mg/kg (Rat)	2000 mg/kg (Rabbit)	5.2 mg/L (Rat) 4 h
Sodium diacetate	[redacted]	5600 mg/kg (Rat)	2000 mg/kg (Rat)	No data available
Ethoxylated alcohol	Proprietary	No data available	No data available	No data available

Immediate, delayed and chronic health effects from exposure

Inhalation If heated: May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.

Eye Contact Causes serious eye damage

Skin Contact Prolonged or repeated contact may cause skin irritation.

Ingestion May act as obstruction if swallowed. Aspiration can be a hazard if this material is swallowed.

Chronic Effects/Carcinogenicity No data available to indicate product or components present at greater than 0.1% are chronic health hazards.

Exposure Levels

No data available

Interactive effects

Eye ailments. Skin disorders.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
Hydrotreated light petroleum distillate	[redacted]	Non-irritating to the skin (similar substances)
Sodium diacetate	[redacted]	Non-irritating to the skin
Ethoxylated alcohol		Skin, rabbit: Causes moderate skin irritation. (similar substances)

Substances	CAS Number	Serious eye damage/irritation
Hydrotreated light petroleum distillate	[redacted]	Non-irritating to rabbit's eye (similar substances)
Sodium diacetate	[redacted]	Causes severe eye irritation which may damage tissue.

Ethoxylated alcohol		Eye, rabbit: Causes severe eye irritation which may damage tissue. (similar substances)

Substances	CAS Number	Skin Sensitization
Hydrotreated light petroleum distillate	[redacted]	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Sodium diacetate	[redacted]	Not regarded as a sensitizer.
Ethoxylated alcohol		Did not cause sensitization on laboratory animals (guinea pig) (similar substances)

Substances	CAS Number	Respiratory Sensitization
Hydrotreated light petroleum distillate	[redacted]	Based on available data, the classification criteria are not met.
Sodium diacetate	[redacted]	No information available
Ethoxylated alcohol		Based on available data, the classification criteria are not met.

Substances	CAS Number	Mutagenic Effects
Hydrotreated light petroleum distillate	[redacted]	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)
Sodium diacetate	[redacted]	No information available
Ethoxylated alcohol		In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects. (similar substances)

Substances	CAS Number	Carcinogenic Effects
Hydrotreated light petroleum distillate	[redacted]	Did not show carcinogenic effects in animal experiments (similar substances)
Sodium diacetate	[redacted]	No information available
Ethoxylated alcohol		Did not show carcinogenic effects in animal experiments (similar substances)

Substances	CAS Number	Reproductive toxicity
Hydrotreated light petroleum distillate	[redacted]	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)
Sodium diacetate	[redacted]	(similar substances)
Ethoxylated alcohol		Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)

Substances	CAS Number	STOT - single exposure
Hydrotreated light petroleum distillate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Sodium diacetate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Ethoxylated alcohol		No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	STOT - repeated exposure
Hydrotreated light petroleum distillate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Sodium diacetate	[redacted]	No significant toxicity observed in animal studies at concentration requiring classification.
Ethoxylated alcohol		No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)

Substances	CAS Number	Aspiration hazard
Hydrotreated light petroleum distillate	[redacted]	Aspiration into the lungs may cause chemical pneumonitis including coughing, difficulty breathing, wheezing, coughing up blood and pneumonia, which can be fatal.
Sodium diacetate	[redacted]	Not applicable
Ethoxylated alcohol		Based on available data, the classification criteria are not met.

12. Ecological Information

Ecotoxicity

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Hydrotreated light petroleum distillate	[redacted]	ErL50(72 h)>10000 mg/L (Skeletonema costatum)	LC50(96 h)>10000 mg/L (Scophthalmus maximus)	No information available	LC50(48 h)>10000 mg/L (Acartia tonsa)

			NOELR(28 d)>1000 mg/L (fish)		NOELR(21 d)=1000 mg/L (Daphnia magna)
Sodium diacetate	[redacted]	EC50 (72 h) >1000 mg/L (Skeletonema costatum)	LC0 (96 h) >100 mg/L (Danio rerio) LC50 (96 h) 273 mg/L (Oreochromis mossambicus)	No information available	EC50 (48 h) >1000 mg/L (Daphnia magna)
Ethoxylated alcohol	Proprietary	IC50(72 h)=1-10 mg/L (Desmodesmus subspicatus)	LC50(96 h)=1-10 mg/L (Cyprinus carpio)	No information available	EC50(48 h)=1-10 mg/L (Daphnia magna) NOAEC (21d) 0.77 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Hydrotreated light petroleum distillate	[redacted]	Readily biodegradable (68.1% @ 28d)
Sodium diacetate	[redacted]	No information available
Ethoxylated alcohol	Proprietary	Readily biodegradable (> 60% @ 28d)

12.3. Bioaccumulative potential

Bioaccumulation is unlikely

Substances	CAS Number	Bioaccumulation
Hydrotreated light petroleum distillate	[redacted]	No information available
Sodium diacetate	[redacted]	No information available
Ethoxylated alcohol	Proprietary	Not Bioaccumulative; BCF = 12.7 - 237 L/Kg

12.4. Mobility in soil

Substances	CAS Number	Mobility
Hydrotreated light petroleum distillate	[redacted]	No information available
Sodium diacetate	[redacted]	No information available
Ethoxylated alcohol	Proprietary	No information available

Other adverse effects

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal Considerations

Safe handling and disposal methods

Disposal should be made in accordance with federal, state, and local regulations.

Disposal of any contaminated packaging

Follow all applicable national or local regulations.

Environmental regulations

Not applicable

14. Transport Information

Transportation Information

Australia ADG

UN Number Not restricted
UN proper shipping name: Not restricted
Transport Hazard Class(es): Not applicable
Packing Group: Not applicable
Environmental Hazards: Not applicable

IMDG/IMO

UN Number Not restricted
UN proper shipping name: Not restricted

Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

IATA/ICAO

UN Number	Not restricted
UN proper shipping name:	Not restricted
Transport Hazard Class(es):	Not applicable
Packing Group:	Not applicable
Environmental Hazards:	Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code
Not applicable

Special precautions during transport
None

HazChem Code
None Allocated

15. Regulatory Information

Safety, health and environmental regulations specific for the product

International Inventories

Australian AICS Inventory	All components are listed on the AIIC or are subject to a relevant exemption, permit, or assessment certificate.
New Zealand Inventory of Chemicals	All components are listed on the NZIoC or are subject to a relevant exemption, permit, or assessment certificate.
US TSCA Inventory	All components listed on inventory or are exempt.
Canadian Domestic Substances List (DSL)	All components listed on inventory or are exempt.

Poisons Schedule number
None Allocated

International Agreements

Montreal Protocol - Ozone Depleting Substances:	Does not apply.
Stockholm Convention - Persistent Organic Pollutants:	Does not apply
Rotterdam Convention - Prior Informed Consent:	Does not apply.
Basel Convention - Hazardous Waste:	Does not apply.

16. Other information

Date of preparation or review

Revision Date: 16-Jun-2023

Revision Note
Update to Format
SDS sections updated:
2

Full text of H-Statements referred to under sections 2 and 3
H302 - Harmful if swallowed
H304 - May be fatal if swallowed and enters airways
H315 - Causes skin irritation
H318 - Causes serious eye damage
H412 - Harmful to aquatic life with long lasting effects

Additional information: For additional information on the use of this product, contact your local Halliburton

representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key abreviations or acronyms used

bw – body weight
CAS – Chemical Abstracts Service
EC50 – Effective Concentration 50%
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
NOEC – No Observed Effect Concentration
OEL – Occupational Exposure Limit
PBT – Persistent Bioaccumulative and Toxic
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
vPvB – very Persistent and very Bioaccumulative
h - hour
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
w/w - weight/weight
d - day

Key literature references and sources for data

www.ChemADVISOR.com/
OSHA
ECHA C&L

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

HALLIBURTON

Multi-Chem

SAFETY DATA SHEET

MC MX 2-6028

Revision date: 24-Sep-2024 **Revision Number:** 1

Section 1: Identification: Product identifier and chemical identity

Product identifier

Product Name MC MX 2-6028

Product Code(s) MC007219

Other means of identification

Pure substance/mixture Mixture

Recommended use of the chemical and restrictions on use

Recommended use Scale Control
Uses advised against Consumer use.

Details of manufacturer or importer

Halliburton Australia Pty. Ltd.
15 Marriott Road, Jandakot, WA 6164
Australia
ACN Number: 009 000 775
Telephone Number: + 61 (08) 6424 4800

For further information, please contact

fdunexchem@halliburton.com

Emergency telephone number

Australia Emergency Telephone Number + 61 1 800 686 951
Global Incident Response Access Code: 334305
Contract Number: 14012

Australian Poisons Information Centre 24 Hour Service: - 13 11 26
Police or Fire Brigade: - 000 (exchange): - 1100

Section 2: Hazard(s) identification

Statement of Hazardous Nature: Non-Hazardous according to the criteria of the 7th Revised Edition of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS), Non-Dangerous Goods according to the criteria of ADG.

GHS Classification

Not a hazardous substance or mixture according to the Globally Harmonised System (GHS). Not classified.

Label elements

Hazard statements

Not a hazardous substance or mixture according to the Globally Harmonised System (GHS). Not classified.

Other hazards which do not result in classification
No information available.

Section 3: Composition/information on ingredients

The product contains no substances which at their given concentration, are considered to be hazardous to health

Chemical name	CAS No.	Weight-%
Non-hazardous ingredients	Proprietary	Balance

If CAS number is "proprietary", the specific chemical identity and percentage of composition has been withheld as a trade secret

Section 4: First aid measures

Description of first aid measures

Inhalation Remove to fresh air.

Eye contact Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a doctor.

Skin contact Wash skin with soap and water.

Ingestion Rinse mouth.

Most important symptoms and effects, both acute and delayed

Symptoms No information available.

Effects of Exposure No information available.

Indication of any immediate medical attention and special treatment needed

Note to doctors Treat symptomatically.

Section 5: Firefighting measures

Suitable Extinguishing Media

Suitable extinguishing media Water fog, carbon dioxide, foam, dry chemical.

Large Fire CAUTION: Use of water spray when fighting fire may be inefficient.

Unsuitable extinguishing media Do not scatter spilled material with high pressure water streams.

Specific hazards arising from the chemical

Specific hazards arising from the chemical No information available.

Carbon oxides. Oxides of phosphorus. Oxides of nitrogen.

Special protective actions for fire-fighters

Special protective equipment and precautions for fire-fighters Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

Section 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures

Personal precautions Ensure adequate ventilation.

For emergency responders Use personal protection recommended in Section 8.

Environmental precautions

Environmental precautions See Section 12 for additional Ecological Information.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Precautions to prevent secondary hazards

Prevention of secondary hazards Clean contaminated objects and areas thoroughly observing environmental regulations.

Section 7: Handling and storage, including how the chemical may be safely used

Precautions for safe handling

Advice on safe handling Handle in accordance with good industrial hygiene and safety practice.

Conditions for safe storage, including any incompatibilities

Storage Conditions Store in a well ventilated area.

Incompatible materials Strong oxidizers.

Section 8: Exposure controls and personal protection

Control parameters

Exposure Limits This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Biological occupational exposure limits This product, as supplied, does not contain any hazardous materials with biological limits established by the region specific regulatory bodies

Appropriate engineering controls

Engineering controls Ensure adequate ventilation, especially in confined areas.

Individual protection measures, such as personal protective equipment

Eye/face protection Safety glasses with side-shields. If splashes are likely to occur, wear: Goggles, Face-shield.

Skin and body protection No special protective equipment required.

Respiratory protection If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN

149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

Environmental exposure controls No information available.

Other protective equipment Eyewash fountains and safety showers must be easily accessible.

Thermal hazards No information available.

Section 9: Physical and chemical properties

Information on basic physical and chemical properties

Physical state Liquid
Appearance No information available
Colour Clear Light Amber to Dark Amber
Odour Unpleasant.
Odour threshold No information available

Property	Values	Remarks • Method
pH	4.0 - 7.0	None known
Melting point / freezing point	No data available	
Initial boiling point and boiling range		
Flash point	> 100 °C / 212 °F	None known
Evaporation rate	No data available	
Flammability	No data available	
Flammability Limit in Air		
Upper flammability or explosive limits	No data available	
Lower flammability or explosive limits	No data available	
Vapour pressure	No data available	
Relative vapour density	No data available	
Relative density	1.1711 - 1.1961	
Water solubility	Soluble in water	
Solubility(ies)	No data available	
Partition coefficient	No data available	
Autoignition temperature	No data available	
Decomposition temperature		
Kinematic viscosity	No data available	
Dynamic viscosity	No data available	
Other information		
Pour Point	No data available	
VOC content	No information available	
Liquid Density	9.76 - 9.98 lbs/gal	
Bulk density	1171 - 1196 kg/m^3	
Particle characteristics	No information available	

Section 10: Stability and reactivity

Reactivity

Reactivity No information available.

Chemical stability

Stability Stable under normal conditions.

Explosion data
Sensitivity to mechanical impact None.

Sensitivity to static discharge None.

Possibility of hazardous reactions

Possibility of hazardous reactions None under normal processing.

Conditions to avoid

Conditions to avoid None known based on information supplied.

Incompatible materials

Incompatible materials Strong oxidizers.

Hazardous decomposition products

Hazardous decomposition products Carbon oxides. Oxides of phosphorus. Oxides of nitrogen.

Section 11: Toxicological information

Information on likely routes of exposure

Principle Routes of Exposure Ingestion, Skin contact, Eye contact, Inhalation, Ingestion, Skin contact, Eye contact, Inhalation

Product Information

Inhalation Specific test data for the substance or mixture is not available.

Eye contact Specific test data for the substance or mixture is not available.

Skin contact Specific test data for the substance or mixture is not available.

Ingestion Specific test data for the substance or mixture is not available.

Symptoms No information available.

Acute toxicity .

Numerical measures of toxicity - Product Information
No information available

The following values are calculated based on chapter 3.1 of the GHS document

ATEmix (oral)	99,999.00	mg/kg
ATEmix (dermal)	99,999.00	mg/kg
ATEmix (inhalation-gas)	99,999.00	ppm
ATEmix (inhalation-vapour)	99,999.00	mg/l
ATEmix (inhalation-dust/mist)	99,999.000	mg/l

See section 16 for terms and abbreviations

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation Based on available data, the classification criteria are not met.

Serious eye damage/eye irritation Based on available data, the classification criteria are not met.

Respiratory or skin sensitisation Based on available data, the classification criteria are not met.

Germ cell mutagenicity	Based on available data, the classification criteria are not met.
Carcinogenicity	Based on available data, the classification criteria are not met.
Reproductive toxicity	Based on available data, the classification criteria are not met.
STOT - single exposure	Based on available data, the classification criteria are not met.
STOT - repeated exposure	Based on available data, the classification criteria are not met.
Aspiration hazard	Based on available data, the classification criteria are not met.

Section 12: Ecological information

Ecotoxicity

Aquatic ecotoxicity

Unknown aquatic toxicity	2.56724 % of the mixture consists of component(s) of unknown hazards to the aquatic environment.
Terrestrial ecotoxicity	There is no data for this product.
Persistence and degradability	Based on available data, the classification criteria are not met
Bioaccumulation	There is no data for this product.
Mobility	Based on available data, the classification criteria are not met
Other adverse effects	No data available

Section 13: Disposal considerations

Disposal methods

Waste from residues/unused products	Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.
Contaminated packaging	Do not reuse empty containers.

See section 8 for more information

Section 14: Transport information

ADG	Not regulated

IATA Not regulated

IMDG Not regulated

Transport in bulk according to Annex II of MARPOL and the IBC Code
No information available

Section 15: Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture

National regulations

Australia

See section 8 for national exposure control parameters

Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP)
Classified as a scheduled poison according to the Standard for the Uniform Scheduling of Medicines and Poisons (SUSMP)
Poison Schedule Number 10

Australian Industrial Chemicals Introduction Scheme (AICIS)
Contact supplier for inventory compliance status

Illicit Drug Precursors/Reagents
This product does not contain any substance(s) on the Illicit Drug Precursors/Reagents list.

International Inventories

TSCA	All components listed on inventory or are exempt
AIIC	All components listed on inventory or are exempt
NZIoC	Product contains one or more components not listed on inventory

Legend:
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
AIIC - Australian Inventory of Industrial Chemicals
NZIoC - New Zealand Inventory of Chemicals

International Regulations

The Montreal Protocol on Substances that Deplete the Ozone Layer Not applicable

The Stockholm Convention on Persistent Organic Pollutants Not applicable

The Rotterdam Convention Not applicable

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal Not applicable

Section 16: Any other relevant information

Revision date 24-Sep-2024

Reason for revision Initial Release

Key or legend to abbreviations and acronyms used in the safety data sheet

ADR - The European Agreement concerning the International Carriage of Dangerous Goods by Road
bw – body weight
CAS – Chemical Abstracts Service
CLP – REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Classification, Labelling and Packaging of substances and mixtures
EN 149 - European standard on filtering halfmasks to protect against particles
FFP - Filtering Facepieces
h - hour
IBC Code – International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk
LL50 – Lethal Loading 50%
d - day
Derived No Effect Level (DNEL)
EC – European Commission
EC10 – Effective Concentration 10%
EC50 – Effective Concentration 50%
EEC – European Economic Community
IATA/ICAO - International Air Transport Association / International Civil Aviation Organization
IMDG/IMO - International Maritime Dangerous Goods / International Maritime Organization
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
NTP – National Toxicology Program
OEL – Occupational Exposure Limit
PEL – Permissible Exposure Limit
ppm – parts per million
REACH – REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals
VOC – Volatile Organic Carbon
UN – United Nations
VLA-EC - short-time excursion limits [Spain valores límite ambientales para la exposición de corta duración]
vPvB – very Persistent and very Bioaccumulative
w/w - weight/weight
Water hazard class (WGK)
UN – United Nations
VOC – Volatile Organic Carbon
TWA - Time-Weighted Average
STEL – Short Term Exposure Limit

Legend Section 8: Exposure controls/personal protection

TWA	TWA (time-weighted average)	STEL	STEL (Short Term Exposure Limit)
Ceiling	Maximum limit value	Sk*	Skin designation
+	Sensitisers		

Key literature references and sources for data used to compile the SDS

Acute Exposure Guideline Level(s) (AEGL(s))
European Chemicals Agency (ECHA) (ECHA_API)
European Chemicals Agency (ECHA) Committee for Risk Assessment (ECHA_RAC)
Hazardous Substance Database
International Uniform Chemical Information Database (IUCLID)
NIOSH (National Institute for Occupational Safety and Health)

Disclaimer

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End of Safety Data Sheet

Appendix E Tier 2 Assessment – Avian Wildlife

Table E-1
Tier 2 Assessment - Summary
Imperial Oil Gas and Imperial Oil and Gas A Northern Territory Tenement - Chemical Risk Assessment

Common Name	Scientific Name	Body Mass (Kg)								Drinking WIR (L/day)[3,4]
		Sex[1]	N	Mean	Standard Deviation	Min	Max	Location	Source ID[2]	Mean
Crested Pigeon	*Ocyphaps lophotes*	**B**	**21**	**0.204**	**---**	**0.142**	**0.26**	**Australia**	**515a**	**0.020**
Willie Wagtail	*Rhipidura leucophrys picata*	**B**	**13**	**0.0201**	**---**	**0.0145**	**0.0255**	**Australia**	**518a**	**0.004**
Peaceful Dove	*Geopelia placida*	**B**	**38**	**0.0478**	**---**	**0.035**	**0.065**	**Australia**	**515a**	**0.008**
Cattle Egret	*Bubulcus ibis*	M	27	0.372	---	0.296	0.46	FL, USA	1207	0.0304
Cattle Egret	*Bubulcus ibis*	**F**	**59**	**0.36**	**---**	**0.27**	**0.512**	**FL, USA**	**1207**	**0.0298**
Brown Honeyeater	*Lichmera indistincta*	M	37	0.0118	0.0015	0.009	0.015	Australia	517	0.0030
Brown Honeyeater	*Lichmera indistincta*	**F**	**15**	**0.0106**	**0.0021**	**0.008**	**0.014**	**Australia**	**517**	**0.0028**

Notes:
1, Sex: M, Male; F, Female; B, Both
2, Body mass statistics compiled in Dunning (2008); Original source documents based on Source ID in Dunning (2008) include:
515a, *Higgins, P J and S J J F Davies 1996 Handbook of Australian, New Zealand and Antarctic birds Oxford University Press, Mel-bourne, Australia Volume 3*
518a, *Higgins, P J , J M Peter, and S J Cowling 2006 Handbook of Australian, New Zealand and Antarctic birds Oxford University Press, Melbourne, Australia Volume 7*
1207, *Telfair, R C 1994 Cattle Egret (Bubulcus ibis) In The Birds of North America, A Poole and F Gill (editors) The Birds of North America, Inc , Philadelphia, PA,* and The American Ornithologists' Union, Washington, DC Number 113
517, *Higgins, P J , J M Peter, and W K Steele 2001 Handbook of Australian, New Zealand and Antarctic birds Oxford University Press, Melbourne, Australia Volume 5*
3, Drinking water ingestion rate (WIR) based on the allometric relationship developed by Calder and Braun (1983), where WIR (L/day) = 0.059 x BW $(Kg)^{0.67}$
4, Proposed WIR shown in bold, estimated based on the arithmetic mean of female or combined body mass; WIR may be estimated based on other body mass statistics depending on the appropriate exposure scenario.
kg = kilogram

Table E-2
Tier 2 Assessment - Crested Pigeon
Imperial Oil Gas and Imperial Oil and Gas A Northern Territory Tenement - Chemical Risk Assessment

Constituent Name	CAS No.	Mammal NOAELt	Mammal NOAEL Test Animal		Avian NOAELt [1]	Avian NOAEL Test Animal		Avian Receptor Crested Pigeon	
			Animal	Body Weight (kg)		Animal	Body Weight (kg)	Body Weight (kg)	Derived TRV
Chlorous acid, sodium salt	[redacted]	4	Rat	0.35	NA	NA	NA	0.204	4.6E+00
Crontonaldehyde	[redacted]	2.5	Rat	0.35	NA	NA	NA	0.204	2.9E+00
Glutaraldehyde	[redacted]	4	Rat	0.35	206	Mallard Duck	1.58	0.204	3.4E+02
Tributyl tetradecyl phosphonium chloride	[redacted]	8.66	Rat	0.35	1980.0	Bobwhite Quail	0.178	0.204	1.9E+03
Octamethylcyclotetrasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.204	1.1E+03
Decamethyl cyclopentasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.204	1.1E+03
Dodecamethylcyclohexasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.204	1.1E+03
Copper (II) sulfate	[redacted]	16.7	Rat	0.35	NA	NA	NA	0.204	1.9E+01
Dicoco dimethyl quaternary ammonium chloride	[redacted]	40.3	Rat	0.35	NA	NA	NA	0.204	4.6E+01

Notes:
NOAELt = No observed adverse effect level test animal
kg = kilogram
NA = not applicable
TRV = toxicity reference value
1/ If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.

$$Derived\ TRV = NOAEL_{test} * \left(\frac{Body\ Weighttest}{Body\ WeightAvian}\right)^{(1/4)}$$

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	l/day	0.020	Table F-1
	EF	Exposure frequency	day/yr	21	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.204	Table F-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

Notes:
a/ Units:
l/day = litres per day
day/yr = days per year
yr = year
kg = kilogram
b/ References:
BPJ - Best Professional Judgement

Table E-2
Tier 2 Assessment - Crested Pigeon
Imperial Oil Gas and Imperial Oil and Gas A Northern Territory Tenement - Chemical Risk Assessment

Constituent Name	CAS No.	EPC[1]	Toxicity	Total Intake (mg/kg/day)	Hazard Quotient
		CW (mg/l)	TRVs		Ingestion
Chlorous acid, sodium salt	[redacted]	0.12	4.6E+00	6.9E-04	1.5E-04
Crontonaldehyde	[redacted]	0.12	2.9E+00	6.9E-04	2.4E-04
Glutaraldehyde	[redacted]	1.00	3.4E+02	5.8E-03	1.7E-05
Tributyl tetradecyl phosphonium chloride	[redacted]	28.00	1.9E+03	1.6E-01	8.4E-05
Octamethylcyclotetrasiloxane	[redacted]	0.001	1.1E+03	5.7E-06	5.0E-09
Decamethyl cyclopentasiloxane	[redacted]	0.001	1.1E+03	5.7E-06	5.0E-09
Dodecamethylcyclohexasiloxane	[redacted]	0.001	1.1E+03	5.7E-06	5.0E-09
Copper (II) sulfate	[redacted]	0.001	1.9E+01	5.7E-06	3.0E-07
Dicoco dimethyl quaternary ammonium chloride	[redacted]	0.10	4.6E+01	5.7E-04	1.2E-05
				Cumulative:	**5.0E-04**

Notes:
CW = concentration in water
EPC = exposure point concentration
mg/kg/day = milligrams per kilograms per day
mg/l = milligrams per litre
NA = not available/applicable
TRV = toxicity reference value
1/ EPC is injected concentration presented on Tables 1 and 2.

$$Total\ Intake = \frac{EPC\ \times IR\ \times EF\ \times ED}{BW\ \times ED\ x\ 365\ {}^{days}/_{year}}$$

$$Hazard\ Quotient = \frac{Total\ Intake\ \left(\frac{mg}{kg-day}\right)}{TRV\ \left(\frac{mg}{kg-day}\right)}$$

Table E-3
Tier 2 Assessment - Willie Wagtail
Imperial Oil Gas and Imperial Oil and Gas A Northern Territory Tenement - Chemical Risk Assessment

Constituent Name	CAS No.	Mammal NOAELt	Mammal NOAEL		Avian NOAELt [1]	Avian NOAEL		Avian Receptor	
			Test Animal			Test Animal		Willie Wagtail	
			Animal	Body Weight (kg)		Animal	Body Weight (kg)	Body Weight (kg)	Derived TRV
Chlorous acid, sodium salt	[redacted]	4	Rat	0.35	NA	NA	NA	0.0201	8.2E+00
Crontonaldehyde	[redacted]	2.5	Rat	0.35	NA	NA	NA	0.0201	5.1E+00
Glutaraldehyde	[redacted]	4	Rat	0.35	206	Mallard Duck	1.58	0.0201	6.1E+02
Tributyl tetradecyl phosphonium chloride	[redacted]	8.66	Rat	0.35	1980.0	Bobwhite Quail	0.178	0.0201	3.4E+03
Octamethylcyclotetrasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.0201	2.0E+03
Decamethyl cyclopentasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.0201	2.0E+03
Dodecamethylcyclohexasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.0201	2.0E+03
Copper (II) sulfate	[redacted]	16.7	Rat	0.35	NA	NA	NA	0.0201	3.4E+01
Dicoco dimethyl quaternary ammonium chloride	[redacted]	40.3	Rat	0.35	NA	NA	NA	0.0201	8.2E+01

Notes:
NOAELt = No observed adverse effect level test animal
kg = kilogram
NA = not applicable
TRV = toxicity reference value
1/ If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.

$$Derived\ TRV = NOAEL_{test} * \left(\frac{Body\ Weighttest}{Body\ WeightAvian}\right)^{(1/4)}$$

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	l/day	0.004	Table F-1
	EF	Exposure frequency	day/yr	21	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.0201	Table F-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

Notes:
a/ Units:
l/day = litres per day
day/yr = days per year
yr = year
kg = kilogram
b/ References:
BPJ - Best Professional Judgement

Table E-3
Tier 2 Assessment - Willie Wagtail
Imperial Oil Gas and Imperial Oil and Gas A Northern Territory Tenement - Chemical Risk Assessment

Constituent Name	CAS No.	EPC[1]	Toxicity	Total Intake (mg/kg/day)	Hazard Quotient
		CW (mg/l)	TRVs		Ingestion
Chlorous acid, sodium salt	[redacted]	0.12	8.2E+00	1.5E-03	1.8E-04
Crontonaldehyde	[redacted]	0.12	5.1E+00	1.5E-03	2.9E-04
Glutaraldehyde	[redacted]	1.00	6.1E+02	1.2E-02	2.0E-05
Tributyl tetradecyl phosphonium chloride	[redacted]	28.00	3.4E+03	3.5E-01	1.0E-04
Octamethylcyclotetrasiloxane	[redacted]	0.001	2.0E+03	1.2E-05	6.0E-09
Decamethyl cyclopentasiloxane	[redacted]	0.001	2.0E+03	1.2E-05	6.0E-09
Dodecamethylcyclohexasiloxane	[redacted]	0.001	2.0E+03	1.2E-05	6.0E-09
Copper (II) sulfate	[redacted]	0.001	3.4E+01	1.2E-05	3.6E-07
Dicoco dimethyl quaternary ammonium chloride	[redacted]	0.10	8.2E+01	1.2E-03	1.5E-05
				Cumulative:	**6.1E-04**

Notes:
CW = concentration in water
EPC = exposure point concentration
mg/kg/day = milligrams per kilograms per day
mg/l = milligrams per liter
NA = not available/applicable
TRV = toxicity reference value
1/ EPC is injected concentration presented on Tables 1 and 2.

$$Total\ Intake = \frac{EPC\ \times IR\ \times EF\ \times ED}{BW\ \times ED\ x\ 365\ {}^{days}/_{year}}$$

$$Hazard\ Quotient = \frac{Total\ Intake\ \left(\frac{mg}{kg-day}\right)}{TRV\ \left(\frac{mg}{kg-day}\right)}$$

Table E-4
Tier 2 Assessment - Peaceful Dove
Imperial Oil Gas and Imperial Oil and Gas A Northern Territory Tenement - Chemical Risk Assessment

Constituent Name	CAS No.	Mammal NOAELt	Mammal NOAEL Test Animal		Avian NOAELt [1]	Avian NOAEL Test Animal		Avian Receptor Peaceful Dove	
			Animal	Body Weight (kg)		Animal	Body Weight (kg)	Body Weight (kg)	Derived TRV
Chlorous acid, sodium salt	[redacted]	4	Rat	0.35	NA	NA	NA	0.0478	6.6E+00
Crontonaldehyde	[redacted]	2.5	Rat	0.35	NA	NA	NA	0.0478	4.1E+00
Glutaraldehyde	[redacted]	4	Rat	0.35	206	Mallard Duck	1.58	0.0478	4.9E+02
Tributyl tetradecyl phosphonium chloride	[redacted]	8.66	Rat	0.35	1980.0	Bobwhite Quail	0.178	0.0478	2.8E+03
Octamethylcyclotetrasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.0478	1.6E+03
Decamethyl cyclopentasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.0478	1.6E+03
Dodecamethylcyclohexasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.0478	1.6E+03
Copper (II) sulfate	[redacted]	16.7	Rat	0.35	NA	NA	NA	0.0478	2.7E+01
Dicoco dimethyl quaternary ammonium chloride	[redacted]	40.3	Rat	0.35	NA	NA	NA	0.0478	6.6E+01

Notes:
NOAELt = No observed adverse effect level test animal
kg = kilogram
NA = not applicable
TRV = toxicity reference value
1/ If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.

$$Derived\ TRV = NOAEL_{test} * \left(\frac{Body\ Weighttest}{Body\ WeightAvian}\right)^{(1/4)}$$

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	l/day	0.008	Table F-1
	EF	Exposure frequency	day/yr	21	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.0478	Table F-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

Notes:
a/ Units:
l/day = litres per day
day/yr = days per year
yr = year
kg = kilogram
b/ References:
BPJ - Best Professional Judgement

Table E-4
Tier 2 Assessment - Peaceful Dove
Imperial Oil Gas and Imperial Oil and Gas A Northern Territory Tenement - Chemical Risk Assessment

Constituent Name	CAS No.	EPC [1]	Toxicity	Total Intake (mg/kg/day)	Hazard Quotient
		CW (mg/l)	TRVs		Ingestion
Chlorous acid, sodium salt	[redacted]	0.12	6.6E+00	1.1E-03	1.7E-04
Crontonaldehyde	[redacted]	0.12	4.1E+00	1.1E-03	2.7E-04
Glutaraldehyde	[redacted]	1.00	4.9E+02	9.3E-03	1.9E-05
Tributyl tetradecyl phosphonium chloride	[redacted]	28.00	2.8E+03	2.6E-01	9.4E-05
Octamethylcyclotetrasiloxane	[redacted]	0.001	1.6E+03	9.3E-06	5.6E-09
Decamethyl cyclopentasiloxane	[redacted]	0.001	1.6E+03	9.3E-06	5.6E-09
Dodecamethylcyclohexasiloxane	[redacted]	0.001	1.6E+03	9.3E-06	5.6E-09
Copper (II) sulfate	[redacted]	0.001	2.7E+01	9.3E-06	3.4E-07
Dicoco dimethyl quaternary ammonium chloride	[redacted]	0.10	6.6E+01	9.3E-04	1.4E-05
				Cumulative:	**5.7E-04**

Notes:
CW = concentration in water
EPC = exposure point concentration
mg/kg/day = milligrams per kilograms per day
mg/l = milligrams per liter
NA = not available/applicable
TRV = toxicity reference value
1/ EPC is injected concentration presented on Tables 1 and 2.

$$Total\ Intake = \frac{EPC\ \times IR\ \times EF\ \times ED}{BW\ \times ED\ x\ 365\ {}^{days}/_{year}}$$

$$Hazard\ Quotient = \frac{Total\ Intake\ \left(\frac{mg}{kg-day}\right)}{TRV\ \left(\frac{mg}{kg-day}\right)}$$

Table E-5
Tier 2 Assessment - Cattle Egret
Imperial Oil Gas and Imperial Oil and Gas A Northern Territory Tenement - Chemical Risk Assessment

Constituent Name	CAS No.	Mammal NOAELt	Mammal NOAEL Test Animal		Avian NOAELt [1]	Avian NOAEL Test Animal		Avian Receptor Cattle Egret	
			Animal	Body Weight (kg)		Animal	Body Weight (kg)	Body Weight (kg)	Derived TRV
Chlorous acid, sodium salt	[redacted]	4	Rat	0.35	NA	NA	NA	0.36	4.0E+00
Crontonaldehyde	[redacted]	2.5	Rat	0.35	NA	NA	NA	0.36	2.5E+00
Glutaraldehyde	[redacted]	4	Rat	0.35	206	Mallard Duck	1.58	0.36	3.0E+02
Tributyl tetradecyl phosphonium chloride	[redacted]	8.66	Rat	0.35	1980.0	Bobwhite Quail	0.178	0.36	1.7E+03
Octamethylcyclotetrasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.36	9.9E+02
Decamethyl cyclopentasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.36	9.9E+02
Dodecamethylcyclohexasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.36	9.9E+02
Copper (II) sulfate	[redacted]	16.7	Rat	0.35	NA	NA	NA	0.36	1.7E+01
Dicoco dimethyl quaternary ammonium chloride	[redacted]	40.3	Rat	0.35	NA	NA	NA	0.36	4.0E+01

Notes:
NOAELt = No observed adverse effect level test animal
kg = kilogram
NA = not applicable
TRV = toxicity reference value
1/ If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.

$$Derived\ TRV = NOAEL_{test} * \left(\frac{Body\ Weighttest}{Body\ WeightAvian}\right)^{(1/4)}$$

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	l/day	0.030	Table F-1
	EF	Exposure frequency	day/yr	21	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.36	Table F-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

Notes:
a/ Units:
l/day = litres per day
day/yr = days per year
yr = year
kg = kilogram
b/ References:
BPJ - Best Professional Judgement

Table E-5
Tier 2 Assessment - Cattle Egret
Imperial Oil Gas and Imperial Oil and Gas A Northern Territory Tenement - Chemical Risk Assessment

Constituent Name	CAS No.	EPC[1]	Toxicity	Total Intake (mg/kg/day)	Hazard Quotient
		CW (mg/l)	TRVs		Ingestion
Chlorous acid, sodium salt	[redacted]	0.12	4.0E+00	5.7E-04	1.4E-04
Crontonaldehyde	[redacted]	0.12	2.5E+00	5.7E-04	2.3E-04
Glutaraldehyde	[redacted]	1.0041	3.0E+02	4.8E-03	1.6E-05
Tributyl tetradecyl phosphonium chloride	[redacted]	28.00	1.7E+03	1.3E-01	8.0E-05
Octamethylcyclotetrasiloxane	[redacted]	0.001	9.9E+02	4.8E-06	4.8E-09
Decamethyl cyclopentasiloxane	[redacted]	0.001	9.9E+02	4.8E-06	4.8E-09
Dodecamethylcyclohexasiloxane	[redacted]	0.001	9.9E+02	4.8E-06	4.8E-09
Copper (II) sulfate	[redacted]	0.001	1.7E+01	4.8E-06	2.9E-07
Dicoco dimethyl quaternary ammonium chloride	[redacted]	0.10	4.0E+01	4.8E-04	1.2E-05
				Cumulative:	**4.8E-04**

Notes:
CW = concentration in water
EPC = exposure point concentration
mg/kg/day = milligrams per kilograms per day
mg/l = milligrams per liter
NA = not available/applicable
TRV = toxicity reference value
1/ EPC is injected concentration presented on Tables 1 and 2.

$$Total\ Intake = \frac{EPC\ \times IR\ \times EF\ \times ED}{BW\ \times ED\ x\ 365\ {}^{days}/_{year}}$$

$$Hazard\ Quotient = \frac{Total\ Intake\ \left(\frac{mg}{kg-day}\right)}{TRV\ \left(\frac{mg}{kg-day}\right)}$$

Table E-6
Tier 2 Assessment - Brown Honeyeater
Imperial Oil Gas and Imperial Oil and Gas A Northern Territory Tenement - Chemical Risk Assessment

Constituent Name	CAS No.	Mammal NOAELt	Mammal NOAEL		Avian NOAELt [1]	Avian NOAEL		Avian Receptor	
			Test Animal			Test Animal		Brown Honeyeater	
			Animal	Body Weight (kg)		Animal	Body Weight (kg)	Body Weight (kg)	Derived TRV
Chlorous acid, sodium salt	[redacted]	4	Rat	0.35	NA	NA	NA	0.0106	9.6E+00
Crontonaldehyde	[redacted]	2.5	Rat	0.35	NA	NA	NA	0.0106	6.0E+00
Glutaraldehyde	[redacted]	4	Rat	0.35	206	Mallard Duck	1.58	0.0106	7.2E+02
Tributyl tetradecyl phosphonium chloride	[redacted]	8.66	Rat	0.35	1980.0	Bobwhite Quail	0.178	0.0106	4.0E+03
Octamethylcyclotetrasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.0106	2.4E+03
Decamethyl cyclopentasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.0106	2.4E+03
Dodecamethylcyclohexasiloxane	[redacted]	1000	Rat	0.35	NA	NA	NA	0.0106	2.4E+03
Copper (II) sulfate	[redacted]	16.7	Rat	0.35	NA	NA	NA	0.0106	4.0E+01
Dicoco dimethyl quaternary ammonium chloride	[redacted]	40.3	Rat	0.35	NA	NA	NA	0.0106	9.7E+01

Notes:
NOAELt = No observed adverse effect level test animal
kg = kilogram
NA = not applicable
TRV = toxicity reference value
1/ If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.

$$Derived\ TRV = NOAEL_{test} * \left(\frac{Body\ Weighttest}{Body\ WeightAvian}\right)^{(1/4)}$$

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	l/day	0.0028	Table F-1
	EF	Exposure frequency	day/yr	21	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.0106	Table F-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

Notes:
a/ Units:
l/day = litres per day
day/yr = days per year
yr = year
kg = kilogram
b/ References:
BPJ - Best Professional Judgement

Table E-6
Tier 2 Assessment - Brown Honeyeater
Imperial Oil Gas and Imperial Oil and Gas A Northern Territory Tenement - Chemical Risk Assessment

Constituent Name	CAS No.	EPC[1]	Toxicity	Total Intake (mg/kg/day)	Hazard Quotient
		CW (mg/l)	TRVs		Ingestion
Chlorous acid, sodium salt	[redacted]	0.12	9.6E+00	1.8E-03	1.9E-04
Crontonaldehyde	[redacted]	0.12	6.0E+00	1.8E-03	3.0E-04
Glutaraldehyde	[redacted]	1.00406	7.2E+02	1.5E-02	2.1E-05
Tributyl tetradecyl phosphonium chloride	[redacted]	28.00	4.0E+03	4.3E-01	1.1E-04
Octamethylcyclotetrasiloxane	[redacted]	0.001	2.4E+03	1.5E-05	6.3E-09
Decamethyl cyclopentasiloxane	[redacted]	0.001	2.4E+03	1.5E-05	6.3E-09
Dodecamethylcyclohexasiloxane	[redacted]	0.001	2.4E+03	1.5E-05	6.3E-09
Copper (II) sulfate	[redacted]	0.001	4.0E+01	1.5E-05	3.8E-07
Dicoco dimethyl quaternary ammonium chloride	[redacted]	0.10	9.7E+01	1.5E-03	1.6E-05
				Cumulative:	**6.4E-04**

Notes:
CW = concentration in water
EPC = exposure point concentration
mg/kg/day = milligrams per kilograms per day
mg/l = milligrams per liter
NA = not available/applicable
TRV = toxicity reference value
1/ EPC is injected concentration presented on Tables 1 and 2.

$$Total\ Intake = \frac{EPC\ \times IR\ \times EF\ \times ED}{BW\ \times ED\ x\ 365\ {}^{days}/_{year}}$$

$$Hazard\ Quotient = \frac{Total\ Intake\ \left(\frac{mg}{kg-day}\right)}{TRV\ \left(\frac{mg}{kg-day}\right)}$$