Appendix A: Change notice – Regulation 22

Interest holder	Tamboran B2 Pty Ltd	**EMP Title**	Beetaloo Sub-basin Shenandoah South E&A Program EMP	**Unique EMP ID**	TAM1-3	**Mod #**	11	**Date**	24/05/2026

Brief Description	1. Inclusion of additional stimulation and tracer fluid chemicals from Patina Energy, COHO and Fusion Technologies. The revised chemical risk assessment report is included as Appendix E to the Shenandoah South E&A EMP (TAM1-3).
Geospatial files included?	N/A

Does the proposed change result in a new, or increased, or potential or actual environmental impact or risk?	**If an INCREASE in the existing potential or actual environmental risk, is it provided for in the EMP?**	**Does the proposed change require additional mitigation measures to be included?**	**Has additional stakeholder engagement been conducted?**	**Does it require additional environmental performance standards and measurement criteria?**	**Does it affect compliances with Sacred Site Authority Certificates?**	**Does it affect current rehabilitation, weed fire, wastewater, erosion and sediment control, spill or emergency response plans?**	**Will the environmental outcome continue to be achieved, and will the impacts and risks be managed to ALARP and acceptable?**
No. There are no new or increased environmental impacts or risks through the addition of the new chemicals. The new chemical has been assessed to have a risk that is low and acceptable.	N/A No increased impact or risk with sufficient controls outlined in the spill management plan and wastewater management plan.	No. Existing mitigation measures are in place covering well construction and operations, spill management and wastewater management.	N/A. Stakeholder engagement is not required on the additional chemicals.	No. Environmental performance standards within the existing approved EMP are sufficient.	No. Activity covered under the existing AAPA certificates C2024-030 and C2024-031.	Yes The spill management plan (EMP Appendix F) has been updated to include the additional proposed chemical. All other plans remain valid and appropriate.	Yes. Mandatory groundwater monitoring required by the Code as outlined in *Table 34 Monitoring program summary*, will be met.

Additional contextual information	Inclusion of the additional chemical to support Tamboran HFS programs for E&A well activities as follows: **Table 1 Product Component Disclosure**

Product Name	Supplier	Confidential Status
Flow Insurance Copper	Patina Energy	Confidential
GT 1-16	Patina Energy	Confidential
Hydrogen Peroxide 50	COHO	
HCL-15B – Hydrochloric Acid 15%	Fusion Technologies	Confidential
FRP-BL1F – HVFR Anionic	Fusion Technologies	Confidential
BIO-GQ510 – Biocide 5/10 Glut Quat	Fusion Technologies	Confidential
SFT-NE-1F – Flowback Surfactant (NE)	Fusion Technologies	Confidential
CSA-1F – Clay Control (70% Choline)	Fusion Technologies	Confidential
SCI-1F – Scale Inhibitor	Fusion Technologies	Confidential
LGA-01F – Guar Gel Concentrate	Fusion Technologies	Confidential
XLB-C1F – Instant Cross Linker	Fusion Technologies	Confidential
BHE-01F – Encapsulated AP	Fusion Technologies	Confidential
BFH-1F – High Buffer	Fusion Technologies	Confidential
BFL-1F – Low Buffer	Fusion Technologies	Confidential

All additional chemicals assessed were considered low risk and acceptable.

Appendix E Beetaloo Chemical Risk Assessment, Revision 12 provides the assessment of the new chemicals (AECOM, 2026).

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

Executive Summary

Table 6: Chemicals that may be added to the proppant during stimulation activities and held on each well pad, based on 3 wells per pad

Material name	Typical volume	Maximum volume	Unit	Storage area	Chemical composition	CAS Number	CRA report
Stimulation chemical							
Acetic acid - 60% pH control	3,000	9,000	L	Stimulation chemical storage area	Acetic acid	64-19-7	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
BE-9 biocide	17,000	17,000	L	Stimulation chemical storage area	Tributyl tetradecyl phosphonium chloride	81741-28-8	AECOM, 2024a – Appendix E
Caustic soda liquid - pH control/ buffer	15,000	45,000	L	Stimulation chemical storage area	Sodium hydroxide	1310-73-2	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
DCA-11001 breaker activator	5,000	15,000	L	Stimulation chemical storage area	Diethanolamine	111-42-2	AECOM, 2024a – Appendix E
DCA-13002 breaker	300	900	kg	Stimulation chemical storage area	Sodium persulfate	7775-27-1	AECOM, 2024a – Appendix E
DCA-13003 breaker	10,000	30,000	L	Stimulation chemical storage area	Chlorous acid, sodium salt Sodium chloride	7758-19-2 7647-14-5	AECOM, 2024a – Appendix E
DCA-16001 clay stabiliser	42,000	126,000	L	Stimulation chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
DCA-17001 corrosion inhibitor	1,000	3,000	L	Stimulation chemical storage area	Diethylene glycol Cinnamaldehyde Amine oxides, cocoalkyldimethyl Methanol Benzaldehyde Alcohols, C12-16, ethoxylated Sodium iodide	111-46-6 104-55-2 61788-90-7 67-56-1 100-52-7 68551-12-2 7681-82-5	AECOM, 2024a – Appendix E

Amended EMP text

Executive Summary

Table 6: Chemicals that may be added to the proppant during stimulation activities and held on each well pad, based on 3 wells per pad

Material name	Typical volume	Maximum volume	Unit	Storage area	Chemical composition	CAS Number	CRA report
Stimulation chemical							
Acetic acid - 60% pH control	3,000	9,000	L	Stimulation chemical storage area	Acetic acid	64-19-7	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
BE-9 biocide	17,000	17,000	L	Stimulation chemical storage area	Tributyl tetradecyl phosphonium chloride	81741-28-8	AECOM, 2025 – Appendix E
Caustic soda liquid - pH control/ buffer	15,000	45,000	L	Stimulation chemical storage area	Sodium hydroxide	1310-73-2	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
DCA-11001 breaker activator	5,000	15,000	L	Stimulation chemical storage area	Diethanolamine	111-42-2	AECOM, 2025 – Appendix E
DCA-13002 breaker	300	900	kg	Stimulation chemical storage area	Sodium persulfate	7775-27-1	AECOM, 2025 – Appendix E
DCA-13003 breaker	10,000	30,000	L	Stimulation chemical storage area	Chlorous acid, sodium salt Sodium chloride	7758-19-2 7647-14-5	AECOM, 2025 – Appendix E
DCA-16001 clay stabiliser	42,000	126,000	L	Stimulation chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
DCA-17001 corrosion inhibitor	1,000	3,000	L	Stimulation chemical storage area	Diethylene glycol Cinnamaldehyde Amine oxides, cocoalkyldimethyl	111-46-6 104-55-2 61788-90-7 67-56-1	AECOM, 2025 – Appendix E

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

DCA-19001 crosslinker	600	1,800	kg	Stimulation chemical storage area	Disodium octaborate tetrahydrate	12008-41-2	AECOM, 2024a – Appendix E
DCA-19002 crosslinker	10,000	30,000	L	Stimulation chemical storage area	Ulexite Ethylene glycol Crystalline silica, quartz	1319-33-1 107-21-1 14808-60-7	AECOM, 2024a – Appendix E
DCA-23001 friction reducer	5,000	15,000	kg	Stimulation chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
DCA-23003 friction reducer	18,000	54,000	L	Stimulation chemical storage area	Hydrotreated light petroleum distillate Ethoxylated branched C13 alcohol Sodium diacetate	64742-47-8 78330-21-9 126-96-5	AECOM, 2024a – Appendix E
DCA-25005 gelling agent	35,000	105,00	kg	Stimulation chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
DCA-30001 scale Inhibitor	15,000	45,000	L	Stimulation chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
DCA-32002 surfactant	15,000	45,000	L	Stimulation chemical storage area	Alcohols, C6-C12, ethoxylated propoxylated Alcohols, C10-C16, ethoxylated propoxylated	68937-66-6 69227-22-1	AECOM, 2024a – Appendix E
DCA-32014 surfactant	200	600	L	Stimulation chemical storage area	Hydrotreated light petroleum distillate Ethanol Fatty acids, tall-oil, ethoxylated C12-C15 Ethoxylated alcohols Amides, tall-oil fatty, N,N-bis(hydroxyethyl) Butyl alcohol Methanol	64742-47-8 64-17-5 61791-00-2 68131-39-5 68155-20-4 71-36-3 67-56-1	AECOM, 2024a – Appendix E
FE-2 buffer	200	600	kg	Stimulation chemical storage area	Citric acid	77-92-9	AECOM, 2024a – Appendix E
Hydrochloric acid - 32%	50,000	150,000	L	Stimulation chemical storage area	Hydrochloric acid (32%)	7647-01-0	AECOM, 2024a – Appendix E

Amended EMP text

					Methanol Benzaldehyde Alcohols, C12-16, ethoxylated Sodium iodide	100-52-7 68551-12-2 7681-82-5	
DCA-19001 crosslinker	600	1,800	kg	Stimulation chemical storage area	Disodium octaborate tetrahydrate	12008-41-2	AECOM, 2025 – Appendix E
DCA-19002 crosslinker	10,000	30,000	L	Stimulation chemical storage area	Ulexite Ethylene glycol Crystalline silica, quartz	1319-33-1 107-21-1 14808-60-7	AECOM, 2025 – Appendix E
DCA-23001 friction reducer	5,000	15,000	kg	Stimulation chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
DCA-23003 friction reducer	18,000	54,000	L	Stimulation chemical storage area	Hydrotreated light petroleum distillate Ethoxylated branched C13 alcohol Sodium diacetate	64742-47-8 78330-21-9 126-96-5	AECOM, 2025 – Appendix E
DCA-25005 gelling agent	35,000	105,00	kg	Stimulation chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
DCA-30001 scale Inhibitor	15,000	45,000	L	Stimulation chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
DCA-32002 surfactant	15,000	45,000	L	Stimulation chemical storage area	Alcohols, C6-C12, ethoxylated propoxylated Alcohols, C10-C16, ethoxylated propoxylated	68937-66-6 69227-22-1	AECOM, 2025 – Appendix E
DCA-32014 surfactant	200	600	L	Stimulation chemical storage area	Hydrotreated light petroleum distillate Ethanol Fatty acids, tall-oil, ethoxylated C12-C15 Ethoxylated alcohols Amides, tall-oil fatty, N,N-bis(hydroxyethyl) Butyl alcohol Methanol	64742-47-8 64-17-5 61791-00-2 68131-39-5 68155-20-4 71-36-3 67-56-1	AECOM, 2025 – Appendix E

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

Alcohols, C11-14-iso-, C13-rich, ethoxylated-surfactant	5,285	15,855	L	Stimulation chemical storage area	Alcohols, C11-14-iso-, C13-rich, ethoxylated	78330-21-9	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
Sodium (C14-16) olefin sulfonate - surfactant	4,658	13,974	L	Stimulation chemical storage area	Sodium (C14-16) olefin sulfonate	68439-57-6	EHS Support, (2023) – Appendix E.1
Diisobutyl glutarate - plasticiser	627	1,881	L	Stimulation chemical storage area	Diisobutyl glutarate	71195-64-7	EHS Support, (2023) – Appendix E.1
Diisobutyl succinate - plasticiser	209	627	L	Stimulation chemical storage area	Diisobutyl succinate	925-06-4	EHS Support, (2023) – Appendix E.1
Diisobutyl adipate-plasticiser	179	537	L	Stimulation chemical storage area	Diisobutyl adipate	141-04-8	EHS Support, (2023) – Appendix E.1
Sodium thiosulphate-stabilising agent	4,763	14,289	L	Stimulation chemical storage area	Sodium thiosulphate	7772-98-7	EHS Support, (2023) – Appendix E.1
Sodium sulphate stabilising agent	913	2,739	L	Stimulation chemical storage area	Sodium sulphate	7757-82-6	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
Sodium sulphite stabilising agent	794	2,382	L	Stimulation chemical storage area	Sodium sulphite	7757-83-7	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
Ethylene glycol-crosslinker Anti-freeze	8,416	25,247	L	Stimulation chemical storage area	Ethylene glycol	107-21-1	AECOM, 2024a – Appendix E EHS Support, (2023) –

Amended EMP text

FE-2 buffer	200	600	kg	Stimulation chemical storage area	Citric acid	77-92-9	AECOM, 2025 – Appendix E
Hydrochloric acid - 32%	50,000	150,000	L	Stimulation chemical storage area	Hydrochloric acid (32%)	7647-01-0	AECOM, 2025 – Appendix E
Alcohols, C11-14-iso-, C13-rich, ethoxylated-surfactant	5,285	15,855	L	Stimulation chemical storage area	Alcohols, C11-14-iso-, C13-rich, ethoxylated	78330-21-9	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
Sodium (C14-16) olefin sulfonate - surfactant	4,658	13,974	L	Stimulation chemical storage area	Sodium (C14-16) olefin sulfonate	68439-57-6	EHS Support, (2023) – Appendix E.1
Diisobutyl glutarate - plasticiser	627	1,881	L	Stimulation chemical storage area	Diisobutyl glutarate	71195-64-7	EHS Support, (2023) – Appendix E.1
Diisobutyl succinate - plasticiser	209	627	L	Stimulation chemical storage area	Diisobutyl succinate	925-06-4	EHS Support, (2023) – Appendix E.1
Diisobutyl adipate-plasticiser	179	537	L	Stimulation chemical storage area	Diisobutyl adipate	141-04-8	EHS Support, (2023) – Appendix E.1
Sodium thiosulphate-stabilising agent	4,763	14,289	L	Stimulation chemical storage area	Sodium thiosulphate	7772-98-7	EHS Support, (2023) – Appendix E.1
Sodium sulfate stabilising agent	913	2,739	L	Stimulation chemical storage area	Sodium sulfate	7757-82-6	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
Sodium sulfite stabilising agent	794	2,382	L	Stimulation chemical storage area	Sodium sulfite	7757-83-7	AECOM, 2025 – Appendix E

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

							Appendix E.1 AECOM, 2024b – Appendix E.2
Choline chloride- clay stabiliser / clay swelling control (2-hydroxy-N,N,N-trimethylethanaminium chloride)	67,750	203,250	L	Stimulation chemical storage area	Choline chloride	67-48-1	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Glutaraldehyde- biocide	14,930	44,790	L	Stimulation chemical storage area	Glutaraldehyde	111-30-8	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Ammonium sulphate- breaker	4,479	13,491	L	Stimulation chemical storage area	Ammonium sulphate	7783-20-2	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
Polyacrylamide- friction reducer	4,479	13,491	L	Stimulation chemical storage area	Polyacrylamide	25085-02-3	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
Sodium polyacrylate- gelling agent	746	2,238	L	Stimulation chemical storage area	Sodium polyacrylate	9003-04-7	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1

Amended EMP text

							EHS Support, (2023) – Appendix E.1
Ethylene glycol- crosslinker Anti-freeze	8,416	25,247	L	Stimulation chemical storage area	Ethylene glycol	107-21-1	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Choline chloride- clay stabiliser / clay swelling control (2-hydroxy-N,N,N-trimethylethanaminium chloride)	67,750	203,250	L	Stimulation chemical storage area	Choline chloride	67-48-1	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Glutaraldehyde- biocide	14,930	44,790	L	Stimulation chemical storage area	Glutaraldehyde	111-30-8	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Ammonium sulfate- breaker	4,479	13,491	L	Stimulation chemical storage area	Ammonium sulfate	7783-20-2	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
Polyacrylamide- friction reducer	4,479	13,491	L	Stimulation chemical storage area	Polyacrylamide	25085-02-3	AECOM, 2025 –

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

Sodium bisulfite- stabiliser	149	447	L	Stimulation chemical storage area	Sodium bisulfite	7631-90-5	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
Alkyl alcohol- surfactant	149	447	L	Stimulation chemical storage area	Alkyl alcohol	56-81-5	EHS Support, (2023) – Appendix E.1
2-Propenoic acid, homopolymer, ammonium salt- biocide	149	447	L	Stimulation chemical storage area	2-Propenoic acid, homopolymer, ammonium salt	9003-03-6	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
Potassium persulfate- braker	149	447	L	Stimulation chemical storage area	Potassium persulfate	7727-21-1	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
2-Ethoxy-naphthalene- surfactant	149	447	L	Stimulation chemical storage area	2-Ethoxy-naphthalene	93-18-5	EHS Support, (2023) – Appendix E.1
Sodium gluconate- stabiliser	8,576	25,728	L	Stimulation chemical storage area	Sodium gluconate	527-07-1	EHS Support, (2023) – Appendix E.1
Boric acid- crosslinker	4,288	12,864	L	Stimulation chemical storage area	Boric acid	10043-35-3	EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Potassium hydroxide- pH control	10,745	32,235	L	Stimulation chemical storage area	Potassium hydroxide	1310-58-3	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1

Amended EMP text

							Appendix E EHS Support, (2023) – Appendix E.1
Sodium polyacrylate- gelling agent	746	2,238	L	Stimulation chemical storage area	Sodium polyacrylate	9003-04-7	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
Sodium bisulfite- stabiliser	149	447	L	Stimulation chemical storage area	Sodium bisulfite	7631-90-5	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
Alkyl alcohol- surfactant	149	447	L	Stimulation chemical storage area	Alkyl alcohol	56-81-5	EHS Support, (2023) – Appendix E.1
2-Propenoic acid, homopolymer, ammonium salt- biocide	149	447	L	Stimulation chemical storage area	2-Propenoic acid, homopolymer, ammonium salt	9003-03-6	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
Potassium persulfate- braker	149	447	L	Stimulation chemical storage area	Potassium persulfate	7727-21-1	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
2-Ethoxy-naphthalene- surfactant	149	447	L	Stimulation chemical storage area	2-Ethoxy-naphthalene	93-18-5	EHS Support, (2023) – Appendix E.1
Sodium gluconate- stabiliser	8,576	25,728	L	Stimulation chemical storage area	Sodium gluconate	527-07-1	EHS Support, (2023) –

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

Mannanase- crosslinker	2	6	L	Stimulation chemical storage area	Mannanase	37288-54-3	EHS Support, (2023) – Appendix E.1
Ammonium persulphate- breaker Diammonium peroxidisulphate – Oxidizing viscosity breaker	7,451	22,353	L	Stimulation chemical storage area	Ammonium persulphate	7727-54-0	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Talc- buffer/ Filler for encapsulate	384	1,152	L	Stimulation chemical storage area	Talc, Magnesium Silicate	14807-96-6	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Sodium bromate- breaker	50,441	151,323	L	Stimulation chemical storage area	Sodium bromate	7789-38-0	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
Hepta sodium phosphonate- Emulsifier	3,176	9,528	L	Stimulation chemical storage area	Hepta sodium phosphonate	22042-96-2	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
Distillates, hydrotreated light- friction reducer/slurry agent	54,231	162,693	L	Stimulation chemical storage area	Distillates, hydrotreated light	64742-47-8	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b –

Amended EMP text

							Appendix E.1
Boric acid- crosslinker	4,288	12,864	L	Stimulation chemical storage area	Boric acid	10043-35-3	EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Potassium hydroxide- pH control	10,745	32,235	L	Stimulation chemical storage area	Potassium hydroxide	1310-58-3	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
Mannanase- crosslinker	2	6	L	Stimulation chemical storage area	Mannanase	37288-54-3	EHS Support, (2023) – Appendix E.1
Ammonium persulphate- breaker Diammonium peroxidisulphate – Oxidizing viscosity breaker	7,451	22,353	L	Stimulation chemical storage area	Ammonium persulphate	7727-54-0	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Talc- buffer/ Filler for encapsulate	384	1,152	L	Stimulation chemical storage area	Talc, Magnesium Silicate	14807-96-6	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Sodium bromate- breaker	50,441	151,323	L	Stimulation chemical storage area	Sodium bromate	7789-38-0	AECOM, 2025 – Appendix E

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

							Appendix E.2
Guar gum- viscosity regulator	15,141	45,423	L	Stimulation chemical storage area	Guar gum	9000-30-0	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Poly-oxyethylene nonylphenol ether- surfactant	4,466	13,398	L	Stimulation chemical storage area	Poly-oxyethylene nonylphenol ether	9016-45-9	EHS Support, (2023) – Appendix E.1
Quaternary ammonium compounds, bis(hydrogenated tallow alkyl)dimethyl, salts with bentonite- biocide	4,466	13,398	L	Stimulation chemical storage area	Quaternary ammonium compounds, bis(hydrogenated tallow alkyl)dimethyl, salts with bentonite	68953-58-2	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
1,6-Hexanediol- cross linker	447	1,341	L	Stimulation chemical storage area	1,6-Hexanediol	629-11-8	EHS Support, (2023) – Appendix E.1
Hydrochloric acid- pH control	44,715	134,145	L	Stimulation chemical storage area	Hydrochloric acid	7647-01-0	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
N-Benzyl-alkylpyridinium chloride- pH control	28	84	L	Stimulation chemical storage area	N-Benzyl-alkylpyridinium chloride	68909-18-2	EHS Support, (2023) – Appendix E.1
Formic acid- corrosion inhibitor	2,001	6,002	L	Stimulation chemical storage area	Formic acid	64-18-6	EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2

Amended EMP text

							EHS Support, (2023) – Appendix E.1
Hepta sodium phosphonate- Emulsifier	3,176	9,528	L	Stimulation chemical storage area	Hepta sodium phosphonate	22042-96-2	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
Distillates, hydrotreated light- friction reducer/slurry agent	54,231	162,693	L	Stimulation chemical storage area	Distillates, hydrotreated light	64742-47-8	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Guar gum- viscosity regulator	15,141	45,423	L	Stimulation chemical storage area	Guar gum	9000-30-0	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Poly-oxyethylene nonylphenol ether- surfactant	4,466	13,398	L	Stimulation chemical storage area	Poly-oxyethylene nonylphenol ether	9016-45-9	EHS Support, (2023) – Appendix E.1
Quaternary ammonium compounds, bis(hydrogenated tallow alkyl)dimethyl, salts with bentonite- biocide	4,466	13,398	L	Stimulation chemical storage area	Quaternary ammonium compounds, bis(hydrogenated tallow alkyl)dimethyl, salts with bentonite	68953-58-2	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

Sodium erythorbate- scaler prohibitor/Reducing Agent	2,001	6,002	L	Stimulation chemical storage area	Sodium erythorbate	6381-77-7	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Citric acid- pH control	15,878	47,634	L	Stimulation chemical storage area	Citric acid	77-92-9	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
Acetic acid- pH Buffer	15,878	47,634	L	Stimulation chemical storage area	Acetic acid	64-19-7	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Isopropanol- clay management	83	249	L	Stimulation chemical storage area	Isopropanol	67-63-0	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
Ethoxylated C12-C16 alcohol - surfactant	57	171	L	Stimulation chemical storage area	Ethoxylated C12-C16 alcohol	68551-12-2	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
Ethoxylated decanol - surfactant	19	57	L	Stimulation chemical storage area	Ethoxylated decanol	26183-52-8	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1

Amended EMP text

1,6-Hexanediol- cross linker	447	1,341	L	Stimulation chemical storage area	1,6-Hexanediol	629-11-8	EHS Support, (2023) – Appendix E.1
Hydrochloric acid- pH control	44,715	134,145	L	Stimulation chemical storage area	Hydrochloric acid	7647-01-0	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
N-Benzyl-alkylpyridinium chloride- pH control	28	84	L	Stimulation chemical storage area	N-Benzyl-alkylpyridinium chloride	68909-18-2	EHS Support, (2023) – Appendix E.1
Formic acid- corrosion inhibitor	2,001	6,002	L	Stimulation chemical storage area	Formic acid	64-18-6	EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Sodium erythorbate- scaler prohibitor/Reducing Agent	2,001	6,002	L	Stimulation chemical storage area	Sodium erythorbate	6381-77-7	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Citric acid- pH control	15,878	47,634	L	Stimulation chemical storage area	Citric acid	77-92-9	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
Acetic acid- pH Buffer	15,878	47,634	L	Stimulation chemical storage area	Acetic acid	64-19-7	AECOM, 2025 – Appendix E EHS Support,

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

Cinnamaldehyde- biocide / Corrosion inhibitor	1,000	3,000	L	Stimulation chemical storage area	Cinnamaldehyde	104-55-2	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Ethoxylated tallow alkyl amine - surfactant	9	27	L	Stimulation chemical storage area	Ethoxylated tallow alkyl amine	61791-26-2	EHS Support, (2023) – Appendix E.1
Methanol- corrosion inhibitor	2	6	L	Stimulation chemical storage area	Methanol	67-56-1	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
Polyacrylamide - friction reducer	49,093	147,279	L	Stimulation chemical storage area	Polyacrylamide	9003-05-08	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2004 – Appendix E.2
Polyethylene glycol trimethylnonyl ether - clay manager/ Emulsifier	748	2,243	L	Stimulation chemical storage area	Polyethylene glycol trimethylnonyl ether	127087-87-0	EHS Support, (2023) – Appendix E.1 AECOM, 2024 - Appendix E.2
Water in additive- stabiliser	66,804	200,412	L	Stimulation chemical storage area	Water in additive	7732-18-5	EHS Support, (2023) – Appendix E.1
Potassium sorbate food grade- corrosion inhibitor	14	42	L	Stimulation chemical storage area	Potassium sorbate	24634-61-5	EHS Support, (2023) – Appendix E.1

Amended EMP text

							(2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Isopropanol- clay management	83	249	L	Stimulation chemical storage area	Isopropanol	67-63-0	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
Ethoxylated C12-C16 alcohol - surfactant	57	171	L	Stimulation chemical storage area	Ethoxylated C12-C16 alcohol	68551-12-2	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
Ethoxylated decanol - surfactant	19	57	L	Stimulation chemical storage area	Ethoxylated decanol	26183-52-8	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
Cinnamaldehyde- biocide / Corrosion inhibitor	1,000	3,000	L	Stimulation chemical storage area	Cinnamaldehyde	104-55-2	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
Ethoxylated tallow alkyl amine - surfactant	9	27	L	Stimulation chemical storage area	Ethoxylated tallow alkyl amine	61791-26-2	EHS Support, (2023) – Appendix E.1
Methanol- corrosion inhibitor	2	6	L	Stimulation chemical storage area	Methanol	67-56-1	AECOM, 2025 – Appendix E

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

Mannanase (Mannan endo-1,4-beta-mannosidase)- cross linker	2	6	L	Stimulation chemical storage area	Mannanase (Mannan endo-1,4-beta-mannosidase)	37288-54-3	EHS Support, (2023) – Appendix E.1
Nonoxynol-9- surfactant/Emulsifier	51	153	L	Stimulation chemical storage area	Nonoxynol-9	26571-11-9	EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
2-Ethylhexanol PO/EO polymer- stabiliser	9	27	L	Stimulation chemical storage area	2-Ethylhexanol PO/EO polymer	64366-70-7	EHS Support, (2023) – Appendix E.1
Corn oil- friction reducer	662	1,986	L	Stimulation chemical storage area	Corn oil	8001-30-7	EHS Support, (2023) – Appendix E.1
Proprietary – SCI-1F Scale inhibitor	19,357	58,071	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2024b – Appendix E.2
Proprietary – surface coating	44	131	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2024b – Appendix E.2
Sodium carbonate – pH buffer	78.5	236	L	Stimulation chemical storage area	Sodium carbonate	497-19-8	AECOM, 2024b – Appendix E.2
Proprietary – improves surface and interfacial tension	292	876	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2024b – Appendix E.2
Proprietary – surfactant	7,592	22,776	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment.	Proprietary	AECOM, 2024b – Appendix E.2

Amended EMP text

							EHS Support, (2023) – Appendix E.1
Polyacrylamide - friction reducer	49,093	147,279	L	Stimulation chemical storage area	Polyacrylamide	9003-05-08	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1 AECOM, 2004 – Appendix E.2
Polyethylene glycol trimethylnonyl ether - clay manager/ Emulsifier	748	2,243	L	Stimulation chemical storage area	Polyethylene glycol trimethylnonyl ether	127087-87-0	EHS Support, (2023) – Appendix E.1 AECOM, 2024 - Appendix E.2
Water in additive- stabiliser	66,804	200,412	L	Stimulation chemical storage area	Water in additive	7732-18-5	EHS Support, (2023) – Appendix E.1
Potassium sorbate food grade- corrosion inhibitor	14	42	L	Stimulation chemical storage area	Potassium sorbate	24634-61-5	EHS Support, (2023) – Appendix E.1
Mannanase (Mannan endo-1,4-beta-mannosidase)- cross linker	2	6	L	Stimulation chemical storage area	Mannanase (Mannan endo-1,4-beta-mannosidase)	37288-54-3	EHS Support, (2023) – Appendix E.1
Nonoxynol-9- surfactant/Emulsifier	51	153	L	Stimulation chemical storage area	Nonoxynol-9	26571-11-9	EHS Support, (2023) – Appendix E.1 AECOM, 2024b – Appendix E.2
2-Ethylhexanol PO/EO polymer- stabiliser	9	27	L	Stimulation chemical storage area	2-Ethylhexanol PO/EO polymer	64366-70-7	EHS Support, (2023) – Appendix E.1

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

					Chemicals were PBT and calculated below the risk thresholds.		
Alkyl Pyridines Quat – Corrosion inhibitor	128	384	L	Stimulation chemical storage area	Alkyl Pyridines Quat	68909-18-2	AECOM, 2024b – Appendix E.2
Polymer/s - Isotridecanol, ethoxylated – Emulsifier	5,742	17,225	L	Stimulation chemical storage area	Isotridecanol, ethoxylated	69011-36-5	AECOM, 2024b – Appendix E.2
HCL-15B – Hydrochloric acid Blend – mineral acid	76,201	228,603	L	Stimulation chemical storage area	Hydrochloric acid	7647-01-0	AECOM, 2024b – Appendix E.2
Proprietary - Emulsifier	8,614	25,842	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2024b – Appendix E.2
Didecyldimethyl-ammonium Chloride - Biocide	1,936	5,807	L	Stimulation chemical storage area	Didecyldimethyl-ammonium Chloride	7173-51-5	AECOM, 2024b – Appendix E.2
Benzalkonium Chloride – Biocide	1,936	5,807	L	Stimulation chemical storage area	Benzalkonium Chloride	8001-54-5	AECOM, 2024b – Appendix E.2
Proprietary – Improve surface and interfacial tension	1,022	3,066	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2024b – Appendix E.2
Proprietary – Improve surface and interfacial tension	341	1,022	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2024b – Appendix E.2
Completion chemicals							
Sodium chloride-weighting agent	15,000	45,000	kg	Completion chemical storage area	Sodium chloride	7647-14-5	AECOM, 2024a – Appendix E
ALDACIDE G biocide	500	1,500	L	Completion chemical storage area	Glutaraldehyde Methanol	111-30-8 67-56-1	AECOM, 2024a – Appendix E

Amended EMP text

Corn oil- friction reducer	662	1,986	L	Stimulation chemical storage area	Corn oil	8001-30-7	EHS Support, (2023) – Appendix E.1
Proprietary – SCI-1F Scale inhibitor	19,357	58,071	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2024b – Appendix E.2
Proprietary – surface coating	44	131	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2024b – Appendix E.2
Sodium carbonate – pH buffer	78.5	236	L	Stimulation chemical storage area	Sodium carbonate	497-19-8	AECOM, 2024b – Appendix E.2
Proprietary – improves surface and interfacial tension	292	876	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2024b – Appendix E.2
Proprietary – surfactant	7,592	22,776	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2024b – Appendix E.2
Alkyl Pyridines Quat – Corrosion inhibitor	128	384	L	Stimulation chemical storage area	Alkyl Pyridines Quat	68909-18-2	AECOM, 2024b – Appendix E.2
Polymer/s - Isotridecanol, ethoxylated – Emulsifier	5,742	17,225	L	Stimulation chemical storage area	Isotridecanol, ethoxylated	69011-36-5	AECOM, 2024b – Appendix E.2
HCL-15B – Hydrochloric acid Blend – mineral acid	76,201	228,603	L	Stimulation chemical storage area	Hydrochloric acid	7647-01-0	AECOM, 2024b – Appendix E.2
Proprietary - Emulsifier	8,614	25,842	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the	Proprietary	AECOM, 2024b – Appendix E.2

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

OXYGON Oxygen scavenger	100	300	kg	Completion chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
BARACOR 100 corrosion inhibitor	2,000	6,000	L	Completion chemical storage area	Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues Methanol Nitrilotriacetic acid, trisodium salt monohydrate	68909-77-3 67-56-1 5064-31-3	AECOM, 2024a – Appendix E
Sodium Hypochlorite 10 – 30% cleaner	10,000	30,000	L	Completion chemical storage area	Sodium hypochlorite Sodium Hydroxide Water	7681-52-9 1310-73-2 7732-18-5	AECOM, 2024a – Appendix E
Drilling chemicals							
CON-DET wetting agent	50	150	kg	Drilling chemical storage area	Amides, coco, N,N-bis (hydroxyethyl) Benzenesulfonic acid, dimethyl-, sodium salt Isopropanol Potassium pyrophosphate Potassium hydroxide	68603-42-9 1300-72-7 67-63-0 7320-34-5 1310-58-3	AECOM, 2024a – Appendix E
SAPP- sodium acid phosphate cement treatment	50	150	kg	Drilling chemical storage area	DISODIUM PYROPHOSPHATE	7758-16-9	AECOM, 2024a – Appendix E
Bentonite- lubricant	3,000	9,000	kg	Drilling chemical storage area	Crystalline silica, quartz Crystalline silica, cristobalite Crystalline silica, tridymite	14808-60-7 14464-46-1 15468-32-3	AECOM, 2024a – Appendix E
Caustic Soda-pH control	1,400	4,200	kg	Drilling chemical storage area	Sodium hydroxide	1310-73-2	AECOM, 2024a – Appendix E
EZ MUD DP or EZ MUD Liquid- drilling mud	2000	6,000	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
ALDACIDE G biocide	336	1,008	kg	Drilling chemical storage area	Glutaraldehyde Methanol	111-30-8 67-56-1	AECOM, 2024a – Appendix E
STOPPIT loss of circulation material	1,000	3,000	kg	Drilling chemical storage area	Crystalline silica, quartz	14808-60-7	AECOM, 2024a – Appendix E
Soda Ash- drill mud conditioner	350	1,050	kg	Drilling chemical storage area	Sodium carbonate	497-19-8	AECOM, 2024a – Appendix E

Amended EMP text

					environment. Chemicals were PBT and calculated below the risk thresholds.		
Didecyldimethyl-ammonium Chloride - Biocide	1,936	5,807	L	Stimulation chemical storage area	Didecyldimethyl-ammonium Chloride	7173-51-5	AECOM, 2024b – Appendix E.2
Benzalkonium Chloride – Biocide	1,936	5,807	L	Stimulation chemical storage area	Benzalkonium Chloride	8001-54-5	AECOM, 2024b – Appendix E.2
Proprietary – Improve surface and interfacial tension	1,022	3,066	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2024b – Appendix E.2
Proprietary – Improve surface and interfacial tension	341	1,022	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2024b – Appendix E.2
Flow Insurance Copper	20	60	kg	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2026 – Appendix E.4
GT 1-16	320	960	kg	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2026 – Appendix E.4
Hydrogen Peroxide 50	10,000	30,000	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	7722-84-1	AECOM, 2026 – Appendix E.4
Starcide	5,575	16,725	kg	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment.	Proprietary	AECOM, 2026 – Appendix E.4

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

BARACOR 100 corrosion inhibitor	250	750	kg	Drilling chemical storage area	Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues Methanol Nitrilotriacetic acid, trisodium salt monohydrate	68909-77-3 67-56-1 5064-31-3	AECOM, 2024a – Appendix E
Sodium chloride (flossy salt)- weighting agent and formation inhibitor	96,000	288,000	kg	Drilling chemical storage area	Sodium chloride	7647-14-5	AECOM, 2024a – Appendix E
Barite- weighting agent	500	1,500	kg	Drilling chemical storage area	Crystalline silica	14808-60-7	AECOM, 2024a – Appendix E
BARACARB loss of circulation material	500	1,500	kg	Drilling chemical storage area	Crystalline silica, quartz	14808-60-7	AECOM, 2024a – Appendix E
Citric acid- pH control	500	1,500	kg	Drilling chemical storage area	Citric acid	5949-29-1	AECOM, 2024a – Appendix E
BARADEFOAM HP drilling fluid/foam	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
Sodium bicarbonate- pH buffer	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
PERFORMATROL- polymer fluid system	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
SOURSCAV- mud additive treat H2S contamination	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
DRIL-N-SLIDE- casing lubricant	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
STEELSEAL- corrosion inhibitor	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values	Proprietary	AECOM, 2024a – Appendix E

Amended EMP text

					Chemicals were PBT and calculated below the risk thresholds.		
HCL-15B Hydrochloric Acid 15%	1,635,297	4,905,891	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2026 – Appendix E.4
FRP-BL1F – HVFR Anionic	753,217	2,259,651	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2026 – Appendix E.4
BIO-GQ510 – Biocide 5/10 Glut Quat	126,334	379,002	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2026 – Appendix E.4
SFT-NE-1F Flowback Surfactant (NE)	157,916	473,748	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2026 – Appendix E.4
CSA-1F Clay Control (70% Choline)	315,836	947,508	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2026 – Appendix E.4
SCI-1F Scale Inhibitor	315,836	947,508	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2026 – Appendix E.4
LGA-01F Guar Gel Concentrate	25,552	76,656	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT	Proprietary	AECOM, 2026 – Appendix E.4

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

					according to the competent authority		
BARAZAN D or BARAZAN D PLUS- viscosity increaser	4,150	12,450	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
PAC L loss of circulation material	2,300	6,900	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
Potassium chloride-weighting agent and formation inhibitor	22,500	67,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
QUIK-FREE – drilling additive	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
BAROFIBRE, BAROFIBRE super fine and BAROFIBRE coarse loss of circulation material	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
BaraBlend-657 Loss of circulation material	500	1,500	kg	Drilling chemical storage area	Crystalline silica, quartz	14808-60-7	AECOM, 2024a – Appendix E
N-DRIL HT PLUS filtration control additive	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
DEXTRID LTE filtration control additive	4,600	13,800	kg	Drilling chemical storage area	Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	533-74-4	AECOM, 2024a – Appendix E
BARABUF pH buffer	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
BDF 933 or BaraLube W-933 drilling lubricant	864	2,592	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E

Amended EMP text

					and calculated below the risk thresholds.		
XLB-C1F Instant Cross Linker	7,154	21,462	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2026 – Appendix E.4
BHE-01F Encapsulated AP	1,190	3,570	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2026 – Appendix E.4
BFH-1F – High Buffer	1,141	3,423	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2026 – Appendix E.4
BFL-1F – Low Buffer	2,422	7,266	L	Stimulation chemical storage area	Based on the CRA, the chemical is of low concern to human health and the environment. Chemicals were PBT and calculated below the risk thresholds.	Proprietary	AECOM, 2026 – Appendix E.4
Completion chemicals							
Sodium chloride-weighting agent	15,000	45,000	kg	Completion chemical storage area	Sodium chloride	7647-14-5	AECOM, 2025 – Appendix E
ALDACIDE G biocide	500	1,500	L	Completion chemical storage area	Glutaraldehyde Methanol	111-30-8 67-56-1	AECOM, 2025 – Appendix E
OXYGON Oxygen scavenger	100	300	kg	Completion chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
BARACOR 100 corrosion inhibitor	2,000	6,000	L	Completion chemical storage area	Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues Methanol	68909-77-3 67-56-1 5064-31-3	AECOM, 2025 – Appendix E

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

BAROLIFT sweeping agent	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
OXYGON oxygen scavenger	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
ENVIRO-THIN filtration control additive	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2024a – Appendix E
Lime pH buffer	500	1,500	kg	Drilling chemical storage area	Calcium hydroxide	1305-62-0	AECOM, 2024a – Appendix E
Calcium chloride	37,000	111,000	kg	Drilling chemical storage area	Calcium chloride	10043-52-4	AECOM, 2024a – Appendix E
Sodium bromide	8,160	24,480	kg	Drilling chemical storage area	Sodium bromide	7647-15-6	AECOM, 2024a – Appendix E
Evolube TR	14,500	43,500	L	Drilling chemical storage area	Triethylene glycol, monobutyl ether 2-Butoxyethanol Diethanolamine	143-22-6 111-76-2 111-42-2	AECOM, 2024a – Appendix E
Radiagreen EME	4,800	14,400	L	Drilling chemical storage area	Fatty esters Specialities	Proprietary	AECOM, 2024a – Appendix E
Radiagreen EBL	4,800	14,400	L	Drilling chemical storage area	Fatty esters Specialities	Proprietary	AECOM, 2024a – Appendix E
Polydrill	7,500	22,500	kg	Drilling chemical storage area	SULPHONATED ORGANIC POLYMER	Proprietary	AECOM, 2024a – Appendix E
Alpine spotting beads	1,000	3,000	kg	Drilling chemical storage area	Styrene	100-42-5	AECOM, 2024a – Appendix E
Barite- weighting agent	354,000	1,062,000	kg	Drilling chemical storage area	Barium sulfate Crystalline silica Mica-group minerals	7727-43-7 14808-60-7 12001-26-2	AECOM, 2024a – Appendix E
Bio-Paq high temp filtration control	1,134	3,402	kg	Drilling chemical storage area	Starch, carboxymethyl ether, sodium salt	9063-38-1	AECOM, 2024a – Appendix E
Brine-Pac XTS corrosion inhibitor	3,400	10,200	L	Drilling chemical storage area	2-methylbut-3-yn-2-ol	115-19-5	AECOM, 2024a – Appendix E

Amended EMP text

					Nitrilotriacetic acid, trisodium salt monohydrate		
Sodium Hypochlorite 10 – 30% cleaner	10,000	30,000	L	Completion chemical storage area	Sodium hypochlorite Sodium Hydroxide Water	7681-52-9 1310-73-2 7732-18-5	AECOM, 2025 – Appendix E
Drilling chemicals							
CON-DET wetting agent	50	150	kg	Drilling chemical storage area	Amides, coco, N,N-bis (hydroxyethyl) Benzenesulfonic acid, dimethyl-, sodium salt Isopropanol Potassium pyrophosphate Potassium hydroxide	68603-42-9 1300-72-7 67-63-0 7320-34-5 1310-58-3	AECOM, 2025 – Appendix E
SAPP- sodium acid phosphate cement treatment	50	150	kg	Drilling chemical storage area	DISODIUM PYROPHOSPHATE	7758-16-9	AECOM, 2025 – Appendix E
Bentonite- lubricant	3,000	9,000	kg	Drilling chemical storage area	Crystalline silica, quartz Crystalline silica, cristobalite Crystalline silica, tridymite	14808-60-7 14464-46-1 15468-32-3	AECOM, 2025 – Appendix E
Caustic Soda-pH control	1,400	4,200	kg	Drilling chemical storage area	Sodium hydroxide	1310-73-2	AECOM, 2025 – Appendix E
EZ MUD DP or EZ MUD Liquid- drilling mud	2000	6,000	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
ALDACIDE G biocide	336	1,008	kg	Drilling chemical storage area	Glutaraldehyde Methanol	111-30-8 67-56-1	AECOM, 2025 – Appendix E
STOPPIT loss of circulation material	1,000	3,000	kg	Drilling chemical storage area	Crystalline silica, quartz	14808-60-7	AECOM, 2025 – Appendix E
Soda Ash- drill mud conditioner	350	1,050	kg	Drilling chemical storage area	Sodium carbonate	497-19-8	AECOM, 2025 – Appendix E
BARACOR 100 corrosion inhibitor	250	750	kg	Drilling chemical storage area	Ethanol, 2,2'-oxybis-, reaction products with ammonia, morpholine derivatives residues Methanol	68909-77-3 67-56-1 5064-31-3	AECOM, 2025 – Appendix E

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

Calcium chloride - salinity	180,000	540,000	kg	Drilling chemical storage area	calcium chloride	10043-52-4	AECOM, 2024a – Appendix E
CF Desco deflocculant	2,270	6,810	kg	Drilling chemical storage area	Tannins, sulfo-methylated crystalline silica, respirable powder	68201-64-9 14808-60-7	AECOM, 2024a – Appendix E
Chek-Loss fibrous LCM	1,360	4,080	kg	Drilling chemical storage area	Cellulose	9004-34-6	AECOM, 2024a – Appendix E
Citric acid - pH control	1,360	4,080	L	Drilling chemical storage area	Citric acid	77-92-9	AECOM, 2024a – Appendix E
Ecco-Temp high temp extender	8,000	24,000	L	Drilling chemical storage area	Triethanolamine	102-71-6	AECOM, 2024a – Appendix E
Flowzan viscosifier	5,000	15,000	kg	Drilling chemical storage area	Contains no hazardous ingredients according to GHS.	N/A	AECOM, 2024a – Appendix E
KEN-SEAL™ PLUS - high temperature filtration control agent	4,000	12,000	Kg	Drilling chemical storage area	Copolymer, sodium salt, dimethylacrylamide, acrylamidomethyl propane, sulfonic	Proprietary	AECOM, 2024a – Appendix E
Mil-Lime (Calcium hydroxide) alkalinity	1,361	4,080	L	Drilling chemical storage area	calcium di-hydroxide	1305-62-0	AECOM, 2024a – Appendix E
Magnesium oxide pH buffer	7,500	22,500	kg	Drilling chemical storage area	magnesium oxide	1309-48-4	AECOM, 2024a – Appendix E
Mil-bio SEA 98 biocide	1,800	5,400	L	Drilling chemical storage area	THPS	55566-30-8	AECOM, 2024a – Appendix E
Mil-carb LCM / bridging	5,000	15,000	kg	Drilling chemical storage area	Limestone crystalline silica, respirable powder	1317-65-3 14808-60-7	AECOM, 2024a – Appendix E
Milstarch filtration control	5,000	15,000	kg	Drilling chemical storage area	Starch	9005-25-8	AECOM, 2024a – Appendix E
Navi-Lube lubricant	16,650	49,950	L	Drilling chemical storage area	Distillates, (petroleum), hydrotreated light Diethylene glycol monobutyl ether Benzene, mono-C10-13-alkyl derivatives, fractionation bottoms, heavy ends, sulfonated, sodium salts Petroleum distillates, hydrotreated heavy naphthenic	64742-47-8 112-34-5 148520-82-5	AECOM, 2024a – Appendix E

Amended EMP text

					Nitrilotriacetic acid, trisodium salt monohydrate		
Sodium chloride (flossy salt)- weighting agent and formation inhibitor	96,000	288,000	kg	Drilling chemical storage area	Sodium chloride	7647-14-5	AECOM, 2025 – Appendix E
Barite- weighting agent	500	1,500	kg	Drilling chemical storage area	Crystalline silica	14808-60-7	AECOM, 2025 – Appendix E
BARACARB loss of circulation material	500	1,500	kg	Drilling chemical storage area	Crystalline silica, quartz	14808-60-7	AECOM, 2025 – Appendix E
Citric acid- pH control	500	1,500	kg	Drilling chemical storage area	Citric acid	5949-29-1	AECOM, 2025 – Appendix E
BARADEFOAM HP drilling fluid/foam	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
Sodium bicarbonate- pH buffer	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
PERFORMATROL- polymer fluid system	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
SOURSCAV- mud additive treat H2S contamination	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
DRIL-N-SLIDE- casing lubricant	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
STEELSEAL- corrosion inhibitor	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

					Benzenesulfonic acid, C10-14-alkyl derivatives, sodium salts	64742-52-5 69669-44-9	
New-Drill Plus shale stabiliser	1,000	3,000	kg	Drilling chemical storage area	2-Propenoic acid, polymer with 2-propenamide, sodium salt	25987-30-8	AECOM, 2024a – Appendix E
Noxygen XT oxygen scavenger	884	2,652	kg	Drilling chemical storage area	2,3-didehydro-3-O-sodio-D-erythro-hexono-1,4-lactone	6381-77-7	AECOM, 2024a – Appendix E
Ova Col 110 HC cloud point glycol	13,000	39,000	kg	Drilling chemical storage area	Glycol Ether	9004-77-7	AECOM, 2024a – Appendix E
Potassium chloride salt / shale stabiliser	41,000	123,000	kg	Drilling chemical storage area	potassium chloride	7447-40-7	AECOM, 2024a – Appendix E
Potassium hydroxide pH source	1,250	3,750	kg	Drilling chemical storage area	potassium hydroxide	1310-58-3	AECOM, 2024a – Appendix E
Pyro-Trol II HT filtration control	25	75	kg	Drilling chemical storage area	Copolymer of acrylamide and 2-acrylamide-2-2methyl propane sulfonic acid	Proprietary	AECOM, 2024a – Appendix E
Pyro-Vis II HT viscosifier	1,400	4,200	kg	Drilling chemical storage area	t-Butyl alcohol	75-65-0	AECOM, 2024a – Appendix E
Soda ash pH and hardness control	1,000	3,000	kg	Drilling chemical storage area	sodium carbonate	497-19-8	AECOM, 2024a – Appendix E
Sodium bicarbonate pH and hardness control	1,000	3,000	kg	Drilling chemical storage area	sodium hydrogen carbonate	144-55-8	AECOM, 2024a – Appendix E
Sodium chloride - salt	54,400	163,200	kg	Drilling chemical storage area	sodium chloride	7647-14-5	AECOM, 2024a – Appendix E
W.O. defoam defoamer	600	1,800	L	Drilling chemical storage area	1-Hexanol, 2-ethyl-	104-76-7	AECOM, 2024a – Appendix E
Xan-Plex D viscosifier	3,000	9,000	kg	Drilling chemical storage area	Contains no hazardous ingredients according to GHS.	N/A	AECOM, 2024a – Appendix E
TEQ-LUBE II - lubricant	14,400	43,200	kg	Drilling chemical storage area	Poly(oxy-1,2-ethanediyl),α-hydro-ω-hydroxy- Ethane-1,2-diol, ethoxylated	25322-68-3	AECOM, 2024a – Appendix E
TEQ-LUBE II - lubricant	14,400	43,200	kg	Drilling chemical storage area	Poly(oxy-1,2-ethanediyl), α-(9Z)-9-octadecen-1-yl-ω-hydroxy-, phosphate	39464-69-2	AECOM, 2024a – Appendix E

Amended EMP text

BARAZAN D or BARAZAN D PLUS-viscosity increaser	4,150	12,450	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
PAC L loss of circulation material	2,300	6,900	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
Potassium chloride-weighting agent and formation inhibitor	22,500	67,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
QUIK-FREE – drilling additive	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
BAROFIBRE, BAROFIBRE super fine and BAROFIBRE coarse loss of circulation material	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
BaraBlend-657 Loss of circulation material	500	1,500	kg	Drilling chemical storage area	Crystalline silica, quartz	14808-60-7	AECOM, 2025 – Appendix E
N-DRIL HT PLUS filtration control additive	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
DEXTRID LTE filtration control additive	4,600	13,800	kg	Drilling chemical storage area	Tetrahydro-3,5-dimethyl-1,3,5-thiadiazine-2-thione	533-74-4	AECOM, 2025 – Appendix E
BARABUF pH buffer	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
BDF 933 or BaraLube W-933 drilling lubricant	864	2,592	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

NEW-THIN – Polymeric thinner	4,680	14,040	kg	Drilling chemical storage area	Contains no hazardous ingredients according to GHS.	N/A	AECOM, 2024a – Appendix E
LC-LUBE -lubricant (graphite)	9,090	27,270	kg	Drilling chemical storage area	Natural graphite	7782-42-5	AECOM, 2024a – Appendix E
MAX-GUARD EA	26,000	78,000	L	Drilling chemical storage area	Poly[oxy(methyl-1,2-ethanediyl)], α-(2-aminomethylethyl)-ω-(2-aminomethylethoxy)-	9046-10-0	AECOM, 2024a – Appendix E
					Acetic acid	64-19-7	AECOM, 2024a – Appendix E
MAX-GUARD PLUS	26,000	78,000	L	Drilling chemical storage area	Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine	Proprietary	AECOM, 2024a – Appendix E
					acetic acid	64-19-7	AECOM, 2024a – Appendix E
					hexamethylenediamine	124-09-4	AECOM, 2024a – Appendix E
					cyclohex-1,2-ylenediamine	694-83-7	AECOM, 2024a – Appendix E
MAX-GUARD PLUS A	26,000	78,000	L	Drilling chemical storage area	1,2-Ethanediamine, N-(2-aminoethyl)-	111-40-0	AECOM, 2024a – Appendix E
					acetic acid	64-19-7	AECOM, 2024a – Appendix E
SARALINE 185V	18,603	55,809	kg	Drilling chemical storage area	Distillates (Fischer-Tropsch), C8-26 - Branched and Linear	848301-67-7	AECOM, 2024a – Appendix E
Proppants*							
100 mesh sand-proppant	91,000	273,000	kg	Stimulation chemical storage area	Sand	14808-60-7	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
Quartz or organophilic phyllosilicate- proppant	1,084	3,252	L	Stimulation chemical storage area	Quartz or organophilic phyllosilicate	14808-60-7	AECOM, 2024a – Appendix E EHS Support, (2023) –

Amended EMP text

BAROLIFT sweeping agent	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
OXYGON oxygen scavenger	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
ENVIRO-THIN filtration control additive	500	1,500	kg	Drilling chemical storage area	Contains no hazardous substances in concentrations above cut-off values according to the competent authority	Proprietary	AECOM, 2025 – Appendix E
Lime pH buffer	500	1,500	kg	Drilling chemical storage area	Calcium hydroxide	1305-62-0	AECOM, 2025 – Appendix E
Calcium chloride	37,000	111,000	kg	Drilling chemical storage area	Calcium chloride	10043-52-4	AECOM, 2025 – Appendix E
Sodium bromide	8,160	24,480	kg	Drilling chemical storage area	Sodium bromide	7647-15-6	AECOM, 2025 – Appendix E
Evolube TR	14,500	43,500	L	Drilling chemical storage area	Triethylene glycol, monobutyl ether 2-Butoxyethanol Diethanolamine	143-22-6 111-76-2 111-42-2	AECOM, 2025 – Appendix E
Radiagreen EME	4,800	14,400	L	Drilling chemical storage area	Fatty esters Specialities	Proprietary	AECOM, 2025 – Appendix E
Radiagreen EBL	4,800	14,400	L	Drilling chemical storage area	Fatty esters Specialities	Proprietary	AECOM, 2025 – Appendix E
Polydrill	7,500	22,500	kg	Drilling chemical storage area	SULPHONATED ORGANIC POLYMER	Proprietary	AECOM, 2025 – Appendix E
Alpine spotting beads	1,000	3,000	kg	Drilling chemical storage area	Styrene	100-42-5	AECOM, 2025 – Appendix E
Barite- weighting agent	354,000	1,062,000	kg	Drilling chemical storage area	Barium sulfate Crystalline silica Mica-group minerals	7727-43-7 14808-60-7	AECOM, 2025 – Appendix E

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

							Appendix E.1
40/70 sand- proppant	1,650,000	4,950,000	kg	Stimulation chemical storage area	Sand	14808-60-7	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1
30/50 sand- proppant	610,000	1,830,000	kg	Stimulation chemical storage area	Sand	14808-60-7	AECOM, 2024a – Appendix E EHS Support, (2023) – Appendix E.1 as 20/40
Silicon dioxide (quartz/sand) 100 sand	4,757,614	14,272,842	kg	Stimulation chemical storage area	Sand	14808-60-7	AECOM, 2024a – Appendix E
Silicon dioxide (quartz/sand) 40/70	5,435,287	16,305,860	kg	Stimulation chemical storage area	Sand	14808-60-7	AECOM, 2024b – Appendix E.2
* Proppants are sand which is inert. They do not require special chemical bunding but are co-located in the stimulation chemical storage area, within the well pad bund. Residual proppant from a stimulation campaign is often used to assist with chemical spills on the well pad, where contaminated spill material is removed.							
Cleaning Chemicals and Spill Response							
Soda ash – sodium carbonate	3,750	11,250	kg	Stimulation chemical storage area	Sodium carbonate - spill response in event acid spill	497-19-8	AECOM, 2024b – Appendix E.2
Flush fluid - distillates (petroleum), hydrotreated	1,500	4,500	L	Stimulation chemical storage area	Distillates (petroleum), hydrotreated - equipment cleaning	64742-47-8	AECOM, 2024b – Appendix E.2

Amended EMP text

						12001-26-2	
Bio-Paq high temp filtration control	1,134	3,402	kg	Drilling chemical storage area	Starch, carboxymethyl ether, sodium salt	9063-38-1	AECOM, 2025 – Appendix E
Brine-Pac XTS corrosion inhibitor	3,400	10,200	L	Drilling chemical storage area	2-methylbut-3-yn-2-ol	115-19-5	AECOM, 2025 – Appendix E
Calcium chloride - salinity	180,000	540,000	kg	Drilling chemical storage area	calcium chloride	10043-52-4	AECOM, 2025 – Appendix E
CF Desco deflocculant	2,270	6,810	kg	Drilling chemical storage area	Tannins, sulfo-methylated crystalline silica, respirable powder	68201-64-9 14808-60-7	AECOM, 2025 – Appendix E
Chek-Loss fibrous LCM	1,360	4,080	kg	Drilling chemical storage area	Cellulose	9004-34-6	AECOM, 2025 – Appendix E
Citric acid - pH control	1,360	4,080	L	Drilling chemical storage area	Citric acid	77-92-9	AECOM, 2025 – Appendix E
Ecco-Temp high temp extender	8,000	24,000	L	Drilling chemical storage area	Triethanolamine	102-71-6	AECOM, 2025 – Appendix E
Flowzan viscosifier	5,000	15,000	kg	Drilling chemical storage area	Contains no hazardous ingredients according to GHS.	N/A	AECOM, 2025 – Appendix E
KEN-SEAL™ PLUS - high temperature filtration control agent	4,000	12,000	Kg	Drilling chemical storage area	Copolymer, sodium salt, dimethylacrylamide, acrylamidomethyl propane, sulfonic	Proprietary	AECOM, 2025 – Appendix E
Mil-Lime (Calcium hydroxide) alkalinity	1,361	4,080	L	Drilling chemical storage area	calcium di-hydroxide	1305-62-0	AECOM, 2025 – Appendix E
Magnesium oxide pH buffer	7,500	22,500	kg	Drilling chemical storage area	magnesium oxide	1309-48-4	AECOM, 2025 – Appendix E
Mil-bio SEA 98 biocide	1,800	5,400	L	Drilling chemical storage area	THPS	55566-30-8	AECOM, 2025 – Appendix E
Mil-carb LCM / bridging	5,000	15,000	kg	Drilling chemical storage area	Limestone crystalline silica, respirable powder	1317-65-3 14808-60-7	AECOM, 2025 – Appendix E

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text	Amended EMP text

Milstarch filtration control	5,000	15,000	kg	Drilling chemical storage area	Starch	9005-25-8	AECOM, 2025 – Appendix E
Navi-Lube lubricant	16,650	49,950	L	Drilling chemical storage area	Distillates, (petroleum), hydrotreated light Diethylene glycol monobutyl ether Benzene, mono-C10-13-alkyl derivatives, fractionation bottoms, heavy ends, sulfonated, sodium salts Petroleum distillates, hydrotreated heavy naphthenic Benzenesulfonic acid, C10-14-alkyl derivatives, sodium salts	64742-47-8 112-34-5 148520-82-5 64742-52-5 69669-44-9	AECOM, 2025 – Appendix E
New-Drill Plus shale stabiliser	1,000	3,000	kg	Drilling chemical storage area	2-Propenoic acid, polymer with 2-propenamide, sodium salt	25987-30-8	AECOM, 2025 – Appendix E
Noxygen XT oxygen scavenger	884	2,652	kg	Drilling chemical storage area	2,3-didehydro-3-O-sodio-D-erythro-hexono-1,4-lactone	6381-77-7	AECOM, 2025 – Appendix E
Ova Col 110 HC cloud point glycol	13,000	39,000	kg	Drilling chemical storage area	Glycol Ether	9004-77-7	AECOM, 2025 – Appendix E
Potassium chloride salt / shale stabiliser	41,000	123,000	kg	Drilling chemical storage area	potassium chloride	7447-40-7	AECOM, 2025 – Appendix E
Potassium hydroxide pH source	1,250	3,750	kg	Drilling chemical storage area	potassium hydroxide	1310-58-3	AECOM, 2025 – Appendix E
Pyro-Trol II HT filtration control	25	75	kg	Drilling chemical storage area	Copolymer of acrylamide and 2-acrylamide-2-2methyl propane sulfonic acid	Proprietary	AECOM, 2025 – Appendix E
Pyro-Vis II HT viscosifier	1,400	4,200	kg	Drilling chemical storage area	t-Butyl alcohol	75-65-0	AECOM, 2025 – Appendix E
Soda ash pH and hardness control	1,000	3,000	kg	Drilling chemical storage area	sodium carbonate	497-19-8	AECOM, 2025 –

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text	Amended EMP text

							Appendix E
Sodium bicarbonate pH and hardness control	1,000	3,000	kg	Drilling chemical storage area	sodium hydrogen carbonate	144-55-8	AECOM, 2025 – Appendix E
Sodium chloride - salt	54,400	163,200	kg	Drilling chemical storage area	sodium chloride	7647-14-5	AECOM, 2025 – Appendix E
W.O. defoam defoamer	600	1,800	L	Drilling chemical storage area	1-Hexanol, 2-ethyl-	104-76-7	AECOM, 2025 – Appendix E
Xan-Plex D viscosifier	3,000	9,000	kg	Drilling chemical storage area	Contains no hazardous ingredients according to GHS.	N/A	AECOM, 2025 – Appendix E
TEQ-LUBE II - lubricant	14,400	43,200	kg	Drilling chemical storage area	Poly(oxy-1,2-ethanediyl),α-hydro-ω-hydroxy- Ethane-1,2-diol, ethoxylated	25322-68-3	AECOM, 2025 – Appendix E
TEQ-LUBE II - lubricant	14,400	43,200	kg	Drilling chemical storage area	Poly(oxy-1,2-ethanediyl), α-(9Z)-9-octadecen-1-yl-ω-hydroxy-, phosphate	39464-69-2	AECOM, 2025 – Appendix E
NEW-THIN – Polymeric thinner	4,680	14,040	kg	Drilling chemical storage area	Contains no hazardous ingredients according to GHS.	N/A	AECOM, 2025 – Appendix E
LC-LUBE -lubricant (graphite)	9,090	27,270	kg	Drilling chemical storage area	Natural graphite	7782-42-5	AECOM, 2025 – Appendix E
MAX-GUARD EA	26,000	78,000	L	Drilling chemical storage area	Poly[oxy(methyl-1,2-ethanediyl)], α-(2-aminomethylethyl)-ω-(2-aminomethylethoxy)-	9046-10-0	AECOM, 2025 – Appendix E
					Acetic acid	64-19-7	AECOM, 2025 – Appendix E
MAX-GUARD PLUS	26,000	78,000	L	Drilling chemical storage area	Reaction mass of 7-azatridecane-1,13-diamine and hexamethylenediamine	Proprietary	AECOM, 2025 – Appendix E
					acetic acid	64-19-7	AECOM, 2025 – Appendix E

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text	Amended EMP text							
						hexamethylenediamine	124-09-4	AECOM, 2025 – Appendix E
						cyclohex-1,2-ylenediamine	694-83-7	AECOM, 2025 – Appendix E
	MAX-GUARD PLUS A	26,000	78,000	L	Drilling chemical storage area	1,2-Ethanediamine, N-(2-aminoethyl)-	111-40-0	AECOM, 2025 – Appendix E
						acetic acid	64-19-7	AECOM, 2025 – Appendix E
	SARALINE 185V	18,603	55,809	kg	Drilling chemical storage area	Distillates (Fischer-Tropsch), C8-26 - Branched and Linear	848301-67-7	AECOM, 2025 – Appendix E
	All Temp (deflocculant)	10,450	31,350	kg	Drilling chemical storage area	Proprietary	Proprietary	AECOM, 2025 – Appendix E
	NX LUBE DR PLUS (Lubricant)	16,654	49,962	L	Drilling chemical storage area	Fatty acid ester of polyalcohol polyoxyethylene fatty acid ester mixed fatty acid (fatty acids, C14-18 and C16-18-unsatd)	85049-33-8 9005-65-6 67701-06-8	AECOM, 2025 – Appendix E
	Mojo Platinum (Lubricant)	16,654	49,962	L	Drilling chemical storage area	Blended Fatty Acid Residue (Fatty acids, mixed tallow and vegetable-oil, distn. Residues) Unsaturated Methyl Esters (Fatty acids, C14-18 and C16-18-unsatd., Me esters) Fatty Acid Ester Mixtures (Fatty acids, tall-oil, diesters with polyethylene glycol) Amid, Tall Oil Fatty, N, N Bis (Hydroxy Ethyl) (Amides, tall-oil fatty, N,N-bis(hydroxyethyl))	70248-31-6 67762-26-9 61791-01-3 68155-20-4	AECOM, 2025 – Appendix E
	MN-MNO (Viscosifier)	8,000	24,000	kg	Drilling chemical storage area	Sodium Carbonate Proprietary Proprietary	497-19-18 Proprietary Proprietary	AECOM, 2025 – Appendix E
	Proppants*							

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text	Amended EMP text

100 mesh sand- proppant	91,000	273,000	kg	Stimulation chemical storage area	Sand	14808-60-7	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
Quartz or organophilic phyllosilicate- proppant	1,084	3,252	L	Stimulation chemical storage area	Quartz or organophilic phyllosilicate	14808-60-7	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
40/70 sand- proppant	1,650,000	4,950,000	kg	Stimulation chemical storage area	Sand	14808-60-7	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1
30/50 sand- proppant	610,000	1,830,000	kg	Stimulation chemical storage area	Sand	14808-60-7	AECOM, 2025 – Appendix E EHS Support, (2023) – Appendix E.1 as 20/40
Silicon dioxide (quartz/sand) 100 sand	4,757,614	14,272,842	kg	Stimulation chemical storage area	Sand	14808-60-7	AECOM, 2025 – Appendix E
Silicon dioxide (quartz/sand) 40/70	5,435,287	16,305,860	kg	Stimulation chemical storage area	Sand	14808-60-7	AECOM, 2024b – Appendix E.2
* Proppants are sand which is inert. They do not require special chemical bunding but are co-located in the stimulation chemical storage area, within the well pad bund. Residual proppant from a stimulation campaign is often used to assist with chemical spills on the well pad, where contaminated spill material is removed.							
Cleaning Chemicals and Spill Response							
Soda ash – sodium carbonate	3,750	11,250	kg	Stimulation chemical storage area	Sodium carbonate - spill response in event acid spill	497-19-8	AECOM, 2024b – Appendix E.2

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

Amended EMP text

Flush fluid - distillates (petroleum), hydrotreated	1,500	4,500	L	Stimulation chemical storage area	Distillates (petroleum), hydrotreated - equipment cleaning	64742-47-8	AECOM, 2024b – Appendix E.2	

3.11 Chemical and fluid management

3.11.1 Chemical types and quantities

Table 19: Estimated chemical volume and storage used in the drilling and stimulation process at each site

As per ES table

3.11 Chemical and fluid management

3.11.1 Chemical types and quantities

Table 19: Estimated chemical volume and storage used in the drilling and stimulation process at each site

As per ES table

Appendices

Appendix F Spill Management Plan

Appendix A Chemical volumes per well and storage areas (based on maximum 3 wells per pad)

NOTE: In accordance with the Code, a chemical risk assessment has been completed on all listed chemicals, which have been verified to not be toxic and persistent and bioaccumulative.

Material name	Typical volume	Maximum volume	Unit	Storage area	Hazardous (Y/N)
Acetic acid – 60%	3,000	9,000	L	Stimulation chemical storage area	No
BE-9 Biocide	17,000	51,000	L	Stimulation chemical storage area	Yes
Caustic Soda Liquid	15,000	45,000	L	Stimulation chemical storage area	No
DCA-11001 Breaker activator	5,000	15,000	L	Stimulation chemical storage area	Yes
DCA-13002 Breaker	300	900	kg	Stimulation chemical storage area	Yes
DCA-13003 Breaker	10,000	30,000	L	Stimulation chemical storage area	Yes
DCA-16001 Clay Stabiliser	42,000	126,000	L	Stimulation chemical storage area	No
DCA-17001 Corrosion inhibiter	1,000	3,000	L	Stimulation chemical storage area	Yes
DCA-19001 Crosslinker	600	1,800	kg	Stimulation chemical storage area	Yes
DCA-19002 Crosslinker	10,000	30,000	L	Stimulation chemical storage area	Yes
DCA-23001 Friction reducer	5,000	15,000	kg	Stimulation chemical storage area	No
DCA-23003 Friction reducer	18,000	54,000	L	Stimulation chemical storage area	No
DCA-25005 Gelling agent	35,000	105,000	kg	Stimulation chemical storage area	No
DCA-30001 Scale inhibitor	15,000	45,000	L	Stimulation chemical storage area	No
DCA-32002 Surfactant	15,000	45,000	L	Stimulation chemical storage area	Yes
DCA-32014 Surfactant	200	600	L	Stimulation chemical storage area	Yes
FE-2 Buffer	200	600	kg	Stimulation chemical storage area	No
Hydrochloric acid – 32%	50,000	150,000	L	Stimulation chemical storage area	Yes
Alcohols, C11-14-iso-, C13-rich,ethoxylated- Surfactant	5,285	15,855	L	Stimulation chemical storage area	Yes
Sodium (C14-16) olefin sulfonate - Surfactant	4,658	13,974	L	Stimulation chemical storage area	Yes

Appendix F Spill Management Plan

Appendix A Chemical volumes per well and storage areas (based on maximum 3 wells per pad)

NOTE: In accordance with the Code, a chemical risk assessment has been completed on all listed chemicals, which have been verified to not be toxic and persistent and bioaccumulative.

Material name	Typical volume	Maximum volume	Unit	Storage area	Hazardous (Y/N)
Acetic acid – 60%	3,000	9,000	L	Stimulation chemical storage area	No
BE-9 Biocide	17,000	51,000	L	Stimulation chemical storage area	Yes
Caustic Soda Liquid	15,000	45,000	L	Stimulation chemical storage area	No
DCA-11001 Breaker activator	5,000	15,000	L	Stimulation chemical storage area	Yes
DCA-13002 Breaker	300	900	kg	Stimulation chemical storage area	Yes
DCA-13003 Breaker	10,000	30,000	L	Stimulation chemical storage area	Yes
DCA-16001 Clay Stabiliser	42,000	126,000	L	Stimulation chemical storage area	No
DCA-17001 Corrosion inhibiter	1,000	3,000	L	Stimulation chemical storage area	Yes
DCA-19001 Crosslinker	600	1,800	kg	Stimulation chemical storage area	Yes
DCA-19002 Crosslinker	10,000	30,000	L	Stimulation chemical storage area	Yes
DCA-23001 Friction reducer	5,000	15,000	kg	Stimulation chemical storage area	No
DCA-23003 Friction reducer	18,000	54,000	L	Stimulation chemical storage area	No
DCA-25005 Gelling agent	35,000	105,000	kg	Stimulation chemical storage area	No
DCA-30001 Scale inhibitor	15,000	45,000	L	Stimulation chemical storage area	No
DCA-32002 Surfactant	15,000	45,000	L	Stimulation chemical storage area	Yes
DCA-32014 Surfactant	200	600	L	Stimulation chemical storage area	Yes
FE-2 Buffer	200	600	kg	Stimulation chemical storage area	No
Hydrochloric acid – 32%	50,000	150,000	L	Stimulation chemical storage area	Yes
Alcohols, C11-14-iso-, C13-rich,ethoxylated- Surfactant	5,285	15,855	L	Stimulation chemical storage area	Yes
Sodium (C14-16) olefin sulfonate - Surfactant	4,658	13,974	L	Stimulation chemical storage area	Yes

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text						Amended EMP text					
Diisobutyl glutarate - plasticiser	627	1,881	L	Stimulation chemical storage area	No	Diisobutyl glutarate - plasticiser	627	1,881	L	Stimulation chemical storage area	No
Diisobutyl succinate - plasticiser	209	627	L	Stimulation chemical storage area	No	Diisobutyl succinate - plasticiser	209	627	L	Stimulation chemical storage area	No
Diisobutyl adipate- plasticiser	179	537	L	Stimulation chemical storage area	No	Diisobutyl adipate- plasticiser	179	537	L	Stimulation chemical storage area	No
Sodium thiosulphate- stabilising agent	4,763	14,289	L	Stimulation chemical storage area	No	Sodium thiosulphate- stabilising agent	4,763	14,289	L	Stimulation chemical storage area	No
Sodium sulphate stabilising agent	913	2,739	L	Stimulation chemical storage area	No	Sodium sulphate stabilising agent	913	2,739	L	Stimulation chemical storage area	No
Sodium sulphite stabilising agent	794	2,382	L	Stimulation chemical storage area	No	Sodium sulphite stabilising agent	794	2,382	L	Stimulation chemical storage area	No
Ethylene glycol- crosslinker	5,112	15,336	L	Stimulation chemical storage area	Yes	Ethylene glycol- crosslinker	5,112	15,336	L	Stimulation chemical storage area	Yes
Choline Chloride- Clay stabiliser	10,301	30,903	L	Stimulation chemical storage area	No	Choline Chloride- Clay stabiliser	10,301	30,903	L	Stimulation chemical storage area	No
Glutaraldehyde- biocide	14,930	44,790	L	Stimulation chemical storage area	Yes	Glutaraldehyde- biocide	14,930	44,790	L	Stimulation chemical storage area	Yes
Ammonium sulphate- breaker	4,479	13,491	L	Stimulation chemical storage area	Yes	Ammonium sulphate- breaker	4,479	13,491	L	Stimulation chemical storage area	Yes
Polyacrylamide- friction reducer	4,479	13,491	L	Stimulation chemical storage area	No	Polyacrylamide- friction reducer	4,479	13,491	L	Stimulation chemical storage area	No
Sodium polyacrylate- gelling agent	746	2,238	L	Stimulation chemical storage area	No	Sodium polyacrylate- gelling agent	746	2,238	L	Stimulation chemical storage area	No
Sodium bisulfite- stabiliser	149	447	L	Stimulation chemical storage area	No	Sodium bisulfite- stabiliser	149	447	L	Stimulation chemical storage area	No
Alkyl alcohol- surfactant	149	447	L	Stimulation chemical storage area	Yes	Alkyl alcohol- surfactant	149	447	L	Stimulation chemical storage area	Yes
2-Propenoic acid, homopolymer, ammonium salt- biocide	149	447	L	Stimulation chemical storage area	Yes	2-Propenoic acid, homopolymer, ammonium salt- biocide	149	447	L	Stimulation chemical storage area	Yes
Potassium persulfate-breaker	149	447	L	Stimulation chemical storage area	Yes	Potassium persulfate-breaker	149	447	L	Stimulation chemical storage area	Yes
2-Ethoxy-naphthalene-surfactant	149	447	L	Stimulation chemical storage area	Yes	2-Ethoxy-naphthalene-surfactant	149	447	L	Stimulation chemical storage area	Yes
Sodium gluconate- stabiliser	8,576	25,728	L	Stimulation chemical storage area	No	Sodium gluconate- stabiliser	8,576	25,728	L	Stimulation chemical storage area	No
Boric -crosslinker	4,288	12,864	L	Stimulation chemical storage area	Yes	Boric -crosslinker	4,288	12,864	L	Stimulation chemical storage area	Yes
Potassium hydroxide- pH control	10,745	32,235	L	Stimulation chemical storage area	Yes	Potassium hydroxide- pH control	10,745	32,235	L	Stimulation chemical storage area	Yes
Mannanase- crosslinker	2	6	L	Stimulation chemical storage area	Yes	Mannanase- crosslinker	2	6	L	Stimulation chemical storage area	Yes
Ammonium persulphate- breaker	7,451	22,353	L	Stimulation chemical storage area	Yes	Ammonium persulphate- breaker	7,451	22,353	L	Stimulation chemical storage area	Yes
Talc- buffer	384	1,152	L	Stimulation chemical storage area	No	Talc- buffer	384	1,152	L	Stimulation chemical storage area	No
Sodium bromate- breaker	50,441	151,323	L	Stimulation chemical storage area	Yes	Sodium bromate- breaker	50,441	151,323	L	Stimulation chemical storage area	Yes
Hepta sodium phosphonate- emulsifier	3,176	9,528	L	Stimulation chemical storage area	No	Hepta sodium phosphonate- emulsifier	3,176	9,528	L	Stimulation chemical storage area	No
Distillates, hydrotreated light- friction reducer	54,231	162,693	L	Stimulation chemical storage area	No	Distillates, hydrotreated light- friction reducer	54,231	162,693	L	Stimulation chemical storage area	No
Guar gum- viscosity regulator	15,141	45,423	L	Stimulation chemical storage area	No	Guar gum- viscosity regulator	15,141	45,423	L	Stimulation chemical storage area	No
Poly-oxyethylene nonylphenol ether- surfactant	4,466	13,398	L	Stimulation chemical storage area	Yes	Poly-oxyethylene nonylphenol ether- surfactant	4,466	13,398	L	Stimulation chemical storage area	Yes
Quaternary ammonium compounds, bis(hydrogenated tallow alkyl)dimethyl, salts with bentonite- biocide	4,466	13,398	L	Stimulation chemical storage area	Yes	Quaternary ammonium compounds, bis(hydrogenated tallow alkyl)dimethyl, salts with bentonite- biocide	4,466	13,398	L	Stimulation chemical storage area	Yes
1,6-Hexanediol- cross linker	447	1,341	L	Stimulation chemical storage area	Yes	1,6-Hexanediol- cross linker	447	1,341	L	Stimulation chemical storage area	Yes

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text						Amended EMP text					
Hydrochloric acid- pH control	44,715	134,145	L	Stimulation chemical storage area	Yes	Hydrochloric acid- pH control	44,715	134,145	L	Stimulation chemical storage area	Yes
N-benzyl-alkyl pyridinium chloride- pH control	28	84	L	Stimulation chemical storage area	Yes	N-benzyl-alkyl pyridinium chloride- pH control	28	84	L	Stimulation chemical storage area	Yes
Formic acid- corrosion inhibitor	38	114	L	Stimulation chemical storage area	Yes	Formic acid- corrosion inhibitor	38	114	L	Stimulation chemical storage area	Yes
Sodium erythorbate- scaler prohibitor	334	1,002	L	Stimulation chemical storage area	No	Sodium erythorbate- scaler prohibitor	334	1,002	L	Stimulation chemical storage area	No
Citric acid- pH control	15,878	47,634	L	Stimulation chemical storage area	No	Citric acid- pH control	15,878	47,634	L	Stimulation chemical storage area	No
Acetic acid- pH control	15,878	47,634	L	Stimulation chemical storage area	No	Acetic acid- pH control	15,878	47,634	L	Stimulation chemical storage area	No
Isopropanol- clay management	83	249	L	Stimulation chemical storage area	Yes	Isopropanol- clay management	83	249	L	Stimulation chemical storage area	Yes
Ethoxylated C12-C16 alcohol - surfactant	57	171	L	Stimulation chemical storage area	Yes	Ethoxylated C12-C16 alcohol - surfactant	57	171	L	Stimulation chemical storage area	Yes
Ethoxylated decanol - surfactant	19	57	L	Stimulation chemical storage area	Yes	Ethoxylated decanol - surfactant	19	57	L	Stimulation chemical storage area	Yes
Cinnamaldehyde- biocide	57	171	L	Stimulation chemical storage area	Yes	Cinnamaldehyde- biocide	57	171	L	Stimulation chemical storage area	Yes
Ethoxylated tallow alkyl amine - surfactant	9	27	L	Stimulation chemical storage area	Yes	Ethoxylated tallow alkyl amine - surfactant	9	27	L	Stimulation chemical storage area	Yes
Methanol- corrosion inhibitor	2	6	L	Stimulation chemical storage area	Yes	Methanol- corrosion inhibitor	2	6	L	Stimulation chemical storage area	Yes
Polyacrylamide - friction reducer	49,093	147,279	L	Stimulation chemical storage area	No	Polyacrylamide - friction reducer	49,093	147,279	L	Stimulation chemical storage area	No
Polyethylene glycol trimethylnonyl ether - clay manager	87	261	L	Stimulation chemical storage area	Yes	Polyethylene glycol trimethylnonyl ether - clay manager	87	261	L	Stimulation chemical storage area	Yes
Water in additive- stabiliser	66,804	200,412	L	Stimulation chemical storage area	No	Water in additive- stabiliser	66,804	200,412	L	Stimulation chemical storage area	No
Potassium sorbate food grade- corrosion inhibitor	14	42	L	Stimulation chemical storage area	No	Potassium sorbate food grade- corrosion inhibitor	14	42	L	Stimulation chemical storage area	No
Mannanase (Mannan endo-1,4-beta-mannosidase)- cross linker	2	6	L	Stimulation chemical storage area	Yes	Mannanase (Mannan endo-1,4-beta-mannosidase)- cross linker	2	6	L	Stimulation chemical storage area	Yes
Nonoxynol-9- surfactant	9	27	L	Stimulation chemical storage area	Yes	Nonoxynol-9- surfactant	9	27	L	Stimulation chemical storage area	Yes
2-Ethylhexanol PO/EO polymer- stabiliser	9	27	L	Stimulation chemical storage area	No	2-Ethylhexanol PO/EO polymer- stabiliser	9	27	L	Stimulation chemical storage area	No
Corn oil- friction reducer	662	1,986	L	Stimulation chemical storage area	No	Corn oil- friction reducer	662	1,986	L	Stimulation chemical storage area	No
AL-Cl-1F - HT Acid Corrosion Inhibitor	1,022	3,066	L	Stimulation chemical storage area	Yes	AL-Cl-1F - HT Acid Corrosion Inhibitor	1,022	3,066	L	Stimulation chemical storage area	Yes
AL-FE-1F - Iron Control	2,001	6,002	L	Stimulation chemical storage area	Yes	AL-FE-1F - Iron Control	2,001	6,002	L	Stimulation chemical storage area	Yes
BFL-1F - Low Buffer	2,000	6,000	L	Stimulation chemical storage area	Yes	BFL-1F - Low Buffer	2,000	6,000	L	Stimulation chemical storage area	Yes
BHE-01F - Encapsulated AP	173	519	L	Stimulation chemical storage area	Yes	BHE-01F - Encapsulated AP	173	519	L	Stimulation chemical storage area	Yes
BIO-GQ510 - Biocide 5/10 Glut Quat	38,715	116,144	L	Stimulation chemical storage area	Yes	BIO-GQ510 - Biocide 5/10 Glut Quat	38,715	116,144	L	Stimulation chemical storage area	Yes
CSA-1F - Clay Control (70% Choline)	96,786	290,358	L	Stimulation chemical storage area	No	CSA-1F - Clay Control (70% Choline)	96,786	290,358	L	Stimulation chemical storage area	No
HCL-15B - 15% HCL	508,008	1,524,023	L	Stimulation chemical storage area	Yes	HCL-15B - 15% HCL	508,008	1,524,023	L	Stimulation chemical storage area	Yes
SFT-NE-1F - Flowback Surfactant (NE)	48,666	145,997	L	Stimulation chemical storage area	Yes	SFT-NE-1F - Flowback Surfactant (NE)	48,666	145,997	L	Stimulation chemical storage area	Yes
BFH-1F - High Buffer	2,000	6,000	L	Stimulation chemical storage area	Yes	BFH-1F - High Buffer	2,000	6,000	L	Stimulation chemical storage area	Yes
FRP-BL1F - HVFR Anionic (Freshwater)	114,830	344,490	L	Stimulation chemical storage area	Yes	FRP-BL1F - HVFR Anionic (Freshwater)	114,830	344,490	L	Stimulation chemical storage area	Yes

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text					
LGA-01F - Guar Gel Concentrate	13,594	40,781	L	Stimulation chemical storage area	Yes
SCI-1F - Scale Inhibitor	96,786	290,358	L	Stimulation chemical storage area	No
XLB-C1F - Instant Cross-linker	3,263	9,788	L	Stimulation chemical storage area	Yes
Sodium chloride	15,000	45,000	kg	Completion chemical storage area	No
ALDACIDE G	500	1,500	L	Completion chemical storage area	Yes
OXYGON	100	300	kg	Completion chemical storage area	No
BARACOR 100	2,000	6,000	L	Completion chemical storage area	Yes
Sodium Hypochlorite 10–30%	10,000	30,000	L	Completion chemical storage area	Yes
CON-DET	50	150	kg	Drilling chemical storage area	No
SAPP	50	150	kg	Drilling chemical storage area	No
Bentonite	3,000	9,000	kg	Drilling chemical storage area	No
Caustic soda	1,400	4,200	kg	Drilling chemical storage area	No
EZ MUD DP or EZ MUD Liquid	2,000	6,000	kg	Drilling chemical storage area	No
ALDACIDE G	336	1008	kg	Drilling chemical storage area	Yes
STOPPIT	1,000	3,000	kg	Drilling chemical storage area	No
Soda ash	350	1050	kg	Drilling chemical storage area	Yes
BARACOR 100	250	750	kg	Drilling chemical storage area	Yes
Sodium chloride (flossy salt)	96,000	288,000	kg	Drilling chemical storage area	No
Barite	500	1,500	kg	Drilling chemical storage area	No
BARACARB	500	1,500	kg	Drilling chemical storage area	Yes
Citric acid	500	1,500	kg	Drilling chemical storage area	Yes
BARADEFOAM HP	500	1,500	kg	Drilling chemical storage area	No
Sodium Bicarbonate	500	1,500	kg	Drilling chemical storage area	No
PERFORMATROL	500	1,500	kg	Drilling chemical storage area	Yes
SOURSCAV	500	1,500	kg	Drilling chemical storage area	No
DRIL-N-SLIDE	500	1,500	kg	Drilling chemical storage area	No
STEELSEAL	500	1,500	kg	Drilling chemical storage area	Yes
BARAZAN D or BARAZAN D Plus	4,150	12,450	kg	Drilling chemical storage area	No
PAC L	2,300	6,900	kg	Drilling chemical storage area	Yes
Potassium chloride	22,500	67,500	kg	Drilling chemical storage area	No
QUIK-FREE	500	1,500	kg	Drilling chemical storage area	No
BAROFIBRE, BAROFIBRE Superfine and BAROFIBRE COARSE	500	1,500	kg	Drilling chemical storage area	No
BaraBlend-657	500	1,500	kg	Drilling chemical storage area	Yes
N-DRIL HT Plus	500	1,500	kg	Drilling chemical storage area	Yes
DEXTRID LTE	4,600	13,800	kg	Drilling chemical storage area	No
BARABUF	500	1,500	kg	Drilling chemical storage area	No
BDF 933 or BaraLube W-933	864	2,592	kg	Drilling chemical storage area	Yes
BAROLIFT	500	1,500	kg	Drilling chemical storage area	No
OXYGON	500	1,500	kg	Drilling chemical storage area	No

Amended EMP text					
LGA-01F - Guar Gel Concentrate	13,594	40,781	L	Stimulation chemical storage area	Yes
SCI-1F - Scale Inhibitor	96,786	290,358	L	Stimulation chemical storage area	No
XLB-C1F - Instant Cross-linker	3,263	9,788	L	Stimulation chemical storage area	Yes
Flow Insurance Copper	20	60	kg	Stimulation chemical storage area	Yes
GT 1-16	320	960	kg	Stimulation chemical storage area	No
Hydrogen Peroxide 50	10,000	30,000	L	Stimulation chemical storage area	Yes
Starcide	5,575	16,725	L	Stimulation chemical storage area	Yes
HCL-15B Hydrochloric Acid 15%	1,635,297	4,905,891	L	Stimulation chemical storage area	Yes
FRP-BL1F – HVFR Anionic	753,217	2,259,651	L	Stimulation chemical storage area	Yes
BIO-GQ510 – Biocide 5/10 Glut Quat	126,334	379,002	L	Stimulation chemical storage area	Yes
SFT-NE-1F Flowback Surfactant (NE)	157,916	473,748	L	Stimulation chemical storage area	Yes
CSA-1F Clay Control (70% Choline)	315,836	947,508	L	Stimulation chemical storage area	No
SCI-1F Scale Inhibitor	315,836	947,508	L	Stimulation chemical storage area	No
LGA-01F Guar Gel Concentrate	25,552	76,656	L	Stimulation chemical storage area	Yes
XLB-C1F Instant Cross Linker	7,154	21,462	L	Stimulation chemical storage area	Yes
BHE-01F Encapsulated AP	1,190	3,570	L	Stimulation chemical storage area	Yes
BFH-1F – High Buffer	1,141	3,423	L	Stimulation chemical storage area	Yes
BFL-1F – Low Buffer	2,422	7,266	L	Stimulation chemical storage area	Yes
Sodium chloride	15,000	45,000	kg	Completion chemical storage area	No
ALDACIDE G	500	1,500	L	Completion chemical storage area	Yes
OXYGON	100	300	kg	Completion chemical storage area	No
BARACOR 100	2,000	6,000	L	Completion chemical storage area	Yes
Sodium Hypochlorite 10–30%	10,000	30,000	L	Completion chemical storage area	Yes
CON-DET	50	150	kg	Drilling chemical storage area	No
SAPP	50	150	kg	Drilling chemical storage area	No
Bentonite	3,000	9,000	kg	Drilling chemical storage area	No
Caustic soda	2,250	6,750	kg	Drilling chemical storage area	Yes
EZ MUD DP or EZ MUD Liquid	2,000	6,000	kg	Drilling chemical storage area	No
ALDACIDE G	336	1008	kg	Drilling chemical storage area	Yes
STOPPIT	1,000	3,000	kg	Drilling chemical storage area	No
Soda ash	350	1050	kg	Drilling chemical storage area	Yes
BARACOR 100	250	750	kg	Drilling chemical storage area	Yes
Sodium chloride (flossy salt)	96,000	288,000	kg	Drilling chemical storage area	No
Barite	500	1,500	kg	Drilling chemical storage area	No
BARACARB	500	1,500	kg	Drilling chemical storage area	Yes
Citric acid	500	1,500	kg	Drilling chemical storage area	Yes
BARADEFOAM HP	500	1,500	kg	Drilling chemical storage area	No
Sodium Bicarbonate	500	1,500	kg	Drilling chemical storage area	No
PERFORMATROL	500	1,500	kg	Drilling chemical storage area	Yes

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text					
ENVIRO-THIN	500	1,500	kg	Drilling chemical storage area	No
Lime	500	1,500	kg	Drilling chemical storage area	Yes
Calcium chloride	37,000	111,000	kg	Drilling chemical storage area	Yes
Sodium bromide	8,610	24,480	kg	Drilling chemical storage area	Yes
Evolube TR	14,500	43,500	L	Drilling chemical storage area	Yes
Radiagreen EME	4,800	14,400	L	Drilling chemical storage area	Yes
Radiagreen EBL	4,800	14,400	L	Drilling chemical storage area	Yes
Polydrill	7,500	22,500	kg	Drilling chemical storage area	Yes
Alpine spotting beads	1,000	3,000	kg	Drilling chemical storage area	Yes
Barite - weighting agent	354,000	1,062,000	kg	Drilling chemical storage area	No
Bio-Paq HT - filtration control	1,134	3,410	kg	Drilling chemical storage area	Yes
Brine-Pac XTS - corrosion inhibitor	3,400	10,200	L	Drilling chemical storage area	Yes
Calcium chloride - salinity	180,000	540,000	kg	Drilling chemical storage area	Yes
CF Desco - deflocculant	2,270	6,810	kg	Drilling chemical storage area	Yes
Chek Loss - fibrous LCM Cellulose	1,360	4,080	kg	Drilling chemical storage area	No
Citric acid - pH control	1,361	4,083	L	Drilling chemical storage area	Yes
Ecco-Temp - HT extender	8,000	24,000	L	Drilling chemical storage area	Yes
Flowzan - viscosifier	5,000	15,000	kg	Drilling chemical storage area	No
Mil-Lime alkalinity	1,361	4,083	L	Drilling chemical storage area	Yes
Magnesium oxide - pH buffer	7,500	22,500	kg	Drilling chemical storage area	No
Mil-bio SEA 98 - biocide	1,800	5,400	L	Drilling chemical storage area	Yes
Mil-carb - LCM / bridging	5,000	15,000	kg	Drilling chemical storage area	No
Milstarch filtration control	5,000	15,000	kg	Drilling chemical storage area	No
Navi-Lube - lubricant	16,650	49,980	L	Drilling chemical storage area	Yes
New-Drill Plus - shale stabiliser	1,000	3,000	kg	Drilling chemical storage area	No
Noxygen XT - oxygen scavenger	880	2,660	kg	Drilling chemical storage area	No
Ova Col 110 HC - cloud point glycol	13,000	39,000	kg	Drilling chemical storage area	Yes
Potassium chloride salt / shale stabiliser	40,800	122,500	kg	Drilling chemical storage area	Yes
Potassium hydroxide - pH source	1,250	3,750	kg	Drilling chemical storage area	Yes
Pyro-Trol II - HT filtration control	25	75	kg	Drilling chemical storage area	No
Pyro-Vis II - HT viscosifier	1,400	4,200	kg	Drilling chemical storage area	Yes
Soda ash - pH and hardness control	1,000	3,000	kg	Drilling chemical storage area	Yes
Sodium bicarbonate - pH and hardness control	1,000	3,000	kg	Drilling chemical storage area	No
Sodium chloride - salt	54,400	163,300	kg	Drilling chemical storage area	No
W.O. defoam - defoamer	600	1,820	L	Drilling chemical storage area	Yes
Xan-Plex D - viscosifier	3,000	9,000	kg	Drilling chemical storage area	No

Amended EMP text					
SOURSCAV	500	1,500	kg	Drilling chemical storage area	No
DRIL-N-SLIDE	500	1,500	kg	Drilling chemical storage area	No
STEELSEAL	500	1,500	kg	Drilling chemical storage area	Yes
BARAZAN D or BARAZAN D Plus	4,150	12,450	kg	Drilling chemical storage area	No
PAC L	2,300	6,900	kg	Drilling chemical storage area	Yes
Potassium chloride	22,500	67,500	kg	Drilling chemical storage area	No
QUIK-FREE	500	1,500	kg	Drilling chemical storage area	No
BAROFIBRE, BAROFIBRE Superfine and BAROFIBRE COARSE	500	1,500	kg	Drilling chemical storage area	No
BaraBlend-657	500	1,500	kg	Drilling chemical storage area	Yes
N-DRIL HT Plus	500	1,500	kg	Drilling chemical storage area	Yes
DEXTRID LTE	4,600	13,800	kg	Drilling chemical storage area	No
BARABUF	500	1,500	kg	Drilling chemical storage area	No
BDF 933 or BaraLube W-933	864	2,592	kg	Drilling chemical storage area	Yes
BAROLIFT	500	1,500	kg	Drilling chemical storage area	No
OXYGON	500	1,500	kg	Drilling chemical storage area	No
ENVIRO-THIN	500	1,500	kg	Drilling chemical storage area	No
Lime	500	1,500	kg	Drilling chemical storage area	Yes
Calcium chloride	37,000	111,000	kg	Drilling chemical storage area	Yes
Sodium bromide	8,610	24,480	kg	Drilling chemical storage area	Yes
Evolube TR	14,500	43,500	L	Drilling chemical storage area	Yes
Radiagreen EME	4,800	14,400	L	Drilling chemical storage area	Yes
Radiagreen EBL	4,800	14,400	L	Drilling chemical storage area	Yes
Polydrill	7,500	22,500	kg	Drilling chemical storage area	Yes
Alpine spotting beads	1,000	3,000	kg	Drilling chemical storage area	Yes
Barite - weighting agent	354,000	1,062,000	kg	Drilling chemical storage area	No
Bio-Paq HT - filtration control	1,134	3,410	kg	Drilling chemical storage area	Yes
Brine-Pac XTS - corrosion inhibitor	3,400	10,200	L	Drilling chemical storage area	Yes
Calcium chloride - salinity	180,000	540,000	kg	Drilling chemical storage area	Yes
CF Desco - deflocculant	2,270	6,810	kg	Drilling chemical storage area	Yes
Chek Loss - fibrous LCM Cellulose	1,360	4,080	kg	Drilling chemical storage area	No
Citric acid - pH control	1,361	4,083	L	Drilling chemical storage area	Yes
Ecco-Temp - HT extender	8,000	24,000	L	Drilling chemical storage area	Yes
Flowzan - viscosifier	5,000	15,000	kg	Drilling chemical storage area	No
KEM-SEAL™ PLUS – high temperature filtration control agent	4,000	12,000	kg	Drilling chemical storage area	No
Mil-Lime alkalinity	1,361	4,083	L	Drilling chemical storage area	Yes
Magnesium oxide - pH buffer	7,500	22,500	kg	Drilling chemical storage area	No
Mil-bio SEA 98 - biocide	1,800	5,400	L	Drilling chemical storage area	Yes
Mil-carb - LCM / bridging	5,000	15,000	kg	Drilling chemical storage area	No

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

TEQ-LUBE II - lubricant (25322-6-3)	14,400	43,200	kg	Drilling chemical storage area	Yes
TEQ-LUBE II - lubricant (39464-69-2)	14,400	43,200	kg	Drilling chemical storage area	Yes
NEW-THIN - Polymeric thinner	4,680	14,040	kg	Drilling chemical storage area	No
LC-LUBE - lubricant (graphite)	9,090	27,270	kg	Drilling chemical storage area	No
General operation chemicals					
Diesel	250	750	KL	Diesel storage tanks	Yes
Hydraulic oil	1,000	3,000	L	Workshop	Yes
Engine oil	1,000	3,000	L	Workshop	Yes
Degreasers	100	300	L	Workshop	Yes
Waste drilling fluids	2,500	7,500	m^3	Drilling mud sump	Yes
Completion fluids	1.4	4.2	ML	Drilling mud sump	No
Condensate	10	10	KL	Drilling chemical storage area	Yes
Flowback	~10.8 ML per well		ML	Flowback tanks	Yes
Proppants*					
100 mesh sand	91,000	273,000	kg	Stimulation chemical storage area	No
Quartz or organophilic phyllosilicate- proppant	1,084	3,252	L	Stimulation chemical storage area	No
40/70 sand	1,650,000	4,950,000	kg	Stimulation chemical storage area	No
30/50 sand	610,000	1,830,000	kg	Stimulation chemical storage area	No
Silicon dioxide (quartz/sand) 100% Sand	4,757,614	14,272,842	kg	Stimulation chemical storage area	No
Silicon dioxide (quartz/sand) 40/70	5,435,287	16,305,860	kg	Stimulation chemical storage area	No
* Proppants are sand which is inert. They do not require special chemical bunding but are co-located in the stimulation chemical storage area, within the well pad bund. Residual proppant from a stimulation campaign is often used to assist with chemical spills on the well pad, where contaminated spill material is removed.					
Cleaning chemicals and spill response					
Soda ash – sodium carbonate	3,750	11,250	kg	Stimulation chemical storage area - spill response for acid spills	Yes
Flush fluid - distillates (petroleum), hydrotreated	1,500	4,500	L	Stimulation chemical storage area - Equipment cleaning	Yes

Amended EMP text

Milstarch filtration control	5,000	15,000	kg	Drilling chemical storage area	No
Navi-Lube - lubricant	16,650	49,980	L	Drilling chemical storage area	Yes
New-Drill Plus - shale stabiliser	1,000	3,000	kg	Drilling chemical storage area	No
Noxygen XT - oxygen scavenger	880	2,660	kg	Drilling chemical storage area	No
Ova Col 110 HC - cloud point glycol	13,000	39,000	kg	Drilling chemical storage area	Yes
Potassium chloride salt / shale stabiliser	40,800	122,500	kg	Drilling chemical storage area	Yes
Potassium hydroxide - pH source	1,250	3,750	kg	Drilling chemical storage area	Yes
Pyro-Trol II - HT filtration control	25	75	kg	Drilling chemical storage area	No
Pyro-Vis II - HT viscosifier	1,400	4,200	kg	Drilling chemical storage area	Yes
Soda ash - pH and hardness control	1,000	3,000	kg	Drilling chemical storage area	Yes
Sodium bicarbonate - pH and hardness control	1,000	3,000	kg	Drilling chemical storage area	No
Sodium chloride - salt	54,400	163,300	kg	Drilling chemical storage area	No
W.O. defoam - defoamer	600	1,820	L	Drilling chemical storage area	Yes
Xan-Plex D - viscosifier	3,000	9,000	kg	Drilling chemical storage area	No
TEQ-LUBE II - lubricant (25322-6-3)	14,400	43,200	kg	Drilling chemical storage area	Yes
TEQ-LUBE II - lubricant (39464-69-2)	14,400	43,200	kg	Drilling chemical storage area	Yes
NEW-THIN - Polymeric thinner	4,680	14,040	kg	Drilling chemical storage area	No
LC-LUBE - lubricant (graphite)	9,090	27,270	kg	Drilling chemical storage area	No
MAX-GUARD EA	26,000	78,000	L	Drilling chemical storage area	Yes
MAX-GUARD PLUS	26,000	78,000	L	Drilling chemical storage area	Yes
MAX-GUARD PLUS A	26,000	78,000	L	Drilling chemical storage area	Yes
SARALINE 185V	18,603	55,809	kg	Drilling chemical storage area	Yes
All-Temp – deflocculant	10,450	31,350	kg	Drilling chemical storage area	No
NX LUBE DR PLUS	16,654	49,962	L	Drilling chemical storage area	No
Mojo Platinum HB – lubricant	16,654	49,962	kg	Drilling chemical storage area	No
MN-MMO – viscosifier	8,000	24,000	Kg	Drilling chemical storage area	No
General operation chemicals					
Diesel	250	750	KL	Diesel storage tanks	Yes
Hydraulic oil	1,000	3,000	L	Workshop	Yes
Engine oil	1,000	3,000	L	Workshop	Yes
Degreasers	100	300	L	Workshop	Yes
Waste drilling fluids	2,500	7,500	m^3	Drilling mud sump	Yes
Completion fluids	1.4	4.2	ML	Drilling mud sump	No
Condensate	10	10	KL	Drilling chemical storage area	Yes
Flowback	~10.8 ML per well		ML	Flowback tanks	Yes

Interest holder	Tamboran B2 Pty Ltd	EMP Title	Beetaloo Sub-basin Shenandoah South E&A Program EMP	Unique EMP ID	TAM1-3	Mod #	8	Date	24/05/2026

Current EMP text

Appendix E Chemical Risk Assessment

AECOM Australia Pty Ltd. 2024a. *Beetaloo Exploration and Appraisal Program - Hydraulic Fracturing Chemical Risk Assessment*, prepared for Tamboran Resources, 8 June 2024.

Appendix E.1 - EHS Support. 2023. *Hydraulic Stimulation Chemical Risk Assessment – Tamboran Resources Northern Territory Tenements*, Prepared for Condor Energy, January 2024.

Appendix E.2 – AECOM Australia Pty Ltd. 2024b. *Beetaloo Exploration and Appraisal Program – Chemical Risk Assessment*, prepared for Fusion Technologies (Australia) Pty Ltd, 5 Septenber 2024.

Amended EMP text

Proppants*					
100 mesh sand	91,000	273,000	kg	Stimulation chemical storage area	No
Quartz or organophilic phyllosilicate- proppant	1,084	3,252	L	Stimulation chemical storage area	No
40/70 sand	1,650,000	4,950,000	kg	Stimulation chemical storage area	No
30/50 sand	610,000	1,830,000	kg	Stimulation chemical storage area	No
Silicon dioxide (quartz/sand) 100% Sand	4,757,614	14,272,842	kg	Stimulation chemical storage area	No
Silicon dioxide (quartz/sand) 40/70	5,435,287	16,305,860	kg	Stimulation chemical storage area	No
* Proppants are sand which is inert. They do not require special chemical bunding but are co-located in the stimulation chemical storage area, within the well pad bund. Residual proppant from a stimulation campaign is often used to assist with chemical spills on the well pad, where contaminated spill material is removed.					
Cleaning chemicals and spill response					
Soda ash – sodium carbonate	3,750	11,250	kg	Stimulation chemical storage area - spill response for acid spills	Yes
Flush fluid - distillates (petroleum), hydrotreated	1,500	4,500	L	Stimulation chemical storage area - Equipment cleaning	Yes

Appendix E Chemical Risk Assessment

AECOM Australia Pty Ltd. 2025. *Beetaloo Exploration and Appraisal Program - Hydraulic Fracturing Chemical Risk Assessment*, Rev 11, prepared for Tamboran Resources, 28 March 2025.

Appendix E.1 - EHS Support. 2023. *Hydraulic Stimulation Chemical Risk Assessment – Tamboran Resources Northern Territory Tenements*, Prepared for Condor Energy, January 2024.

Appendix E.2 – AECOM Australia Pty Ltd. 2024b. *Beetaloo Exploration and Appraisal Program – Chemical Risk Assessment*, prepared for Fusion Technologies (Australia) Pty Ltd, 5 September 2024.

Appendix E.3 – AECOM Australia Pty Ltd. 2026. *Beetaloo Exploration and Appraisal Program – Chemical Risk Assessment*, prepared for Tamboran Resources Pty Ltd, 24 May 2026.

Prepared for
Tamboran B2 Pty Ltd
ABN: 42 105 431 525

AECOM

Beetaloo Exploration and Appraisal Program - Hydraulic Fracturing Chemical Risk Assessment

Beetaloo Sub-basin, NT

24-May-2026

Commercial-in-Confidence

aecom.com

Delivering a better world

Beetaloo Exploration and Appraisal Program - Hydraulic Fracturing Chemical Risk Assessment

Beetaloo Sub-basin, NT

Client: Tamboran B2 Pty Ltd

ABN: 42 105 431 525

Prepared by

AECOM Australia Pty Ltd
Larrakia Country, Level 1 C308, 19C Kitchener Drive, Darwin NT 0800, GPO Box 3175, Darwin NT 0801, Australia
T +61 1800 868 654 www.aecom.com
ABN 20 093 846 925

24 May 2026

Job No.: 60788134

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 and ISO45001.

Quality Information

Document	Beetaloo Exploration and Appraisal Program - Hydraulic Fracturing Chemical Risk Assessment
Ref	60623736
Date	24-May-2026
Originator	Cindy Cheung, Tiffany Teo
Checker/s	Michael Archer
Verifier/s	Michael Archer

Revision History

Rev	Revision Date	Details	Approved	
			Name/Position	Signature
A	22-May-2026	Draft	Michael Archer Technical Director	
0	24-May-2026	Final	Michael Archer Technical Director	

Table of Contents

1.0 Introduction

Tamboran B2 Pty Ltd (Tamboran) commissioned AECOM Australia Pty Ltd (AECOM) to perform a Chemical Risk Assessment (CRA) for the products proposed to be used in Tamboran's Exploration and Appraisal Program in the Beetaloo Basin.

1.1 Scope

The CRA was undertaken to assess the potential human health and environmental effects of the chemicals proposed to be used during the program. Specifically, the following was assessed:

- Stimulation fluid
- Tracer fluid

The product component disclosure for the stimulation and tracer fluid is provided in **Table 1**.

Table 1 Product Component Disclosure

Product Name	Volume	Supplier	Confidential Status
Flow Insurance Copper	20 kg	Patina Energy	Confidential
GT 1-16	320 kg	Patina Energy	Confidential
Hydrogen Peroxide 50	10000 L	COHO	
Starcide	5575 kg	Haliburton	Confidential
HCL-15B – Hydrochloric Acid 15%	1635297 L	Fusion Technologies	Confidential
FRP-BL1F – HVFR Anionic	753217 L	Fusion Technologies	Confidential
BIO-GQ510 – Biocide 5/10 Glut Quat	126334 L	Fusion Technologies	Confidential
SFT-NE-1F – Flowback Surfactant (NE)	157916 L	Fusion Technologies	Confidential
CSA-1F – Clay Control (70% Choline)	315836 L	Fusion Technologies	Confidential
SCI-1F – Scale Inhibitor	315836 L	Fusion Technologies	Confidential
LGA-01F – Guar Gel Concentrate	25552 L	Fusion Technologies	Confidential
XLB-C1F – Instant Cross Linker	7154 L	Fusion Technologies	Confidential
BHE-01F – Encapsulated AP	1190 L	Fusion Technologies	Confidential
BFH-1F – High Buffer	1141 L	Fusion Technologies	Confidential
BFL-1F – Low Buffer	2422 L	Fusion Technologies	Confidential

The chemical composition of the stimulation and tracer fluid is provided in **Table 2** and the mass balance presented in **Appendix A**. The Safety Data Sheets (SDS) are presented in **Appendix D**.

Table 2 Chemical Composition

CAS	Chemical Name	Vol %
Stimulation Fluid		
Confidential	Confidential	7.1E-02
Confidential	Confidential	3.0E-04
Confidential	Confidential	2.2E-03
Confidential	Confidential	1.2E-02
Confidential	Confidential	1.9E-03
Confidential	Confidential	9.6E-04
Confidential	Confidential	4.1E-04

CAS	Chemical Name	Vol %
Confidential	Confidential	2.9E-04
Confidential	Confidential	4.2E-06
Confidential	Confidential	1.7E-04
Confidential	Confidential	1.0E-04
Confidential	Confidential	5.4E-04
Confidential	Confidential	5.7E-05
Confidential	Confidential	1.5E-02
Confidential	Confidential	7.6E-04
Confidential	Confidential	7.5E-02
Confidential	Confidential	7.3E-02
Confidential	Confidential	6.2E-03
Confidential	Confidential	7.4E-03
Confidential	Confidential	1.4E-03
Confidential	Confidential	1.2E-02
Confidential	Confidential	1.0E-03
Confidential	Confidential	1.9E-03
Confidential	Confidential	2.4E-01
Confidential	Confidential	3.1E-04
Confidential	Confidential	2.4E-03
Confidential	Confidential	8.4E-03
Confidential	Confidential	1.9E-03
Confidential	Confidential	3.8E-03
Confidential	Confidential	3.3E-04
Tracer Fluid		
Confidential	Confidential	100
Confidential	Confidential	
Confidential	Confidential	
Confidential	Confidential	
Confidential	Confidential	
Confidential	Confidential	
Confidential	Confidential	
Confidential	Confidential	
Confidential	Confidential	
Confidential	Confidential	
Confidential	Confidential	
Confidential	Confidential	
Confidential	Confidential	

CAS	Chemical Name	Vol %
Confidential	Confidential	
Confidential	Confidential	
Confidential	Confidential	
7722-84-1	Hydrogen peroxide (50% w/w min) aqueous solution	
Confidential	Confidential	

1.2 Approach

This risk assessment aligns with the *Northern Territory Government, Department of Environment, Parks and Water Security, Environment Management Plan Content Guideline, 2021* (herein referred to as DEPWS 2021) and is in accordance with requirements of the *Petroleum (Environment) Regulations 2016* (herein referred to as the Regulations).

The methods used for this CRA also follow the guidance provided by the *Department of the Environment and Energy, Exposure Draft - Chemical Risk Assessment Guidance Manual: for chemicals associated with coal seam gas extraction, 2017* (DoEE, 2017) and the methodology adopted for the CRA is in general accordance with the following:

- Australian Industrial Chemicals Introduction Scheme (AICIS) (formerly National Industrial Chemicals Notifications and Assessment Scheme (NICNAS)), National Assessment of Chemicals Associated with Coal Seam Gas Extraction in Australia, 2017 (herein referred to as NICNAS 2017), which includes the approach outlined in the National Chemical Risk Assessment Guidance Manuals published by the National Environment Protection Council (NEPC)
- enHealth, Environmental Health Risk Assessment, Guidelines for Assessing Human Health Risks from Environmental Hazards, 2012
- *National Environment Protection (Assessment of Site Contamination) Measure 1999*, as amended 2013 (ASC NEPM); Schedule B4, Site-specific health risk assessment methodology.

This CRA comprised the following tasks:

- Hazard assessment. An evaluation of the environmental hazard of the chemical additives in the stimulation fluid systems, based on their environmental persistence, bioaccumulation and aquatic toxicity properties. Also included was an evaluation of potential human health effects (i.e. genotoxicity, carcinogenicity, reproductive toxicity, oral toxicity, inhalation toxicity, dermal toxicity, chronic repeated dose toxicity).
- Exposure assessment. An evaluation of surface and sub-surface exposure pathways and mass balance calculation to identify the amount of each chemical additive of the stimulation fluid system.
- Screening and validation processes via Tier 1 and Tier 2assessments. Determination of chemicals known to be of low concern, and identification of chemicals for further risk assessment.
    - Tier 1: using published information about each chemical proposed to be used in the stimulation fluid systems.
    - Tier 2: A quantitative evaluation of the potential risks to human health associated with the stimulation activities using toxicity values and quantitative estimates of chemical intake, based on the identification of complete exposure pathways using generic field level information and hazard identification.

2.0 Tier 1 Screen

2.1.1 Tier 1 Screen Methodology

The screening process for the chemicals in the human health assessment is consistent with the approach outlined in DoEE (2017) and Appendix C of DEPWS (2021).

The following general approach was used to screen the chemicals of potential concern (COPCs):

- If the chemicals are found on any of the following national or international lists of substances applicable to chemicals associated with coal seam gas extraction as being of low concern, then a Tier 2 assessment was deemed not to be warranted.
  - AICIS Inventory Multi-tiered Assessment and Prioritisation (IMAP) Tier 1 Lists
  - National Assessment of Chemicals Associated with Coal Seam Gas Extraction in Australia, Technical Report Number 11. Chemicals of low concern for human health based on initial assessment of hazards (NICNAS 2017)
  - USEPA High Production Volume (Indicator 1)[1]
  - European Chemicals Agency (ECHA) Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Annex IV[2].
- If the chemical was listed as a low concern chemical and the Persistence, Bioaccumulation and Toxicity (PBT) assessment, conducted as per DEPWS (2021) guidance, did not identify a PBT substance, a Tier 2 assessment was deemed not to be warranted.
- If the chemical was not listed as a chemical of low concern (i.e. due to not being previously evaluated by national/international agencies) but was not a PBT substance and no human health hazard was identified, then a Tier 2 assessment was deemed not to be warranted.

The outcome of the Tier 1 assessment identifies the chemicals of low human health and environmental concern for which no further management or mitigation is considered necessary.

2.1.2 Outcome of Tier 1 Screen

The Tier 1 screening is provided in **Appendix B**, the chemical toxicological profiles are provided in **Appendix C** and the SDS are provided in **Appendix D**.

Comparison of the chemicals in **Table 3** with the assessment criteria as presented in DoEE (2017) and in Appendix C of DEPWS (2021) indicated that 19 chemicals from the Stimulation Fluid were not considered to require a Tier 2 assessment. Further, 11 of those chemicals have been assessed by AICIS under the IMAP framework and were identified to be of low concern to human health and/or the environment.

All 18 chemicals from the Tracer Fluid were not considered to require a Tier 2 assessment. Furthermore, analytical results indicate that the Tracer Fluid do not contain regulated per- and polyfluoroalkyl substances (PFAS). The analytical results on the Tracer Fluid are provided in **Appendix E**.

Table 3 presents a summary of the chemicals identified to be of low concern to human health and/or the environment for the products.

[1] The US EPA High Production Volume (HPV) chemicals are those which are manufactured in or imported into the US in amounts ≥ 1million pounds/year. Indicator 1 denotes those chemicals not considered a candidate for testing, based on a preliminary US EPA review indicating testing would not further our understanding of the chemical's properties (NICNAS 2017).
[2] Annex IV of the European REACH regulation (i.e. Registration; Evaluation; Authorisation; and restriction of Chemicals) contains a list of substances exempt from registration on the basis that they are considered to cause minimum risk due to their intrinsic properties (NICNAS 2017).

Table 3 Chemicals identified to be of low concern (Tier 1)

CAS #	Chemical	Reasoning
Stimulation Fluid		
Confidential	Confidential	A Tier 1 assessment under the AICIS IMAP assessment framework has been conducted which concluded that this chemical poses no unreasonable risk to human health and the environment. The chemical is not classified as PBT and its ecotoxicity is low based on available acute data. A Tier 2 assessment is not required.
Confidential	Confidential	A Tier 1 assessment under the AICIS IMAP assessment framework has been conducted which concluded that this chemical poses no unreasonable risk to the environment. The chemical is not classified as PBT and its ecotoxicity is low based on available acute data. It is noted that the chemical causes systemic acute effects to human health particularly acute toxicity by the oral route of exposure. Management of this chemical is addressed in the Environmental Management Plan (EMP) to prevent accidental release. Occupational health and safety (OH&S) procedures implemented by Tamboran will minimise human health exposure. A Tier 2 assessment is not required.
Confidential	Confidential	A Tier 1 assessment under the AICIS IMAP assessment framework has been conducted which concluded that this chemical poses no unreasonable risk to the environment. It is noted that the chemical is corrosive to the skin, eyes and gastrointestinal and respiratory tracts. Management of this chemical is addressed in the EMP to prevent accidental release. OH&S procedures implemented by Tamboran will minimise human health exposure. A Tier 2 assessment is not required.
Confidential	Confidential	This chemical has been listed by AICIS as a chemical unlikely to require further regulation to manage risks to health. A Tier 2 assessment is not required.
Confidential	Confidential	A Tier 1 assessment under the AICIS IMAP assessment framework has been conducted which concluded that this chemical poses no unreasonable risk to human health and the environment. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as low based on acute data. The chemical is not classified as PBT. It is noted that the chemical is hazardous to human health via the inhalation pathways and as such OH&S procedures will be implemented by Tamboran will minimise human health exposure. Management of this chemical is addressed in the EMP to prevent accidental release. A Tier 2 assessment is not required.
Confidential	Confidential	A Tier 1 assessment under the AICIS IMAP assessment framework has been conducted which concluded that this polymer poses no unreasonable risk to human health and the environment. The chemical is not classified as PBT. A Tier 2 assessment is not required.
Confidential	Confidential	A Tier 1 assessment under the AICIS IMAP assessment framework has been conducted which concluded that this chemical poses no unreasonable risk to the environment. The chemical is not classified as PBT and its ecotoxicity is

CAS #	Chemical	Reasoning
		low based on available acute data. It is noted that the chemical may cause serious eye damage and respiratory irritation. Management of this chemical is addressed in the EMP to prevent accidental release. OH&S procedures implemented by Tamboran will minimise human health exposure. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as low based on acute data. The chemical is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. It is noted that the chemical is corrosive. Management of this chemical is addressed in the EMP to prevent accidental release. OH&S procedures implemented by Tamboran will minimise human health exposure. A Tier 2 assessment is not required.
Confidential	Confidential	A Tier 1 assessment under the AICIS IMAP assessment framework has been conducted which concluded that this chemical poses no unreasonable risk to the environment. It is noted that the chemical is corrosive. Management of this chemical is addressed in the EMP to prevent accidental release. OH&S procedures implemented by Tamboran will minimise human health exposure. A Tier 2 assessment is not required.
Confidential	Confidential	A Tier 1 assessment under the AICIS IMAP assessment framework has been conducted which concluded that this chemical poses no unreasonable risk to human health and the environment. A Tier 2 assessment is not required.
Confidential	Confidential	A Tier 1 assessment under the AICIS IMAP assessment framework has been conducted which concluded that this chemical poses no unreasonable risk to human health. The chemical is not classified as PBT and its ecotoxicity is low based on available chronic data. A Tier 2 assessment is not required.
Confidential	Confidential	This chemical is not classified as PBT. It is noted that the chemical is a corrosive substance for which dermal absorption is considered likely to be very low. The effects of dermal exposure will be dominated by those at the site of contact (i.e. local effects) and systemic toxicity is considered to be unlikely. As such OH&S procedures implemented by Tamboran will minimise human health exposure. Management of this chemical is addressed in the EMP to prevent accidental release. A Tier 2 assessment is not required.
Confidential	Confidential	This chemical has been listed by AICIS as a chemical unlikely to require further regulation to manage risks to health. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as low based on chronic data. The chemical is not classified as PBT. It is noted that the chemical is corrosive. Management of this chemical is addressed in the EMP to prevent accidental release. OH&S procedures implemented by Tamboran will minimise human health exposure. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as moderate based on acute data. The substance is inorganic and ubiquitous in the

CAS #	Chemical	Reasoning
		environment. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	A Tier 1 assessment under the AICIS IMAP assessment framework has been conducted which concluded that this chemical poses no unreasonable risk to human health. The chemical is not classified as PBT and its ecotoxicity is low based on available chronic data. A Tier 2 assessment is not required.
Confidential	Confidential	A Tier 1 assessment under the AICIS IMAP assessment framework has been conducted which concluded that this chemical poses no unreasonable risk to human health. The chemical is not classified as PBT and its ecotoxicity is low based on available acute data. A Tier 2 assessment is not required.
Confidential	Confidential	This chemical has been listed by AICIS as a chemical unlikely to require further regulation to manage risks to health. A Tier 2 assessment is not required.
Tracer Fluid		
Confidential	Confidential	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.

CAS #	Chemical	Reasoning
Confidential	Confidential	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as moderate based on acute data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as moderate based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	A Tier 1 assessment under the AICIS IMAP assessment framework has been conducted which concluded that this chemical poses no unreasonable risk to human health. The chemical is not classified as PBT and its ecotoxicity is low based on available acute data. A Tier 2 assessment is not required.
7722-84-1	Hydrogen peroxide (50% w/w min) aqueous solution	The risk was classified as high based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
Confidential	Confidential	The risk was classified as moderate based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.

Based on the Tier 1 screening, 11 chemicals were identified to require a Tier 2 assessment:

- Confidential
- Confidential
- Confidential
- Confidential
- Confidential
- Confidential

- Confidential
- Confidential
- Confidential
- Confidential
- Confidential

It is to be noted that none of these chemicals in **Table 3** were identified to be PBT (i.e., none of the organic chemicals meet all three criteria of being persistent *and* bioaccumulative *and* toxic).

3.0 Tier 2 Screen

3.1.1 Tier 2 Screen Methodology

The purpose of the risk characterisation portion of the assessment is to provide a conservative estimate of the potential risk resulting from exposure to the COPCs that may occur during stimulation and hydraulic fracturing activities. The risk characterisation evaluates the toxicity of the COPC and characterises the risk of the chemical assessed for specific exposure pathways identified below.

A two-stage process is employed during risk characterisation. First, risk ratios are developed for the chemical for potentially complete exposure pathways associated with applicable release scenarios. For the assessment of the overall potential for adverse human health effects posed by simultaneous exposure to multiple chemicals, the estimated daily intake of the chemicals by inhalation and direct (ingestion and dermal) contact were compared to tolerable daily intakes to calculate an individual hazard quotient (HQ) and then summed for all constituents into a hazard index (HI). The identification of toxicity values undertaken in this risk assessment has followed DoEE (2017), NICNAS (2017) and enHealth (2012) guidance. The toxicity values selected for this assessment were from Level 1 or 2 sources such as NICNAS (2017), AICIS and ECHA REACH databases.

Consistent with Australian risk assessment methodologies, if the HI is less than or equal to 1, then no adverse health effects are likely associated with exposures and no risk / hazard reduction measures are required. There should be no need for further management controls on the chemical additional to those already in place (DoEE, 2017).

However, if the total HI is greater than 1, adverse health effects may be possible and therefore the assumptions inherent in the risk characterisation process warrant further evaluation via Tier 2 analysis.

3.1.2 Conceptual Exposure Model

Based on the risk mitigation measures identified in the NT Government *Scientific Inquiry into Hydraulic Fracturing in the Northern Territory*, the *Code of Practice for Onshore Petroleum Activities* (the Code) in the Northern Territory and mitigation measures outlined by Tamboran in its Environmental Management Plans (EMPs), no potentially complete exposure pathways were identified for the stimulation chemicals to impact groundwater that is used for beneficial purposes in the project area. The specific controls implemented by Tamboran focused on the protection of aquifers follow industry standard practice and include:

- the physical vertical separation distances of 1,400 m between the aquifer and target formation to prevent any migration of stimulation fluid to aquifer units
- the horizontal separation distance between the exploration well and the closest groundwater extraction bores of at least 1 km, as per the Code
- use of double lined wastewater tanks with leak detection
- implementation of spill management plan
- use of enclosed tanks and freeboard requirements
- mandatory secondary containment requirements.

Potential exposures to the chemicals at the project area were therefore assessed to be limited to the above ground storage and handling of the chemicals and associated (liquid and solid) stimulation waste.

The Tier 2 assessment evaluated the toxicity of the individual chemicals and characterised the potential cumulative exposure risks of the total fluid mixtures to workers. The methodology incorporated an assessment of potential exposures to the workers, with the following identified as the only potentially complete exposure pathways:

- Incidental ingestion and dermal contact of stimulation fluid by workers during stimulation operations.

These scenarios are also deemed protective of the following due to the less frequent and short duration of these exposures occurring:

- Worker exposure during a spill (i.e., a coupling breaks on a tank and releases product onto the worker) or leak scenarios.

Exposure parameters were selected based on a combination of default assumptions for workers from ASC NEPM, enHealth (2012) and site-specific information from Tamboran (i.e. if personal protective equipment is used). Exposure parameters are provided in **Appendix B** and toxicological profiles are provided in **Appendix C**.

3.1.3 Chemicals of Potential Concern

Exposure point concentrations (EPC) for the chemicals were provided to AECOM by the chemical provider (Fusion Technologies). It was conservatively assumed that 100% of the mass of the chemicals injected into the well will be present in the stimulation fluid. The EPCs are presented in **Appendix B**.

A summary of the chemical and its EPC that require further assessment is presented in **Table 4**.

Table 4 Chemicals requiring further assessment (Tier 2)

CAS #	Chemical Name	EPC (mg/L)
Confidential	Confidential	3
Confidential	Confidential	26
Confidential	Confidential	22
Confidential	Confidential	11
Confidential	Confidential	6.5
Confidential	Confidential	823
Confidential	Confidential	86
Confidential	Confidential	129
Confidential	Confidential	21
Confidential	Confidential	101
Confidential	Confidential	22

Toxicity reference values (TRVs) were selected to be consistent with the TRVs used in the National Assessment of Chemicals Associated with Coal Seam Gas Extraction in Australia (NICNAS 2017) and benchmarked with other regulator approved CRAs of similar operations in the Bowen, Surat and Beetaloo Basins.

3.1.4 Outcome of Tier 2 Screen

For the assessment of the overall potential for adverse human health effects posed by exposure to the chemical, the estimated daily intake of the COPC (via incidental ingestion and dermal contact) was compared to tolerable daily intakes to calculate an individual hazard quotient (HQ) and then summed for all COPC into a hazard index (HI). It is noted that in this instance, the HQ will be the same as the HI as there is only one COPC.

Consistent with Australian risk assessment methodologies, if the HI is less than or equal to 1, then no adverse health effects are likely associated with exposures. However, if the total HI is greater than 1, health effects cannot be ruled out and therefore the assumptions inherent in the risk characterisation process warrant further evaluation.

A summary of the estimated HI for the workers that are relevant to the assessment of potential exposure to the COPC in stimulation fluid, based on the available data is presented in **Table 5**. The Tier 2 screening risk calculations are provided in **Appendix B**.

Table 5 Risk associated with potential exposure to Workers

Receptor and Pathway	Threshold Hazard Index
	100% Mass Return
Worker Exposure	
Ingestion of chemicals via incidental contact	0.006
Dermal exposure to chemicals via incidental contact	0.002
Inhalation of mist from the evaporation units containing flowback water	0.003
Total Hazard Index	**0.01**

The following can be concluded from the Tier 2 screening:

- The estimated HI associated with potential exposure to COPC identified in the stimulation fluid and assuming 100% mass recovery, is below the target 1, hence, risks are considered to be acceptable.

Further, based on the margin of safety in the risk estimate, the risk to workers will remain acceptably low even if the duration of work exceeds the assumed one month period (up to 365 days/year).

4.0 Chemical Transport, Storage and Handling

AECOM understands that Tamboran aligns its transport, storage, and handling of hazardous chemicals with WHS Regulations, and the prescribed chemical legislation including all obligations and duties for storage and handling of hazardous chemicals and eliminating risks to workers from potential exposure and the potential requirements for health monitoring.

The following prescribed chemical legislation, as defined by the Petroleum (Environment) Regulations 2016, are recommended to be followed as it relates to the transport, storage, and handling of stimulation and hydraulic fracturing chemicals:

- *Medicines, Poisons and Therapeutic Goods Act 2012 and Medicines, Poisons and Therapeutic Goods Regulations 2014*
- *Dangerous Goods Act 1998*
- *Water Act 1992*
- *Waste Management and Pollution Control Act 1998*
- *Work Health and Safety (National Uniform Legislation) Act 2011*
- *Radiation Protection Act 2004.*

5.0 References

DoEE (2017). Department of the Environment and Energy, Exposure Draft - Chemical Risk Assessment Guidance Manual: for chemicals associated with coal seam gas extraction, 2017

enHealth (2012). Environmental Health Risk Assessment, Guidelines for Assessing Human Health Risks from Environmental Hazards, 2012

ASC NEPM (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999*, as amended 2013; Schedule B4, Site-specific health risk assessment methodology

NEPC (2009). National Chemical Risk Assessment Guidance Manuals. https://www.nepc.gov.au/projects/chemical-risk-assessment-guidance-manuals

NICNAS (2017). National Industrial Chemicals Notification and Assessment Scheme, National Assessment of Chemicals Associated with Coal Seam Gas Extraction in Australia, 2017

NT Government Scientific Inquiry into Hydraulic Fracturing in the Northern Territory, Draft Final Report, December 2017

DEPWS (2021). Northern Territory Government, Department of Environment, Parks and Water Security, Environment Management Plan Content Guideline, 2021

Appendix A

Mass Balance

Appendix A - Hydraulic Fluid Systems Mass Balance

Stimulation Fluid Recipe							
Chemical Name	**CAS Number**	**Density (kg/L)**	**Volume of Chemical (L)**	**Volume Fraction (%v/v)**	**Chemical Mass in Fluid (kg)**	**Mass Fraction (% w/w)**	**Concentration in Injected Fluid (mg/L)**
[redacted]			160857	0.055642%	191258	0.064%	680
			638	0.000221%	949	0.000%	3
			6925	0.002396%	7272	0.002%	26
			37508	0.012974%	51011	0.017%	181
			5795	0.002005%	6143	0.002%	22
			3015	0.001043%	3136	0.001%	11
			1141	0.000395%	2431	0.001%	9
			999	0.000346%	958	0.000%	3
			5	0.000002%	14	0.000%	0.05
			216	0.000075%	573	0.000%	2
			389	0.000134%	692	0.000%	2.5
			1715	0.000593%	1818	0.001%	6.5
			71	0.000025%	180	0.000%	1
			41696	0.014423%	50869	0.017%	181
			2422	0.000838%	2519	0.00%	9
			289333	0.100083%	231466	0.077%	823
			211611	0.073198%	232772	0.077%	827
			14006	0.004845%	27242	0.009%	97
			22924	0.007930%	24162	0.008%	86
			4132	0.001429%	4561	0.002%	16
			39984	0.013831%	36265	0.012%	129
			3447	0.001192%	3305	0.001%	12
			6713	0.002322%	5840	0.002%	21
			703038	0.243187%	809900	0.269%	2878
			797	0.000276%	1593	0.001%	6
			4880	0.001688%	8296	0.003%	29
			31316	0.010833%	28404	0.009%	101
			6446	0.002230%	6317	0.002%	22
			10155	0.003513%	10155	0.003%	36
			1139	0.000394%	1093	0.0%	4
Proppants							
Silicon Dioxide (quartz / sand) 100 # Sand	14808-60-7	2.65	3,590,652	1.24204%	9515228	3.2%	
Silicon Dioxide (quartz / sand) 40/70	14808-60-7	2.65	4,102,103	5.7442820%	10870573	3.6%	
Water							
Water in additives	7732-18-5	1	1,725,028	0.596703%	1725028	0.6%	
Water	7732-18-5	1	278,062,068	96.184%	278062068	92.3%	
Total Chemical Additives			1613312		967,133	0.3%	
Total Proppant			7692755		20385801	6.8%	
Total Water (in additives)			1,725,028		1725028	0.6%	
Total Make Up Water			278062068		278062068	92.3%	

The mass balance also estimates the concentration of each chemical that will be returned to surface during the flowback of two hydraulically fractured wells, based on an upper estimate of 100% mass recovery

Appendix B

Tier 1 and Tier 2 Risk Screen Calculations

Chemical Name	CAS Number	Volume or Mass of Chemical (L or kg)	Concentration in Injected Fluid (mg/L)	Parent Compound Purpose	Ecotoxicity[1]	Toxicity[2]	Biodegradation[1,3]	Bioaccummulative[1]	Tier 1 Screening Assessment[1]	Discussion	Tier 2 Assessment Worker Ingestion Risk	Tier 2 Assessment Worker Dermal Risk	Tier 2 Assessment Worker Aerosol Inhalation Risk	Hazard Quotient	Outcome of Tier 2 Worker Risk Assessment[1]
[redacted]		160,857	680	Friction Reducer	Fathead minnow LC50: 810 mg/L Rainbow trout LC50: > 100 mg/L Bluegill sunfish LC50: >300 mg/L Daphnia magna LC50: 470 mg/L	Based on acute: Low	Yes. [redacted] is a large molecular weight, water-soluble polymer. It is not expected to be readily biodegradable; thus, it meets the screening criteria for persistence.	No. It is not expected to meet the criteria for bioaccumulation.	Tier 1 (tMAP)	A Tier 1 Environmental Assessment for this chemical has been conducted by AICIS which concluded that it was low concern to the environment. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		638	3	Cross-linker	Chronic: Daphnia (6 mg/L) and Fish (2.1 mg/L).	Based on chronic: Moderate	N.A.(inorganic)	N.A.(inorganic)	Tier 2	The risk was classified as moderate based on chronic data. The exposure concentration is above the respective ecotoxicity values. A Tier 2 assessment is required.	1.9E-05	2.2E-08	8.0E-06	2.7E-05	Based on the calculated HQ the chemical is of low concern for workers (refer to individual toxicity profile and risk calculations for further detail).
		6,925	26	Corrosion inhibitor	Danio rerio (Zebrafish) 96 h LC50 = 3.1 mg/L; Daphnia magna (Water flea) 48 h EC50 = 3.86 mg/L; Pseudokirchneriella subcapitata (Green algae) 72 h EC50 = 4.07 mg/L 72 h NOEC value = 2.0 mg/L Pseudokirchneriella subcapitata (Green algae)	Based on Chronic: Moderate	Not Persistent. Based on the results of the ready biodegradability studies, cinnamaldehyde is categorised as Not Persistent.	Not Bioaccumulative. Based on low log K values and/or expected natural metabolism and regulation of internal concentrations, the chemical is categorised as Not Bioaccumulative.	Tier 2	The risk was classified as moderate based on chronic data. The exposure concentration is above the respective ecotoxicity values. A Tier 2 assessment is required.	4.6E-05	3.0E-07	1.9E-05	6.5E-05	Based on the calculated HQ the chemical is of low concern for workers (refer to individual toxicity profile and risk calculations for further detail).
		37,508	181	Anti-freeze	LC50 for fish > 22800 mg/L LC50 for Daphnia >7600 mg/L NOEC for Algae >100 mg/L	Based on Acute: Low	Readily biodegradable	No based on the measured log Kow of -1.36 and a measured BCF of 10	Tier 1 (tMAP)	A Tier 1 Environmental Assessment for this chemical has been conducted by AICIS which concluded that it was low concern to the environment. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		5,795	22	Biocide	96 h acute Bluegill sunfish LC50 = 11.2 mg/L 48 h acute Oyster larvae LC550 = 2.1 mg/L 96 h acute Green crabs LC50 = 465 mg/L 96 h acute Grass shrimp LC50 = 41 mg/L 48 acute Daphnia magna LC50 = 0.35 mg/L 48 acute Daphnia magna LC50 = 16.3 mg/L 21 d reproduct'n Daphnia magna LOEC = 4.3 mg/L, NOEC = 2.1 mg/L 96 h algal growth inhibition Selenastrum capricornutum ILm = 3.9 mg/L (median inhibitory limit) 96 h algal growth inhibition Scenedesmus subspicatus EC50 = 1.0 mg/L Bacterial inhibition Sewage microbes IC50 = 25-34 mg/L	Based on Chronic: Moderate	Readily biodegradable	No based on the Log Pow of -0.01	Tier 2	The risk was classified as moderate based on chronic data. The exposure concentration is above the respective ecotoxicity values. A Tier 2 assessment is required.	1.9E-03	7.9E-07	8.0E-04	2.7E-03	Based on the calculated HQ the chemical is of low concern for workers (refer to individual toxicity profile and risk calculations for further detail).
		3,015	11	Emulsifier	Read across from CAS 9016-45-9 (Polyoxyethylene Nonylphenol Ether) Acute: Fish: 96 h EC50 = 1.3 mg/L (Lepomis macrochirus) Invertebrates: 48 h LC50 = 1.821 mg/L (QSAR) Algae: 5 d EC50 = 37.4 mg/L (Scenedesmus opolensis), Gallery worm: 48 h LC50 = 3.26 mg/L (Capitella capitata) Chronic: Fish: 21 d NOEC = 0.048 mg/L (Oncorhynchus mykiss) (read across from nonylphenol monoethoxylate) Invertebrates: 6 d NOEC = 1.0 mg/L (Daphnia magna) Algae: 96 h NOEC = 8.0 mg/L (Pseudokirchneriella subcapitata)	Based on Chronic: Very High	No. Based on results obtained from biodegradation studies, this chemical is categorised as Not Persistent.	No. Based on the available measured bioconcentration data, this chemical is categorised as Not Bioaccumulative.	Tier 2	The risk was classified as very high based on chronic data. The exposure concentration is above the respective ecotoxicity values. A Tier 2 assessment is required.	2.6E-04	1.3E-06	1.1E-04	3.7E-04	Based on the calculated HQ the chemical is of low concern for workers (refer to individual toxicity profile and risk calculations for further detail).
		1,141	9	pH Buffer	Measured acute endpoints were available for fish (196 mg/L). Measured chronic endpoint were available for Daphnia (240 mg/L)	Based on Chronic: Low	N.A.(inorganic)	N.A. (inorganic)	Tier 1 (tMAP)	A Tier 1 Environmental Assessment for this chemical has been conducted by AICIS which concluded that it was low concern to the environment. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		999	3	Improve surface and interfacial tension	Acute: Fish: 96 hr LL50 was >1.6 mg/L Invertebrates: 48 hr LL50 was 25 mg/L Algae: 72 hr EL50 was 7.9 mg/L	Based on Acute: High	No. The chemical is predicted to be readily biodegradable.	No. The the chemical does not meet the screening criteria for bioaccumulation.	Tier 1	This chemical has been listed as a chemical unlikely to require further regulation to manage risks to health by AICIS. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		5	0.05	Filter for encapsulate	No data	Based on low bioavailability: Low	Not readily biodegradable	Not bioaccumulative	Tier 1 (tMAP)	A Tier 1 Human Health Assessment for this chemical has been conducted by AICIS which concluded that this chemical was identified as low concern to human health. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		216	2	Suspension agent	No acute toxicity to fish, Daphnia, or algae, though some physical effects were observed with loading rates of greater than or equal to 10 g/L (OECD 2004). Any harmful effects to aquatic ecosystems are therefore not ecotoxicological in nature. No chronic toxicity data were identified.	Based on Acute: Low	N.A.(inorganic)	N.A. (inorganic)	Tier 1	The risk was classified as low based on acute data. The substance is not classified as PBT. It is noted that the substance is hazardous to human health via the inhalation pathways and as such OH&S procedures will be implemented by Tamboran will minimise human health exposure. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		389	2.5	Surface coating	No data	No data	The polymers are synthetic addition polymers with stable carbon-chain backbones. If released to the environment, the polymers in this group are not expected to undergo rapid deoradation	The polymer is expected to have a very high molecular weight and poor water solubility. Therefore, this polymer is considered to be not bioaccumulative	Tier 1 (tMAP)	A Tier 1 Human Health Assessment for this chemical has been conducted by AICIS which concluded that this chemical was identified as low concern to human health. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		1,715	6.5	Emulsifier	Acute: Fish: 96 h EC50 = 1.3 mg/L (Lepomis macrochirus) Invertebrates: 48 h EC50 = 0.328 mg/L (read across from nonylphenol monoethoxylate, CAS RN 27986-36-3) Algae: 5 d EC50 = 37.4 mg/L (Scenedesmus opolensis), Chronic: Fish: 21 d NOEC = 0.048 mg/L (Oncorhynchus mykiss) (read across from nonylphenol monoethoxylate, CAS RN 27986-36-3) Invertebrates: 6 d NOEC = 1.0 mg/L (Daphnia magna) Algae: 96 h NOEC = 8.0 mg/L (Pseudokirchneriella subcapitata)	Based on Acute and Chronic: Very High	No. The chemical is expected to undergo degradation in the environment.	No. The chemical is expected to have low to moderate bioaccumulation potential in aquatic organisms.	Tier 2	The risk was classified as very high based on acute and chronic data. The exposure concentration is above the respective ecotoxicity values. A Tier 2 assessment is required.	1.5E-04	7.7E-07	6.3E-05	2.2E-04	Based on the calculated HQ the chemical is of low concern for workers (refer to individual toxicity profile and risk calculations for further detail).
		71	1	pH Buffer	96-hour LC50 Bluegill sunfish (Lepomis macrochirus) = 300 mg/L 96-hour LC50 to mosquitofish (Gambusia affinis) = 740 mg/L 48-hour EC50 to the invertebrate Ceriodaphnia cf. dubia = 200 to 227 mg/L	Based on acute: Low	N.A.(inorganic)	N.A. (inorganic)	Tier 1 (tMAP)	A Tier 1 Environmental Assessment for this chemical has been conducted by AICIS which concluded that it was low concern to the environment. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		41,696	181	Corrosion Inhibitor	ECLC50 values between 1 and 100 mg/L Daphnia magna 21-d NOEC for effects on reproduction was 100 mg/L.	Based on chronic: Low	No. The chemical is expected to be readily biodegradable.	No. The low log Kow values of < 0 and the calculated BCF values of 3.2 show low potential for bioaccumulation.	Tier 1	The risk was classified as low based on acute data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		2,422	9	pH Buffer	Acute endpoints: Fish = 75 mg/L, Daphnia EC50 = 32 mg/L Chronic endpoints: Daphnia = 150 mg/L	Based on Acute: Moderate	Readily biodegradable	Not Bio accumulative (Based on log Kow = 0.136)	Tier 1 (tMAP)	A Tier 1 Environmental Assessment for this chemical has been conducted by AICIS which concluded that it was low concern to the environment. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		289,333	823	Slurry agent	Lowest acute endpoint for Daphnia = 0.018 mg/L	Based on acute: High	Readily biodegradable	Yes. Based on calculated log BCF values for constituents that range from 2.78 to 4.06, and calculated BCF values of 598 to 11,430 L/kg wet-weight.	Tier 2	The risk was classified as high based on acute data. The exposure concentration is above the respective ecotoxicity values. It is noted that the concentration exceeds theoretical solubility and as such, potential direct exposure to non-aqueous phase liquid (NAPL) is hazardous to human health. Occupational health and safety (OH&S) procedures will be implemented by Tamboran to minimise human health exposure. A Tier 2 assessment is required.	2.9E-04	7.1E-04	1.2E-04	1.1E-03	Based on the calculated HQ the chemical is of low concern for workers (refer to individual toxicity profile and risk calculations for further detail).
		211,611	827	Clay swelling control	96-hour fish LC50 value is >100 mg/L 48-hour in vertebrate EC50 is 349 mg/L 72-hour EC50 to Pseudokirchneriella subcapitata is >1,000 mg/L 21-day Daphnia NOEC value is 30.2 mg/L	Based on Chronic: Low	[redacted] is readily biodegradable and thus it does not meet the screening criteria for persistence.	Not Bioaccumulative (based on a measured log Kow of -3.77 and a calculated BCF of 0.59)	Tier 1 (tMAP)	A Tier 1 Human Health Assessment for this chemical has been conducted by AICIS which concluded that this chemical was identified as low concern to human health. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		14,006	97	Scale inhibitor	96-h LC50 for the rainbow trout is in the range 180-252 mg/L, EC50 values determined in acute tests with aquatic invertebrates are all in excess of 150 mg/L, Chronic/prolonged toxicity to fish (60-day NOEC = 25.6 mg/L)	Based on chronic: Low	Potentially. Not rapidly degradable.	No. Based on the low log Kow (-3.40) and read-across from related substances.	Tier 1 (tMAP)	A Tier 1 Human Health Assessment for this chemical has been conducted by AICIS which concluded that this chemical was identified as low concern to human health. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		22,924	86	Surfactant	Acute: For invertebrates the LC50 (48 h) for Ceriodaphnia conforms dubia was 4.53 mg/L For algae, the EC50 (72 h) was determined to be 1.97 mg/L The LC50 (96 h) for zebra fish (Danio rerio) resulted in 4.2 mg/L Chronic result within a 21-d reproduction study is available with a NOEC of 2.42 mg/L for Daphnia magna The NOEC for algae was 1.2 mg/L	Based on Acute: High	No. The substances of this category are readily biodegradable.	No. The NOEC from the chronic aquatic toxicity data on the substance is >0.01 mg/L, hence does not meet the screening criteria for toxicity.	Tier 2	The risk was classified as high based on acute data. The exposure concentration is above the respective ecotoxicity values. A Tier 2 assessment is required.	3.1E-04	5.1E-04	1.3E-04	9.6E-04	Based on the calculated HQ the chemical is of low concern for workers (refer to individual toxicity profile and risk calculations for further detail).
		4,132	16	Corrosion inhibitor	The 96 hour LC50 to the sheepshead minnow, Cyprinodon variegatus, in synthetic seawater is 74.1 mg/L The 48 hour EC50 to Daphnia magna, in freshwater is 3.1 mg/L The 48 hour LC50 to Daphnia magna, in marine water is 2.85 mg/L. The acute toxicity to freshwater green algae was determined. The EC50 (growth rate) was found to be 0.47 mg/L whilst the NOEC (growth rate) was 0.02 mg/L. The EC50/LC50 for microorganisms is117 mg/L and the NOEC for microorganisms is 8.1 mg/L.	Based on Acute: Very High	No. Short term seawater biodegradation showed limited degradation and assessment on the starting materials suggest ultimate biodegradation	No. The Log Kow is ≤ 3.93 at 25 °C and pH 1.1 – 2 which does not meet the screening criteria for bioaccumulation.	Tier 1. Acute toxicity only (corrosive). No evidence of systemic toxicity.	The risk was classified as very high based on acute data. The substance is not classified as PBT. It is noted that the substance is a corrosive substance for which dermal absorption is considered likely to be very low. The effects of dermal exposure will be dominated by those at the site of contact (i.e. local effects) and systemic toxicity is considered to be unlikely. As such OH&S procedures implemented by Tamboran will minimise human health exposure. Management of this chemical is addressed in the EMP to prevent accidental release. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		39,984	129	Emulsifier	Acute toxicity: Fish: LL50 (96h) > 1.1 mg/L (geom. mean measured, OECD 203) Aquatic invertebrates: EL50 (48h): 0.544 mg/L (geom. mean measured, OECD 202) Algae: ErC50 (72h): 3.4 mg/L (meas. arith. mean, OECD 201) Chronic toxicity: Fish: no data available Aquatic invertebrates: NOEC (21 d): 0.218 mg/L (TWA, OECD 211) Algae: ErC10 (72h): 1.33 mg/L (meas. arith. mean, EU method C.3)	Based on Acute: Very High	No. These chemicals were found to be readily biodegradable.	No. Bioaccumulation in organisms is expected to be negligible, due to biotransformation and excretion of alcohol ethoxylates.	Tier 2	The risk was classified as very high based on acute data. The exposure concentration is above the respective ecotoxicity values. A Tier 2 assessment is required.	9.1E-04	1.9E-06	3.8E-04	1.3E-03	Based on the calculated HQ the chemical is of low concern for workers (refer to individual toxicity profile and risk calculations for further detail).
		3,447	12	Improve surface and interfacial tension	Acute: Fish: 96 hr LL50 was >1.6 mg/L Invertebrates: 48 hr LL50 was 25 mg/L Algae: 72 hr EL50 was 7.9 mg/L	Based on Acute: High	No. The chemical is predicted to be readily biodegradable.	No. The the chemical does not meet the screening criteria for bioaccumulation.	Tier 1	This chemical has been listed as a chemical unlikely to require further regulation to manage risks to health by AICIS. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		6,713	21	Biocide	Acute: Fish: 96 h LC50 = 0.19 mg/L, Lepomis macrochirus (Bluegill) Invertebrates: 48 h LC50 = 0.018 mg/L, Daphnia magna Algae: 96 h EC50 = 0.014 mg/L, Pseudokirchneriella subcapitata (Green algae) Chronic: Invertebrates: 21 d NOEC = 0.125 mg/L, Daphnia magna Algae: 72 h NOEC = 0.06 mg/L, Pseudokirchneriella subcapitata (Green algae)	Based on Acute and Chronic: Very High	No. Based on biodegradation studies, this chemical is categorised as Not Persistent.	No. Based on the available measured bioconcentration data, all chemicals in this group are categorised as Not Bioaccumulative.	Tier 2	The risk was classified as very high based on acute and chronic data. The exposure concentration is above the respective ecotoxicity values. A Tier 2 assessment is required.	7.4E-04	1.7E-05	3.1E-04	1.1E-03	Based on the calculated HQ the chemical is of low concern for workers (refer to individual toxicity profile and risk calculations for further detail).
		703,038	2,878	Mineral acid	Algae = 0.492 mg/L Daphnia = 0.492 mg/L Fish = 4.92 mg/L Daphnia (chronic) = 62 mg/L	Based on Chronic: Low	N.A.(inorganic)	N.A. (inorganic)	Tier 1	The risk was classified as low based on chronic data. The substance is not classified as PBT. Management of this chemical is addressed in the EMP to prevent accidental release. OH&S procedures implemented by Tamboran will minimise human health exposure. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		797	6	Oxidizing viscosity breaker	Acute Aquatic - Fish -96-hr LC50 Oncorhynchus - 76.3 mg/L -48-hr EC50 Daphnia magnia, - 120 mg/L -72-hr EC10 Phaeodactylum tricornutum - 320 mg/L Acute Aquatic - Invertebrate -Daphnia magna reproduction test - NOEC of 20.8 mg/L	Based on acute: Moderate	No. Not applicable, inorganic salt, ionic species ubiquitous in environment.	No. Not applicable, inorganic salt, ionic species ubiquitous in environment.	Tier 1	The risk was classified as moderate based on acute data. The substance is inorganic and ubiquitous in the environment. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		4,880	29	pH control	LC50/EC50 > 100 mg/L (fish, daphnia, algae)it day NOEC = 425 mg/L (algae)	Based on Chronic: Low	Readily biodegradable	No based on low log Kow	Tier 1 (NICNAS)	This chemical has been listed as a chemical unlikely to require further regulation to manage risks to health by AICIS. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		31,316	101	Emulsifier	96 h LC50, Oncorhynchus mykiss = 5 – 7 mg/L 50 d Lepomis macrochirus, NOEC = 0.11 – 0.33 mg/L 48 h EC50 Daphnia magna = 2.5 mg/L 21 d NOEC Daphnia magna = 0.77 – 1.75 mg/L. 96 h EC50 (green algae) = 1.4 mg/L EC50 (3 h) for microorganisms > 140 mg/L	Based on Chronic and Acute: High	Readily biodegradable	Not bioaccumulative	Tier 2	The risk was classified as high based on chronic and acute data. The exposure concentration is above the respective ecotoxicity values. A Tier 2 assessment is required.	7.1E-04	2.6E-04	3.0E-04	1.3E-03	Based on the calculated HQ the chemical is of low concern for workers (refer to individual toxicity profile and risk calculations for further detail).
		6,446	22	Biocide	Acute toxicity: Oncorhynchus mykiss (Rainbow trout) 96 h LC50 = 0.064 mg/L Pimephales promelas (Fathead minnow) 96 h LC50 = 0.28 mg/L Daphnia magna (Water flea) 48 h EC50 = 0.037 mg/L Daphnia magna (Water flea) 48 h EC50 = 0.0059 mg/L Chlorella pyrenoidosa (Green algae) 96 h EC50 = 0.67 mg/L Scenedesmus pannonicus (Green algae) 96 h EC50 = 0.065 mg/L Chronic toxicity: Pimephales promelas (Fathead minnow) 34 d NOAEC = 0.032 mg/L Daphnia magna (Water flea) 21 d NOEC = 0.00415 mg/L	Based on Acute and Chronic: Very High	No. The chemical is expected to be biodegradable.	No. The chemical is expected to have low bioaccumulation potential in aquatic organisms.	Tier 2	The risk was classified as very high based on acute and chronic data. The exposure concentration is above the respective ecotoxicity values. A Tier 2 assessment is required.	7.7E-04	1.7E-06	3.2E-04	1.1E-03	Based on the calculated HQ the chemical is of low concern for workers (refer to individual toxicity profile and risk calculations for further detail).
		10,155	36	Viscosifier	Lowest measured ecotoxicity endpoint for fish was reported to be 218 mg/L.	Based on Acute: Low	[redacted] expected to readily biodegrade. Thus, it is not expected to meet the screening criteria for persistence.	Not Bioaccumulative based on the molecular weight of guar gum (ranges from 200,000 to 300,000 daltons), and it is also water soluble.	Tier 1 (tMAP)	A Tier 1 Human Health Assessment for this chemical has been conducted by AICIS which concluded that this chemical was identified as low concern to human health. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
		1,139	4	Improve surface and interfacial tension	Acute: Fish: 96 hr LL50 was >1.6 mg/L Invertebrates: 48 hr LL50 was 25 mg/L Algae: 72 hr EL50 was 7.9 mg/L	Based on Acute: High	No. The chemical is predicted to be readily biodegradable.	No. The the chemical does not meet the screening criteria for bioaccumulation.	Tier 1	This chemical has been listed as a chemical unlikely to require further regulation to manage risks to health by AICIS. A Tier 2 assessment is not required.	NA	NA	NA	NA	NA
													Total Risk	**1.0E-02**	The chronic health risks associated with potential exposure to COPC identified in flowback water, where the Stimulation Fluid Recipe is used and assuming 100% mass recovery are considered to be acceptable.

Notes
* Chemical composition and information not provided to AECOM due to proprietary controls by the chemical manufacturer
Tier 1 (tMAP) - Chemical identified as of low concern for human health, as published in the National Assessment of Chemicals Associated with Coal Seam Gas Extraction in Australia (NICNAS 2017).
1 - Please refer to the individual toxicity profiles for further detail.
2 - Toxicity assessed using NT (2021)
3 - Biodegradation assessed as per NT (2021) and DoEE (2017)
BCF - Bioconcentration Factor
NA - Not Applicable
NICNAS 2017 - National Assessment of Chemicals Associated with Coal Seam Gas Extraction in Australia
DoEE 2017 - Draft Risk Assessment Guidance Manual: For Chemicals Associated with Coal Seam Gas Extraction, Australian Government, Department of Energy
NT 2021 - Northern Territory Government, Department of Environment, Parks and Water Security, Environment Management Plan Content Guideline, 2021

Toxicity and Dermal Absorption Parameters

C = calculated from chronic value, Ch = chronic value adopted

CAS#	Chemical	Oral/Dermal Exposures				Inhalation Exposures								
		Threshold Chronic TDI or RfD (mg/kg/day)		Dermal Permeability (cm/hr)	Reference	Inhalation Unit Risk $(ug/m^3)^{-1}$	Non-Threshold Slope Factor $(mg/kg/day)^{-1}$		Threshold Chronic TC or RfC (mg/m^3)		NOAEC or LOAEC (mg/m^3)	NOAEL or LOAEL (mg/kg bw/d)	UF	Reference
	COPC in Hydraulic Fracturing Fluid Injected into Well													
[redacted]		0.55	D	9.14E-04	EPI				2.145	converted from RFD		55	100	REACH ECHA
		2	D	5.20E-03	EPI				7.8	converted from RFD		200	100	NICNAS (2017)
		0.04	D	3.25E-04	EPI				0.156	converted from RFD		4	100	NICNAS (2017)
		0.15	D	3.99E-03	EPI				0.585	converted from RFD		15	100	NHMRC (2008)
		0.15	D	3.99E-03	EPI				0.585	converted from RFD		15	100	NHMRC (2008)
		10	D	1.96E+00	EPI				39	converted from RFD		1000	100	NICNAS (2017)
		0.5	D	1.67E-03	EPI				1.95	converted from RFD		50	100	AICIS (2019)
		0.96	D	1.29E+00	EPI				3.744	converted from RFD		96	100	AICIS (2020)
		0.1	D	1.81E-02	EPI				0.39	converted from RFD		10	100	USEPA (2017)
		0.1	D	1.71E-03	EPI				0.39	converted from RFD		10	100	AICIS (2015)
		0.5	D	2.87E-01	EPI				1.95	converted from RFD		50	100	AICIS (2019)

Notes:

D - Derived (refer to individual Toxicity Profiles)

* uncertainty factors of 10 each for intra-species variability (variability across the human population) and inter-species variability (variability between responses seen in animals and humans), for sub-chronic exposures

A - No information available. Assumed default value.

References:

[redacted]

EPI - USEPA Estimation Programs Interface (EPI) Suite

NICNAS (2017) - Department of the Environment and Energy 2017 , National assessment of chemicals associatedwith coal seam gas extraction in Australia, prepared by the National Industrial ChemicalsNotification and Assessment Scheme

REACH - ECHA REACH European Chemicals Agency Database: http://apps.echa.europa.eu

NHMRC (2008) Australian Guidelines for Water Recycling, Augmentation of Drinking Water Supplies

Exposure to Chemicals via Incidental Ingestion of Flowback fluid

Chronic Exposures

General Data/ Equations	Units	Exposure Calculations (RME) Ingestion of Flowback Water by Workers	
Exposure Parameters			
Exposure Frequency (EF)	days/year	20	Assume work 5 days per week for 1 month during the fraccing period (site-specific information from Tamboran)
Exposure Duration (ED)	years	0.083	Maximum duration of the frac. Works will be complete in one month (site-specific information from Tamboran).
Body Weight (BW)	kg	78	Average male and female adults as per enHealth 2012
Averaging Time - NonThreshold (ATc)	days	25550	USEPA 1989 and CSMS 1996
Averaging Time - Threshold (ATn)	days	30.42	USEPA 1989 and CSMS 1996
Ingestion Rate (IRw)	L/day or L/hr	0.005	Assume Incidental ingestion of 5 ml (1 tsp) of water per day during fraccing.
Bioavailability (B)	-	100%	Assume 100% bioavailability via ingestion of chemicals in water.
Intake Factor = IRw*B*EF*ED / BW*AT	L/kg/day	**4.2E-09** **3.5E-06**	**NonThreshold** **Threshold**

Daily Intake from Water = Concentration in Water x Intake Factor (ref: USEPA 1989)
NonThreshold Risk = Daily Intake from Water for NonThreshold Effects x Slope Factor
Hazard Quotients = (Daily Intake from Water for Threshold Effects/ADI)

Chemical	Toxicity Data: Non-Threshold Slope Factor	Toxicity Data: Chronic Threshold TDI	Toxicity Data: Background Intake (% Chronic TDI)	Toxicity Data: Chronic TDI Allowable for Assessment (TDI-Background)	Concentration in Water	Daily Intake: NonThreshold	Daily Intake: Threshold	Calculated Risk: NonThreshold Risk	Calculated Risk: Chronic Hazard Quotient
	(mg/kg-day)$^{-1}$	(mg/kg/day)		(mg/kg/day)	(mg/L)	(mg/kg/day)	(mg/kg/day)	(unitless)	(unitless)
[redacted]		5.5E-01		5.5E-01	3.00	1.3E-08	1.1E-05	--	1.9E-05
		2.0E+00		2.0E+00	26.00	1.1E-07	9.1E-05	--	4.6E-05
		4.0E-02		4.0E-02	22.00	9.2E-08	7.7E-05	--	1.9E-03
		1.5E-01		1.5E-01	11.00	4.6E-08	3.9E-05	--	2.6E-04
		1.5E-01		1.5E-01	6.50	2.7E-08	2.3E-05	--	1.5E-04
		1.0E+01		1.0E+01	823.00	3.4E-06	2.9E-03	--	2.9E-04
		5.0E-01		5.0E-01	129.00	5.4E-07	4.5E-04	--	9.1E-04
		9.6E-01		9.6E-01	86.00	3.6E-07	3.0E-04	--	3.1E-04
		1.0E-01		1.0E-01	21.00	8.8E-08	7.4E-05	--	7.4E-04
		1.0E-01		1.0E-01	22.00	9.2E-08	7.7E-05	--	7.7E-04
		5.0E-01		5.0E-01	101.00	4.2E-07	3.5E-04	--	7.1E-04
							Total Risk (mixture)		**6.14E-03**

Note:
This scenario is deemed protective of the following scenarios due to the less frequent and short duration of exposures:
- Worker exposure during a spill (i.e.a couple breaks on a tank and releases product onto the worker) or leak scenarios

Dermal Exposure to Chemicals via Contact of Flowback Fluid

Chronic Exposures

General Data/ Equations	Units	Exposure Calculations (RME) Dermal Contact with Flowback Fluid by Workers	
Exposure Parameters			
Exposure Frequency (EF)	days/year	20	Assume work 5 days per week for 1 month during the fraccing period
Exposure Duration (ED)	years	0.083	Maximum duration of the operation. Works will be complete in one month.
Body Weight (BW)	kg	78	Average male and female adults as per enHealth 2012
Averaging Time - NonThreshold (ATc)	days	25550	USEPA 1989 and CSMS 1996
Averaging Time - Threshold (ATn)	days	30.42	USEPA 1989 and CSMS 1996
Event Frequency (EV)	(events/day)	1	
Surface Area (SAw)	cm^2	2300	Hands and forearms exposed (enHealth 2012) Occupational HSE would require long pants and closed shoes on Australian work sites; forearms conservatively included
Event Duration (tevent)	hr/event	1	Assume contact with fraccing fluid for 1 hour per event
Conversion Factor (CF)	L/cm^3	1.E-03	Conversion of units
$CDI_{Der,w} = \frac{DAevent * SA * EV * EF * ED}{365 \frac{days}{year} * AT * BW}$	mg/kg/day	calculated	Chronic Daily Intake via dermal contact with water
$DAevent = Cw * Kp * t_{event} * CF$	mg/cm^2-event	calculated	Dermal absorbed dose per event per unit exposed skin area

Daily Intake from Water = Concentration in Water x Dermal Permeability x Intake Factor (ref: USEPA 1989, 2004)
NonThreshold Risk = Daily Intake from Water for NonThreshold Effects x Slope Factor
Hazard Quotients = (Daily Intake from Water for Threshold Effects/ADI)

Chemical	Toxicity Data: Non-Threshold Slope Factor	Toxicity Data: Chronic Threshold TDI	Toxicity Data: Background Intake (% chronic TDI)	Toxicity Data: Chronic TDI Allowable for Assessment (TDI-Background)	Dermal Permeability (Kp)	Concentration in Water (Cw)	DAevent	Chronic Daily Intake $CDI_{der,w}$: NonThreshold	Chronic Daily Intake $CDI_{der,w}$: Threshold	Calculated Risk: NonThreshold Risk	Calculated Risk: Chronic Hazard Quotient
	$(mg/kg\text{-}day)^{-1}$	(mg/kg/day)		(mg/kg/day)	(cm/hr)	(mg/L)	mg/cm^2-event	(mg/kg/day)	(mg/kg/day)	(unitless)	(unitless)
[redacted]		5.5E-01		5.5E-01	9.1E-4	3.00	2.74E-06		1.2E-08	--	2.2E-08
		2.0E+00		2.0E+00	5.2E-3	26.00	1.35E-04		6.0E-07	--	3.0E-07
		4.0E-02		4.0E-02	3.3E-4	22.00	7.15E-06		3.2E-08	--	7.9E-07
		1.5E-01		1.5E-01	4.0E-3	11.00	4.39E-05		1.9E-07	--	1.3E-06
		1.5E-01		1.5E-01	4.0E-3	6.50	2.59E-05		1.1E-07	--	7.7E-07
		1.0E+01		1.0E+01	2.0E+0	823.00	1.61E+00		7.1E-03	--	7.1E-04
		5.0E-01		5.0E-01	1.7E-3	129.00	2.15E-04		9.5E-07	--	1.9E-06
		9.6E-01		9.6E-01	1.3E+0	86.00	1.11E-01		4.9E-04	--	5.1E-04
		1.0E-01		1.0E-01	1.8E-2	21.00	3.80E-04		1.7E-06	--	1.7E-05
		1.0E-01		1.0E-01	1.7E-3	22.00	3.76E-05		1.7E-07	--	1.7E-06
		5.0E-01		5.0E-01	2.9E-1	101.00	2.90E-02		1.3E-04	--	2.6E-04
									Total Risk (mixture)		**1.5E-03**

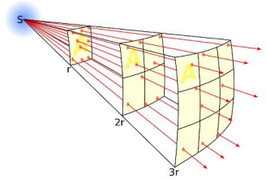
Note:
This scenario is deemed protective of the following scenarios due to the less frequent and short duration of exposures:
- Worker exposure during a spill (i.e.a couple breaks on a tank and releases product onto the worker) or leak scenarios

Aerosol Exposure - Flowback Fluid

The concentration of COPC in aerosol spray was estimated by calculating the concentration for driftable droplets using a mixed box model in which steady state
An emission factor for driftable aerosol was estimated using the algorithm presented below.

Emission Factor for Driftable Aerosol Algorithm

$$Emission\ Factor_{driftable\ aerosol}\left(\frac{L}{m^3}\right) = \frac{Box\ Centre^2(m) \times \left(\frac{Spray\ Vol\ \left(\frac{L}{hr}\right) \times Aerosol_{driftable}(\%)}{BoxVR\ \left(\frac{m^3}{hr}\right)}\right)}{BoxDistance^2\ (m)}$$



Aerosol Exposure Modelling Notes:

1) The inhalation of chemicals in mist/aerosol resultant from evaporation activities is dependent upon the concentration in water, the amount of water used per unit time, how close a person stands to the spray generation, how long they are in a position of exposure and the extent of spray drift (determined by the size of the water droplets and speed/direction of the wind). These equations are applicable for non-volatile contaminants that are inhaled.

2) These equations calculate the concentration for driftable droplets using a simple well mixed box model in which steady state air concentrations are calculated. The 'Inverse square law' is then applied to approximate the air concentration at a distance from the virtual air box. This law assumes the further away a receptor is from the spray source, the density of the droplets will decrease. The density of the spray droplets is inversely proportional to the square of the distance from the source.

Parameter	Units	Value	Description
Spray box length	m	3	Assume a 'spray box' of 3 m long.
Spray box width	m	3	Assume a 'spray box' of 3 m wide.
Box Centre	m	1.5	Distance to centre of box is 1.5 m.
$Box_{Distance}$	m	2	Distance the worker is from the 'spray box'. Assumed a distance of 2 m.
$Aerosol_{driftable}$	unitless	0.2	Proportion of aerosol spray that drifts outside the 'spray box' and available for exposure. Assumed 0.2, based on a droplet size of 400 – 500 µm that falls approximately 0.3 m in less than 10 seconds, with a lateral drift of approximately 3.5 m in a 5 km/hr wind (i.e. a light breeze) (Grisso et al. 2013).
Spray Volume	L/hr	1800.0	1800 L/min, value adopted from NZ MtE (2011) Appendix 5A.
Wind speed	m/hr	9000	Based on windspeed of 2.5 m/sec
BoxVR	m^3/hr	81000.0	Ventilation rate of spray in the 'spray box'. Assumed to be 81,000 m3/hr based on a wind speed of 9000 m/hr, and a 'spray box' dimension of 3 x 3 m.

CAS	Chemical	Concentration in Water	Generation rate of chemical in volume	Driftable Aerosol Emission Factor
		mg/L	mg/hr	L/m^3
[redacted]	[redacted]	3.00	1080	2.500000E-03
		26.00	9360	2.500000E-03
		22.00	7920	2.500000E-03
		11.00	3960	2.500000E-03
		6.50	2340	2.500000E-03
		823.00	296280	2.500000E-03
		129.00	46440	2.500000E-03
		86.00	30960	2.500000E-03
		21.00	7560	2.500000E-03
		22.00	7920	2.500000E-03
		101.00	36360	2.500000E-03

Exposure to Chemicals via Inhalation of Mist from the Evaporation Units - Flowback Fluid

Chronic Exposures

General Data/ Equations	Units	Exposure Calculations (RME) Inhalation of Mist by Workers	
Exposure Parameters			
Exposure Frequency (EF)	days/year	20	Assume work 5 days per week for 1 month during the fraccing period (site-specific information from Tamboran)
Exposure Duration (ED)	years	0.083	Maximum duration of the frac. Works will be complete in one month (site-specific information from Tamboran).
Exposure Time (ET)	hr/day	1	Professional judgement for irrigation exposure. Assume worker to be near tank for 1 hours every working day.
Driftable aerosol emission factor (EMF)	L/m3	2.50E-03	Calculated
Aerosol Inhalation Bioavailability (AAF)	unitless	1.0	Assume 100% bioavailability
Averaging Time - Threshold (AT)	years	0.1	USEPA 1989 and CSMS 1996
$ITF_{inh,w,shwr} = \frac{EmF \times AAF \times ET_{iw} \times EF \times ED}{365\ \frac{days}{year} \times 24\ \frac{hours}{day} \times AT}$			

Daily Intake = Concentration in Water x Intake Factor (ref: USEPA 1989)
Hazard Quotients = (Daily Intake from Water for Threshold Effects/ADI)

		Threshold Intake and Risk Calculations						
CAS	Chemical	Groundwater Concentration	Aerosol Inhalation Bioavailability	Driftable Aerosol Emission Factor	RfC (Background Corrected)	Adult Exposure Factor (threshold)	Adult Exposure Adjusted Air Concentration (threshold)	Hazard Index (Adult)
		mg/L	(unitless)	(L/m^3)	(mg/m^3)	(L/m^3)	(mg/m^3)	(unitless)
[redacted]		3.0	1.00	2.50E-03	2.15E+00	5.71E-06	1.71E-05	8.0E-06
		26.0	1.00	2.50E-03	7.80E+00	5.71E-06	1.48E-04	1.9E-05
		22.0	1.00	2.50E-03	1.56E-01	5.71E-06	1.26E-04	8.0E-04
		11.0	1.00	2.50E-03	5.85E-01	5.71E-06	6.28E-05	1.1E-04
		6.5	1.00	2.50E-03	5.85E-01	5.71E-06	3.71E-05	6.3E-05
		823.0	1.00	2.50E-03	3.90E+01	5.71E-06	4.70E-03	1.2E-04
		129.0	1.00	2.50E-03	1.95E+00	5.71E-06	7.36E-04	3.8E-04
		86.0	1.00	2.50E-03	3.74E+00	5.71E-06	4.91E-04	1.3E-04
		21.0	1.00	2.50E-03	3.90E-01	5.71E-06	1.20E-04	3.1E-04
		22.0	1.00	2.50E-03	3.90E-01	5.71E-06	1.26E-04	3.2E-04
		101.0	1.00	2.50E-03	1.95E+00	5.71E-06	5.76E-04	3.0E-04
							Total Threshold Risk (mixture)	**0.0026**

Summary of Risk to Workers - Flowback Fluid
Exposure fo Target Chemicals - Theoretical Data

Receptor/Exposure Pathway	Calculated HI 100% Mass Return
Use of Stimulation Fluid in Hydraulic Fracturing	
Planned Recipe	
Workers	
Ingestion of Chemicals via Incidental Contact with Flowback Water	0.006
Dermal Exposure to Chemicals via Incidental Contact with Flowback Water	0.002
Inhalation of mist from the evaporation units	0.003
Total Risk	**0.01**

Tracer Fluid

Chemical Name	CAS Number	Volume or Mass of Chemical (L or kg)	Concentration in Injected Fluid (mg/L)	Parent Compound Purpose	Ecotoxicity[1]	Toxicity[2]	Biodegradation[1,3]	Bioaccummulative[1]	Tier 1 Screening Assessment	Discussion
[redacted]	[redacted]	20	2.5E-13	Tracer	Fish 96h LC50 > 100 mg/L Invertebrates 48h EC50 > 0.1 mg/L Microorganism 3h EC50 > 100 mg/L Fish 96h NOEC = 1000 mg/L	Based on chronic: Low	Yes. Not readily biodegradable	No, based in BCF values less than 50.	Tier 1	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Fish 96h LC50 > 100 mg/L Invertebrates 48h EC50 > 0.1 mg/L Microorganism 3h EC50 > 100 mg/L Fish 96h NOEC = 1000 mg/L	Based on chronic: Low	Yes. Not readily biodegradable	No, based in BCF values less than 50.	Tier 1	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Fish 96h LC50 > 100 mg/L Invertebrates 48h EC50 > 0.1 mg/L Microorganism 3h EC50 > 100 mg/L Fish 96h NOEC = 1000 mg/L	Based on chronic: Low	Yes. Not readily biodegradable	No, based in BCF values less than 50.	Tier 1	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Fish 96h LC50 > 100 mg/L Invertebrates 48h EC50 > 0.1 mg/L Microorganism 3h EC50 > 100 mg/L Fish 96h NOEC = 1000 mg/L	Based on chronic: Low	Yes. Not readily biodegradable	No, based in BCF values less than 50.	Tier 1	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Fish 96h LC50 > 100 mg/L Invertebrates 48h EC50 > 0.1 mg/L Microorganism 3h EC50 > 100 mg/L Fish 96h NOEC = 1000 mg/L	Based on chronic: Low	Yes. Not readily biodegradable	No, based in BCF values less than 50.	Tier 1	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Fish 96h LC50 > 100 mg/L Invertebrates 48h EC50 > 0.1 mg/L Microorganism 3h EC50 > 100 mg/L Fish 96h NOEC = 1000 mg/L	Based on chronic: Low	Yes. Not readily biodegradable	No, based in BCF values less than 50.	Tier 1	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Fish 96h LC50 > 100 mg/L Invertebrates 48h EC50 > 0.1 mg/L Microorganism 3h EC50 > 100 mg/L Fish 96h NOEC = 1000 mg/L	Based on chronic: Low	Yes. Not readily biodegradable	No, based in BCF values less than 50.	Tier 1	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Fish 96h LC50 > 100 mg/L Invertebrates 48h EC50 > 0.1 mg/L Microorganism 3h EC50 > 100 mg/L Fish 96h NOEC = 1000 mg/L	Based on chronic: Low	Yes. Not readily biodegradable	No, based in BCF values less than 50.	Tier 1	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Fish 96h LC50 > 100 mg/L Invertebrates 48h EC50 > 0.1 mg/L Microorganism 3h EC50 > 100 mg/L Fish 96h NOEC = 1000 mg/L	Based on chronic: Low	Yes. Not readily biodegradable	No, based in BCF values less than 50.	Tier 1	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Fish 96h LC50 > 100 mg/L Invertebrates 48h EC50 > 0.1 mg/L Microorganism 3h EC50 > 100 mg/L Fish 96h NOEC = 1000 mg/L	Based on chronic: Low	Yes. Not readily biodegradable	No, based in BCF values less than 50.	Tier 1	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Fish 96h LC50 > 100 mg/L Invertebrates 48h EC50 > 0.1 mg/L Microorganism 3h EC50 > 100 mg/L Fish 96h NOEC = 1000 mg/L	Based on chronic: Low	Yes. Not readily biodegradable	No, based in BCF values less than 50.	Tier 1	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Fish 96h LC50 > 100 mg/L Invertebrates 48h EC50 > 0.1 mg/L Microorganism 3h EC50 > 100 mg/L Fish 96h NOEC = 1000 mg/L	Based on chronic: Low	Yes. Not readily biodegradable	No, based in BCF values less than 50.	Tier 1	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Fish 96h LC50 > 100 mg/L Invertebrates 48h EC50 > 0.1 mg/L Microorganism 3h EC50 > 100 mg/L Fish 96h NOEC = 1000 mg/L	Based on chronic: Low	Yes. Not readily biodegradable	No, based in BCF values less than 50.	Tier 1	The risk was classified as low based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Fish LC50 (96h) 87 mg/L Daphnia magna EC50 (48h) 182 mg/L Algae ErC50 (72h), ErC10 (72h) >100 mg/L	Based on Acute: Moderate	No, expected to be readily biodegradable.	No, based on log Kow of 0.07.	Tier 1	The risk was classified as moderate based on acute data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Acute: Fish 48 h LC50 = 1000 mg/L Invertebrate 48 h EC50 = 200 mg/L Algae 72 h EbC50 = 196 mg/L Chronic: Fish 36 d NOEC = 5.25 mg/L Invertebrate 21 d EC10 = 32 mg/L Algae 72 h NOEC = 31 mg/L	Based on Chronic: Moderate	Yes, the chemical is not readily biodegradable.	No, based in BCF values less than 100.	Tier 1	The risk was classified as moderate based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	20	2.5E-13	Tracer	Under environmental relevant conditions therefore the acute toxicity of benzoic acid, sodium benzoate and potassium benzoate for all four trophic levels is > 100 mg/L.	Based on Acute: Low	No, expected to be readily biodegradable.	No, based on log Kow of 1.88.	Tier 1	A Tier 1 Human Health Assessment for this chemical has been conducted by AICIS which concluded that this chemical was identified as low concern to human health. A Tier 2 assessment is not required.
Hydrogen peroxide (50% w/w min) aqueous solution	7722-84-1	10,000	20	Tracer	Acute: Fish EC50 = 16.4 mg/L Daphnia EC50 = 2.4 mg/L Algae EC50 = 0.5 mg/L Chronic: Daphnia NOEC = 0.63 mg/L Algae NOEC = 0.13 mg/L	Based on Chronic: High	No, not expected to be persistent.	No, based on the log Kow of -1.57.	Tier 1	The risk was classified as high based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.
[redacted]	[redacted]	5,575	1,000	Tracer	Acute: Fish LC50 (96 h) = 135.21 mg/L Invertebrates EC50 (48 h) = 37.9 mg/L Invertebrates EC50 (48 h) = 4.1 mg/L Algae EC50 (72 h) = 5.7 mg/L Algae EC50 = 3.35 mg/L Chronic: Invertebrates NOEC (21 d) = 1.3 mg/L	Based on Chronic: Moderate	No, expected to be readily biodegradable.	No, based on the log Kow of -0.11.	Tier 1	The risk was classified as moderate based on chronic data. The substance is not classified as PBT. The exposure concentration is below the respective ecotoxicity values. A Tier 2 assessment is not required.

Notes
* Chemical composition and information not provided to AECOM due to proprietary controls by the chemical manufacturer
Tier 1 (IMAP) - Chemical identified as of low concern for human health, as published in the National Assessment of Chemicals Associated with Coal Seam Gas Extraction in Australia (NICNAS 2017).
1 - Please refer to the individual toxicity profiles for further detail.
2 - Toxicity assessed using NT (2021)
3 - Biodegradation assessed as per NT (2021) and DoEE (2017)
BCF - Bioconcentration Factor
NA - Not Applicable
NICNAS 2017 - National Assessment of Chemicals Associated with Coal Seam Gas Extraction in Australia
DoEE 2017 - Draft Risk Assessment Guidance Manual: For Chemicals Associated with Coal Seam Gas Extraction, Australian Government, Department of Energy
NT 2021 - Northern Territory Government, Department of Environment, Parks and Water Security, Environment Management Plan Content Guideline, 2021

Appendix C

Toxicological Profiles

Appendix C Toxicological Profiles

REDACTED

Appendix D

SDS

Safety Data Sheet

Section 1: Identification of the substance

1.1 Product identifiers

Flow Insurance™ Copper

1.2 Relevant identified uses

Oil and gas diagnostics

1.3 Details of the supplier of the safety data sheet

Patina Energy

1906 Johanna Drive. STE A

Houston, Texas 77055

USA

1.4 Emergency telephone number

Emergency Phone #: (832) 657-7299

Section 2: Hazards identification

2.1 Classification of the substance

Acute toxicity, Oral, (Category 4) H302

2.2 GHS Label elements, including precautionary statements

Pictogram 

Signal word – Warning

Hazard statement – Harmful if swallowed

Precautionary statements – Wash skin thoroughly after handling

Do not eat, drink, or smoke when handling

Avoid release to the environment

If swallowed call a doctor if you feel unwell, rinse mouth

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

None

Section 3: Composition

3.1 Substances

Flow Insurance™ Copper- 100%

Section 4: First aid measures

4.1 First aid measures

General advice - Move out of dangerous area.

If breathed in - Move person to fresh air. If not breathing, give artificial respiration.

In case of skin contact - Wash off with soap and plenty of water.

In case of eye contact - Flush eyes with water as a precaution.

If swallowed - Never give anything by mouth to an unconscious person. Rinse mouth with water.

4.2 Most important symptoms and effects, both acute and delayed

No data available

4.3 Indication of any immediate medical attention and special treatment needed

No data available

Section 5: Firefighting measures

5.1 Extinguishing media

No data available

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

No data available

5.4 Further information

No data available

Section 6: Accidental release measures

6.1 Personal precautions, protective equipment, and emergency procedures

For personal protection see section 8.

6.2 Environmental precautions

No special environmental precautions are required

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

Section 7: Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Provide appropriate ventilation at places where dust is formed.

7.2 Conditions for safe storage

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

7.3 Specific end uses

No other specific uses

Section 8: Personal protection

8.1 Control parameters

No data available

8.2 Personal Protection

Personal protective equipment

Eye protection – Safety glasses with side shields

Skin protection – Handle with gloves. Wash and dry hands.

Body Protection – Long sleeves, trousers, and safety boots.

Respiratory protection – For nuisance exposures use type P95 particle respirator.

Control of environmental exposure – Avoid discharge into the environment.

Section 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance Form: white solid

b) Odor - No data available

c) Odor Threshold - No data available

d) pH - No data available

e) Melting point - Melting point: > 459 °F

f) Initial boiling point and boiling range - No data available

g) Flash point - No data available

h) Evaporation rate - No data available

i) Flammability (solid, gas) - This product is not flammable

j) Upper/lower flammability or explosive limits - No data available

k) Vapor pressure - No data available

l) Vapor density - No data available

m) Relative density - No data available

n) Water solubility - No data available

o) Partition coefficient - No data available

p) Auto-ignition temperature - No data available

q) Decomposition temperature - No data available

r) Viscosity - No data available

s) Explosive properties - No data available

t) Oxidizing properties - No data available

9.2 Other safety information - No data available

Section 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

Stable

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

No data available

Section 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Carcinogenicity

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Section 12: Ecological information

12.1 Toxicity

No data available

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT assessment

No data available

12.6 Other adverse effects

No data available

Section 13: Disposal considerations

13.1 Waste treatment methods

Dispose of as unused product.

Section 14: Transport information

DOT (US)

Not dangerous goods

The above information is believed to be correct but does not claim to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions.

SAFETY DATA SHEET

According to Safe Work Australia

Revision: 14-03-2026

Hydrogen Peroxide 50%

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY / UNDERTAKING

1.1. Identification of the substance/preparation

Product name	:	HYDROGEN PEROXIDE-50 %w/w Grade-3
Chemical Name	:	Hydrogen Peroxide
Synonyms	:	Hydroperoxide, Hydrogen dioxide
Molecular formula	:	H_2O_2
Molecular Weight	:	34 g/mol

1.2. Use of the Substance/Preparation

Recommended use	:	Versatile chemical used in various industries for bleaching, chemical synthesis, environmental control / effluent treatment, sterilizations etc.

1.3. Manufacturers / Suppliers Details

Name	:	COHO Group PTY LTD
Address	:	L5 455 Upper Edward Str Spring Hill, QLD, Australia, 4000
Telephone	:	+61 447 725 362

1.4. Emergency telephone number

Telephone	:	+61 447 725 362

2. HAZARDS IDENTIFICATION

2.1. GHS-Classification (EC n°1272/2008)

This mixture is classified as Hazardous.

Physical Hazard:

Hazard Class	Hazard category	H Phrases	H- Statement
Oxidizing liquids	Category 2	H272	May intensify fire; Oxidizer

Health Hazard:

Hazard Class	Hazard category	H Phrases	H- Statement
Skin Irritation	Category 2	H315	Causes Skin irritation
Acute Toxicity- Oral	Category 4	H302	Harmful if swallowed
Acute Toxicity - Inhalation	Category 4	H332	Harmful if inhaled
Specific Target Organ Toxicity (STOT) – Single Exposure	Category 3	H335	May cause respiratory irritation.
Eye Damage	Category 1	H318	Serious Eye Damage

Environmental Hazard:

Hazard Class	Hazard category	H Phrases	H- Statement
Acute Aquatic Toxicity	Category 2	H401	Toxic to aquatic life

2.2. GHS Label elements, including precautionary statements.

Revision: 14-03-2026

Hydrogen Peroxide 50%

Name(s) on label:

Hazardous components : Hydrogen Peroxide (50.0%w/w min)

Signal Word

- Danger

Hazard Symbols

Hazard Statements

- H272 May intensify fire, Oxidizer.
- H315 Causes skin irritation.
- H302 Harmful if swallowed.
- H318 Serious Eye Damage
- H332 Harmful if inhaled.
- H335 May cause respiratory irritation.
- H401 Toxic to aquatic life.

Precautionary statements

Prevention

- P220 Keep/Store away from clothing/flammable/combustible materials.
- P261 Avoid breathing dust/fume/gas/mist/vapors/spray.
- P264 Wash skin thoroughly after handling.
- P270 Do not eat, drink or smoke when using this product.
- P271 Use only outdoor or in well-ventilated areas.
- P280 Wear protective gloves/protective clothing/eye protection/face protection.

Response

- P301+P312+P330+P331 IF SWALLOWED: Call a POISON CENTRE or doctor/Physician. Rinse mouth. Do NOT induce vomiting.
- P302+P353 +P361 IF ON SKIN: Rinse skin with water/shower. Remove/take off immediately all contaminated clothing.
- P304+P340+P312 IF INHALED: Remove person to fresh air and keep at rest in a position comfortable for breathing. Call a POISON CENTRE or doctor/physician if you feel unwell.
- P305+P351+P338+P310 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue to rinsing. Immediately call a POISON CENTRE or doctor/Physician.

- P370+P378 In case of Fire: Use Water, Use water spray for extinction.

Storage

- P403+P233 Sore in a well-ventilated place. Keep container tightly closed.

Disposal

- P501 Dispose of content by diluting with profuse water and in in accordance with local/regional/national regulations.

2.3. Other hazards which do not result in Classification or are not covered by the GHS

- H412 Harmful to aquatic life with long lasting effects.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substance : **Not Applicable. This product is a mixture.**

3.2 Mixture : **Hydrogen Peroxide, aqueous solution**

CAS-No. : 7722-84-1

Concentration : **50.0 % w/w min.**

3.2. Hazardous Components:

Substance Name	Hazard class	Hazard Category	Route of Exposure	H Phrases
Hydrogen Peroxide	Oxidizing liquid	Category 1		H271
	Acute Toxicity	Category 4	Inhalation	H332
	Acute Toxicity	Category 4	Oral	H302
	Skin corrosion	Category 1		H314
	Specific target organ toxicity – Single exposure	Category 3	Inhalation	H335
	Acute aquatic toxicity	Category 2		H401
	Chronic aquatic toxicity	Category 3		H412

4. FIRST AID MEASURES

4.1. Description of necessary measures for different routes of exposure

On Inhalation

- Remove to fresh air.
- If symptoms persist, call a physician.

In case of Eye contact

- Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
- In the case of difficulty of opening the lids, administer an analgesic eye wash (oxybuprocaine).
- Consult with an ophthalmologist immediately in all cases.

In case of Skin contact

- Remove and wash contaminated clothing before re-use.
- Wash off with plenty of water.
- Keep warm and in a quiet place.

- Consult a physician.

On Ingestion
- Call a physician immediately.
- Take the victim immediately to hospital.

If victim is conscious:
- If swallowed, rinse mouth with water (only if the person is conscious).
- Do NOT induce vomiting.

If victim is unconscious but breathing:
- Artificial respiration and/or oxygen may be necessary.

4.2. Most important symptoms/effects, acute and delayed

Inhalation
- Corrosive to respiratory system
- Symptoms: Breathing difficulties, Cough, pulmonary oedema, nausea, Vomiting
- Prolonged Exposure: Nose bleeding, chronic bronchitis

Skin contact
- Corrosive
- Causes severe burns.
- Symptoms: redness, swelling of tissue

Eye contact
- Corrosive
- Causes severe burns.
- Small amounts splashed into eyes can cause irreversible tissue damage and blindness.
- Symptoms: Redness, lachrymation, swelling of tissue

Ingestion
- If ingested, severe burns to mouth and throat, as well as a danger of perforation of the esophagus and the stomach.
- Symptoms: Nausea, Abdominal pain, Blood vomiting, suffocation, cough, severe shortness of breath
- Risk of: Respiratory disorder

4.3. Indication of immediate medical attention and special treatment needed.

Notes to physician
- Take the victim immediately to hospital.
- Consult with an ophthalmologist immediately in all cases.
- Burns must be treated by a physician.
- Keep under medical supervision for at least 48 hours.

5. FIRE-FIGHTING MEASURES

5.1. Suitable extinguishing media
- Water
- Water spray

5.2. Unsuitable Extinguishing media
- None.

5.3. Specific hazards arising from the chemical
- Oxygen released in thermal decomposition may support combustion.
- Contact with combustible material may cause fire.

- Contact with flammables may cause fire or explosions.
- Risk of explosion if heated under confinement.

5.4. Special protective equipment for fire-fighters
- Evacuate personnel to safe areas.
- In the event of fire, wear self-contained breathing apparatus.
- When intervention in proximity wear acid resistant over suit.
- Clean contaminated surface thoroughly.

5.5. Other information
- Keep product and empty container away from heat and sources of ignition.
- Keep containers and surroundings cool with water spray.
- Approach from upwind.
- HAZCHEM Code: 2P

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment, and emergency procedures

Advice to non-emergency personnel
- Prevent further leakage or spillage if safe to do so.
- Keep away from Incompatible products.

Advice to emergency personnel
- Evacuate personnel to safe areas.
- Keep people away from upwind spill/leak.
- Use personal protective equipment.
- In case of contact with combustible material, keep material wet with plenty of water.
- Keep wet with water.

6.2. Environmental precautions

- Limited quantity
  Flush into sewer with plenty of water.
- Large quantities:
  If the product contaminates rivers and lakes or drains inform the respective authorities.

6.3. Methods and materials for containment and cleaning up

- Dam up.
- Soak up with inert absorbent material.
- Dilute with plenty of water.
- Do not add chemical products.
- Keep in suitable, closed and properly labelled containers for disposal.
- Treat recovered material as described in the section "Disposal considerations".
- Never return spills in original containers for re-use.

7. HANDLING AND STORAGE

7.1. Precaution for safe handling

- Use only in well-ventilated areas.
- Keep away from heat.
- Keep away from Incompatible products.
- May not get in touch with:
  Organic materials
- Use only equipment and materials which are compatible with the product.
- Before all operations, passivate the piping circuits and vessels according to the procedure recommended by the producer.

- Never return unused material to storage receptacle.
- Use only in an area with adequate water supply.
- Containers and equipment used to handle the product should be used exclusively for that product.
- Do not confine the product in a circuit, between closed valves, or in a container without a vent.

7.2. Condition for safe Storage, including any incompatibilities

- Keep in a shaded and well-ventilated place.
- Keep away from heat and direct sunlight.
- Keep away from Incompatible products.
- Keep away from combustible material.
- Store in a receptacle equipped with a vent.
- Store in original container.
- Keep container closed.
- Keep in a bunded area.
- Regularly check the condition and temperature of the containers.
- Information about special precautions needed for bulk handling is available on request.

7.3. Packaging material

- Aluminum 99,5 %
- Stainless steel 304L / 316L
- Approved grades of HDPE

7.4. Specific use(s)

- For further information, please contact: Supplier

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1. Control Paramètres

Exposure Limit Values

Hydrogen peroxide

- WEL (TWA = 1 ppm, TWA = 1.4 mg/m^3)
- WEL (STEL = 2 ppm, STEL = 2.8 mg/m^3)
- TLV (NOHSC) (TWA = 1 ppm, TWA = 1.4 mg/m^3)

8.2. Appropriate Engineering Controls

- Ensure adequate ventilation.
- Apply technical measures to comply with the occupational exposure limits.

8.3 Individual Protection Measures

8.3.1. Respiratory protection

- In case of emissions, face mask with type NO-P3 cartridge.
- Self-contained breathing apparatus in medium confinement/insufficient oxygen/in case of large uncontrolled emissions/in all circumstances when the mask and cartridge do not give adequate protection.
- Use only respiratory protection that conforms to international/ national standards.

8.3.2. Hand protection

- Protective gloves - impervious chemical resistant:
- Take note of the information given by the producer concerning permeability and break through times, and of special workplace conditions (mechanical strain, duration of contact).

- Suitable material: PVC, Natural Rubber, Butyl-rubber, Nitrile Rubber

8.3.3. Eye protection

- Chemical resistant goggles must be worn.
- If splashes are likely to occur, wear: Tightly fitting safety goggles, Face-shield.

8.3.4. Skin and body protection

- Protective suit
- If splashes are likely to occur, wear:
- Apron, Boots
- Suitable material: PVC, rubber products

8.3.5. Hygiene measures

- Ensure that Safety showers are close to the workstation location.
- Eye wash bottle with pure water
- When using do not eat, drink or smoke.
- Handle in accordance with good industrial hygiene and safety practice.

8.4. Environmental exposure controls

- Dispose of rinse water in accordance with local and national regulations.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. General Information (appearance, odour)

Appearance	:	liquid
Color	:	colorless
Odour	:	pungent

9.2. Important Health Safety and Environmental Information

pH	:	<2.0 *Remarks*: Apparent pH
Boiling point/range	:	115 °C (H_2O_2 50 %)
Flash point	:	*Remarks*: The product is not flammable.
Melting point / freezing Point	:	-52 °C (H_2O_2 50 %).
Flammability (Solid, gas)	:	*Lower explosion limit*: *Remarks*: The product is not flammable.
Explosive properties	: :	Not explosive *Remarks*: With certain materials (see section 10).
Oxidizing properties	:	*Remarks*: yes
Vapour pressure	: : :	1 mbar *Temperature*: 30 °C (H_2O_2 50 %) 12 mbar *Temperature*: 20 °C *Remarks*: Total pressure (H_2O_2 + H_2O) (H_2O_2 50 %) 72 mbar *Temperature*: 50 °C

		Remarks: Total pressure (H_2O_2 + H_2O) (H_2O_2 50 %)
Relative density	:	1.2 (H_2O_2 50 %)
Bulk density	:	not applicable
Solubility	: : :	Soluble Water Polar organic solvents
Partition coefficient (in octanol/water)	:	*log Pow*: -1.1
Auto-ignition Temperature	:	not applicable
Decomposition Temperature	:	>= 60 °C *Remarks*: Self-Accelerating decomposition temperature (SADT)
	:	< 60 °C *Remarks*: Slow decomposition
Viscosity	:	1.17 mPa.s *Temperature*: 20 °C (H_2O_2 50 %)
Vapor density	:	1 (H_2O_2 50 %)

9.3. Other information

Surface tension	:	75.6 mN/m *Temperature*: 20 °C (H_2O_2 50 %)

10. STABILITY AND REACTIVITY

10.1. Reactivity

- Potential for exothermic hazard
- Decomposes on heating.
-

10.2. Chemical Stability

- Stable under recommended storage conditions.

10.3. Possibility of hazardous reactions

- Contact with combustible material may cause fire.
- Contact with flammable may cause fire or explosions.
- Risk of explosion if heated under confinement.
- Fire or intense heat may cause violet rupture

10.4. Conditions to avoid

- Contamination
- To avoid thermal decomposition, do not overheat.

10.5. Incompatible materials

- Acids, bases, metals, Salts of metals, reducing agents, organic materials, flammable materials.

10.6. Hazardous decomposition products

- Oxygen, the release of other hazardous decomposition products is possible if contaminated

with incompatible material.

11. TOXICOLOGICAL INFORMATION

11.1 Toxicological data

Acute oral toxicity

- LD_{50}, rat, >225 & <1200 mg/kgbw (H_2O_2 50 %)

Acute inhalation toxicity

- LC_{50}, 4 h, rat, 2.000 mg/m3 (Hydrogen peroxide)

Acute dermal toxicity

- LD_{50}, rabbit, > 2.000 mg/kg corrosive (H_2O_2 50 %)

Skin irritation

- Rabbit, Skin irritation, corrosive effet (H_2O_2 50 %)

Eye irritation

- Risk of serious damage to eyes. (H_2O_2 50 %)

Irritation (other route)

- Inhalation, mouse, Irritating to respiratory system., RD 50 = 665 mg/m3 (Hydrogen peroxide)

Sensitization

- Guinea pig, did not cause sensitization on laboratory animals.

Chronic toxicity

- Oral, Prolonged exposure, Various species, Target Organs**:** Gastrointestinal tract, observed effect.
- Inhalation, Repeated exposure, dog, LOEL**:** 14.6 mg/m3, irritant effects

Carcinogenicity

- Oral, Prolonged exposure, mouse, Target Organs**:** duodenum, carcinogenic effects
- Dermal, Prolonged exposure, mouse, Animal testing did not show any carcinogenic effects.

Toxicity for reproduction

- Substance is totally bio transformed (metabolized).
- Study scientifically unjustified.

Specific target Organ toxicity – Single exposure

- Inhalation, mice, 665 mg/m3,
- Remark: RD 50. Irritating to respiratory system.

Repeated dose toxicity

- Oral, 90-day, mouse, Target Organs: Gastrointestinal tract, 300ppm, LOAEL (Pure Substance)
- Oral, 90-day, mouse, 100 ppm, NOAEL (Pure Substance)
- Inhalation, 28-day, rat, Target Organs: Respiratory system, 10 ppm, LOAEL, vapor (Pure Substance)
- Inhalation, 28-day, 2 ppm, NOAEL, vapor (Pure substance)

Other information

- No data available.

12. ECOLOGICAL INFORMATION

12.1. Ecotoxicity

Acute toxicity

- Fishes, Pimephales promelas, LC_{50}, 96 h, 16.4 mg/l
- Fishes, Pimephales promelas, NOEC, 96 h, 5 mg/l
- Crustaceans, EC_{50}, 48 h, 2.4 mg/l
- Crustaceans, NOEC, 48 h, 1 mg/l

Chronic toxicity

- Molluscs, NOEC, 56 Days, 2 mg/l
- Algae, Chlorella vulgaris, EC_{50}, growth rate, 72 h, 4.3 mg/l
- Algae, Chlorella vulgaris, NOEC, 72 h, 0.1 mg/l

12.2. Persistence and degradability

Abiotic degradation

- Air, indirect photo-oxidation, $t_{1/2}$ from 16 - 20 h
  Conditions: sensitizer: OH radicals
- water, redox reaction, $t_{1/2}$ from 25 - 100 h
  Conditions: mineral and enzymatic catalysis, fresh water
- water, redox reaction, $t_{1/2}$ from 50 - 70 h
  Conditions: mineral and enzymatic catalysis, salt water
- Soil, redox reaction, $t_{1/2}$ from 0.05 - 15 h
  Conditions: mineral catalysis

Biodegradation

- aerobic, $t_{1/2}$ < 2 min
  Conditions: biological treatment sludge. Remarks: Readily biodegradable.
- aerobic, $t_{1/2}$ from 0.3 - 5 d
  Conditions: fresh water. Remarks: Readily biodegradable.
- Anaerobic.
  Conditions: Soil/Sediments. Remarks: not applicable
- aerobic, $t_{1/2}$ < 12 hrs.
  Conditions: soil. Remarks: Readily biodegradable.

12.3. Bio accumulative potential

- Bio accumulative potential
  Result: Does not bioaccumulate.

12.4. Mobility in Soil

- Air, Volatility, Henry's law constant (H) = 1 Pa.m^3/mol
  Conditions: 20 °C Remarks: not significant
- water
  Considerable solubility and mobility
  Remarks: The product evaporates slowly.
- Soil/sediments
  Remarks: non-significant evaporation and adsorption

12.5. Other adverse effects

- no data available

13. DISPOSAL CONSIDERATIONS

13.1. Waste from residues / unused products

- In accordance with local and national regulations.
- Limited quantity
- Dilute with plenty of water.
- Flush into sewer with plenty of water.

- Large quantities:
  Contact manufacturer.
  In accordance with local and national regulations.

13.2. Contaminated Packaging

- Empty containers.
- Clean container with water.
- Dispose of rinse water in accordance with local and national regulations.
- Do not rinse the dedicated containers.
- The empty and clean containers are to be reused in conformity with regulations.

14. TRANSPORT INFORMATION

IATA

UN number	UN 2014
Proper shipping name:	Not permitted to transport.
Transport Hazard Class	Not permitted to transport.
Sub-risks Hazard Class	Not permitted to transport.
Packing group	
Packing instruction (cargo aircraft)	Not permitted to transport.
Packing instruction (passenger aircraft)	Not permitted to transport.

- IATA: forbidden over 40 %

IMDG

UN number	UN 2014
Proper shipping name:	HYDROGEN PEROXIDE, AQUEOUS SOLUTION
Transport Hazard Class	5.1
Sub-risks Hazard Class	8
Packing group	II
Marine Pollutant	No
Labels	5.1 – Oxidizing substance 8 - Corrosive
EmS Number	F – H, S – Q

15. REGULATORY INFORMATION

15.1. Label

- Hazardous components which must be listed on the label: Hydrogen peroxide.
- Classified as hazardous according to criteria of NOHSC.

Symbol(s)	C	Corrosive
R-phrase(s)	R8	Contact with combustible material may cause fire.
	R34	Causes burns.
S-phrase(s)	S 1/2	Keep locked up and out of the reach of children.
	S 3	Keep in a cool place.
	S28	After contact with skin, wash immediately with Plenty of water.
	S36/39	Wear suitable protective clothing and eye/face. Protection.
	S45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where Possible).

15.2. Other information

- The percentage concentration of the solution must be indicated next to the product name.

16. OTHER INFORMATION

16.1. Text of phrases mentioned.

- WEL — WORKPLACE EXPOSURE LIMIT.
- TWA — TIME WEIGHTED AVERAGE.
- STEL — SHORT TERM EXPOSURE LIMIT.
- NOHSC — NATIONAL OCCUPATIONAL HEALTH AND SAFETY COMMISSION

16.2. NFPA (National Fire Protection Association) - Classification

Health	3 serious.
Flammability	0 minimal.
Instability or Reactivity	1 slight.
Special Notices	OX Oxidizer.

Safety Data Sheet

Section 1: Identification of the substance

1.1 Product identifiers

GT 01-16

1.2 Relevant identified uses

Oil and gas diagnostics

1.3 Details of the supplier of the safety data sheet

Patina Energy

1906 Johanna Drive, Ste A

Houston, Texas 77055

USA

1.4 Emergency telephone number

Emergency Phone #: (720) 532-4886

Section 2: Hazards identification

2.1 Classification of the substance

The substance is a modified hydrocarbon which is:

- Inert

- Non-hazardous

- Not dangerous

- Non-combustible

2.2 GHS Label elements, including precautionary statements

Pictogram – None

Signal word – None

Hazard statement – May be harmful if swallowed

Precautionary statements – Do not eat or drink when handling

Avoid release to the environment

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

None

Section 3: Composition

3.1 Substances

[redacted]tracer - 100%

Section 4: First aid measures

4.1 First aid measures

General advice - Move out of dangerous area.

If breathed in - Move person to fresh air. If not breathing, give artificial respiration.

In case of skin contact - Wash off with soap and plenty of water.

In case of eye contact - Flush eyes with water as a precaution.

If swallowed - Never give anything by mouth to an unconscious person. Rinse mouth with water.

4.2 Most important symptoms and effects, both acute and delayed

No data available

4.3 Indication of any immediate medical attention and special treatment needed

No data available

Section 5: Firefighting measures

5.1 Extinguishing media

No data available

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

No data available

5.4 Further information

No data available

Section 6: Accidental release measures

6.1 Personal precautions, protective equipment, and emergency procedures

For personal protection see section 8.

6.2 Environmental precautions

No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

Section 7: Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes.

7.2 Conditions for safe storage

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

7.3 Specific end uses

No other specific uses

Section 8: Personal protection

8.1 Control parameters

No data available

8.2 Personal Protection

Personal protective equipment

Eye protection – Safety glasses with side shields

Skin protection – Handle with gloves. Wash and dry hands.

Body Protection – Long sleeves, trousers, and steel-toed boots.

Control of environmental exposure – Avoid discharge into the environment.

Section 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a) Appearance Form: colorless liquid

b) Odor - No data available

c) Odor Threshold - No data available

d) pH - No data available

e) Melting point - Melting point: No data available

f) Initial boiling point and boiling range - No data available

g) Flash point – No data available

h) Evaporation rate - No data available

i) Flammability (solid, gas) – No data available

j) Upper/lower flammability or explosive limits - No data available

k) Vapor pressure - No data available

l) Vapor density - No data available

m) Relative density - No data available

n) Water solubility - No data available

o) Partition coefficient - No data available

p) Auto-ignition temperature – No data available

q) Decomposition temperature - No data available

r) Viscosity - No data available

s) Explosive properties - No data available

t) Oxidizing properties - No data available

9.2 Other safety information - No data available

Section 10: Stability and reactivity

10.1 Reactivity

No data available

10.2 Chemical stability

Stable

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

No data available

10.6 Hazardous decomposition products

No data available

Section 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Carcinogenicity

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Section 12: Ecological information

12.1 Toxicity

No data available

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT assessment

No data available

12.6 Other adverse effects

No data available

Section 13: Disposal considerations

13.1 Waste treatment methods

Dispose of as unused product.

Section 14: Transport information

DOT (US)

Not dangerous goods

The above information is believed to be correct but does not claim to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions.

HALLIBURTON

SAFETY DATA SHEET

[redacted]

Revision Date: 27-Jul-2023 **Revision Number:** 13

1. Identification of the hazardous chemical and of the supplier

Product identifier

Product Name [redacted]

Other means of identification

Hazardous Material Number: HB003388

Recommended use of the chemical and restrictions on use

Recommended Use Bactericide

Supplier details

Halliburton Energy Service (M) Sdn Bhd
10th Floor, G Tower,
199 Jalan Tun Razak,
50400, Kuala Lumpur, Malaysia
Phone Number: +603-9206 6888

Halliburton Energy Service (M) Sdn Bhd
Labuan Base,
Ranca-Ranca Industrial Estate
Labuan FT, LAB 82223 Malaysia
Phone Number: +60 87-596 200 ext Gate B-886086263

Halliburton Energy Service (M) Sdn Bhd
Warehouse 38, Phase 2, Kemaman Supply Base (KSB)
24007, Kemaman
Terengganu, Malaysia
Phone Number : +609-862 8000

For further information, please contact:

E-mail Address fdunexchem@halliburton.com

Emergency Phone number

+60 015 4 877 0772
Global Incident Response Access Code: 334305
Contract Number: 14012

2. Hazard Identification

Classification of the hazardous chemical

Acute Oral Toxicity	Category 4 - H302
Acute inhalation toxicity - vapor	Category 4 - H332
Skin Corrosion / Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Skin Sensitization	Category 1 - H317
Specific Target Organ Toxicity - (Repeated Exposure)	Category 2 - H373
Chronic Aquatic Toxicity	Category 3 - H412

Label Elements

Hazard Pictograms

Signal Word: **Danger**

Hazard Statements

H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H332 - Harmful if inhaled
H373 - May cause damage to organs through prolonged or repeated exposure
H412 - Harmful to aquatic life with long lasting effects

Precautionary Statements

Prevention

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
P271 - Use only outdoors or in a well-ventilated area
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

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 person to fresh air and keep 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
P301 + P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
P330 - Rinse mouth
P312 - Call a POISON CENTER and doctor/physician if you feel unwell.
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P333 + P313 - If skin irritation or rash occurs: 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**
Oxazolidine	Proprietary

Special Labelling of certain mixtures Use biocides safely. Always read the label and product information before use.

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).

3. Composition and information on ingredients of the hazardous chemical

Substances	CAS Number	PERCENT (w/w)	GHS Classification - Malaysia
[redacted]	Proprietary	> 60%	Acute Tox. 4 (H302) Acute Tox. 4 (H332) Skin Corr. 1C (H314) Eye Corr. 1 (H318) Skin Sens. 1 (H317) STOT RE 2 (H373) Aquatic Chronic 3 (H412)

4. First aid measures

Description of 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.

Most important symptoms and effects, both acute and delayed

Harmful if swallowed. Toxic in contact with skin. Causes severe skin burns and eye damage. Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause allergic skin reaction. Harmful if inhaled. May cause heritable genetic damage. May cause cancer. May cause damage to organs through prolonged or repeated exposure.

Indication of any immediate medical attention and special treatment needed

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable extinguishing media

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

None known.

Physicochemical 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

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.
See Section 8 for additional information.

Environmental precautions

Prevent from entering sewers, waterways, or low areas. Consult local authorities.

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

Precautions for safe handling

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Avoid breathing mist. Ensure adequate ventilation. Do NOT consume food, drink, or tobacco in contaminated areas. 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.

Conditions for safe storage, including any incompatibilities

Store in original container. Store away from oxidizers. 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. Keep Away From Food

8. Exposure controls and personal protection

Control parameters

Exposure Limits

Substances	CAS Number	Malaysia OEL	ACGIH TLV-TWA
Oxazolidine	Proprietary	Not applicable	Not applicable

Appropriate engineering controls

Engineering Controls Use in a well ventilated area.

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 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 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. 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 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. (EN-166)

Other Precautions Eyewash fountains and safety showers must be easily accessible.

Environmental Exposure Controls Do not flush into surface water or sanitary sewer system. Avoid subsoil penetration

9. Physical and chemical properties

Information on basic physical and chemical properties

Physical State: Liquid
Color Colorless to slight yellow
Odor: Sweet amine
Odor Threshold: No information available

Property Remarks/ - Method	Values
pH:	10 (0.15%)
Freezing Point / Range	No data available
Melting Point / Range	< -35 °C / -31 °F
Pour Point / Range	< -39 °C / < -38.2 °F
Boiling Point / Range	204 °C / 399.2 °F
Flash Point	> 100 °C / > 212 °F (PMCC)
Evaporation rate	No data available
Vapor Pressure	0.014 hPa
Vapor Density	No data available
Specific Gravity	1.049 - 1.069
Water Solubility	Soluble in water
Solubility in other solvents	benzene heptane
Partition coefficient: n-octanol/water	1.89
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	&21
Explosive Properties	No information available
Oxidizing Properties	No information available

Other information

Molecular Weight	186.25
VOC Content (%)	No data available

10. Stability and reactivity

Reactivity
Not expected to be reactive.

Chemical stability
Stable under recommended storage conditions

Possibility of hazardous reactions
Will Not Occur

Conditions to avoid
None anticipated

Incompatible materials
Strong oxidizers. Strong acids. Reducing agents.

Hazardous decomposition products
Formaldehyde. Oxides of nitrogen. Oxides of sulfur.

11. Toxicological information

Information on possible routes of exposure
Principle Route of Exposure Eye or skin contact, inhalation.

Symptoms related to exposure

Most Important Symptoms/Effects

Harmful if swallowed. Toxic in contact with skin. Causes severe skin burns and eye damage. Causes severe eye irritation which may damage tissue. Causes severe skin irritation with tissue destruction. May cause allergic skin reaction. Harmful if inhaled. May cause heritable genetic damage. May cause cancer. May cause damage to organs through prolonged or repeated exposure.

Numerical measures of toxicity

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
[redacted]	Proprietary	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 serious eye damage

Skin Contact Toxic in contact with skin. Causes severe skin irritation with tissue destruction. May cause an allergic skin reaction.

Ingestion Harmful if swallowed. Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity Suspected of causing genetic defects May cause cancer Prolonged or repeated exposure may cause damage to the upper respiratory tract. May cause damage to organs through prolonged or repeated exposure.

Exposure Levels

No data available

Interactive effects

Skin disorders. Eye ailments.

Data limitations

No data available

Substances	CAS Number	Skin corrosion/irritation
[redacted]		Causes severe irritation and or burns (Rabbit)

	CAS Number	Serious eye damage/irritation
		Causes severe irritation and or burns (Rabbit)

	CAS Number	Skin Sensitization
		May cause sensitization by skin contact (guinea pig)

	CAS Number	Respiratory Sensitization
		No information available

	CAS Number	Mutagenic Effects
		In vivo tests did not show mutagenic effects. In vitro tests did not show mutagenic effects.

	CAS Number	Carcinogenic Effects
		Did not show carcinogenic effects in animal experiments

	CAS Number	Reproductive toxicity
		Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.

	CAS Number	STOT - single exposure
		No significant toxicity observed in animal studies at concentration requiring classification.

	CAS Number	STOT - repeated exposure
		Causes damage to organs through prolonged or repeated exposure: Gastrointestinal tract (GI) Respiratory system

	CAS Number	Aspiration hazard
		Not applicable

12. Ecological information

Ecotoxicity

12.1. Toxicity

Ecotoxicity effects

Toxic to aquatic life. Toxic to aquatic life with long lasting effects.

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
[redacted]	Proprietary	EC50(72 h)=5.7 mg/L (Desmodesmus subspicatus) EC50()=3.35 mg/L (Skeletonema costatum)	LC50(96 h)=135.21 mg/L (Scophthalmus maximus)	EC50: 44 mg/L (activated sludge)	EC50(48 h)=37.9 mg/L (Daphnia magna) EC50(48 h)=4.1 mg/L (Acartia tonsa) NOEC(21 d)=1.3 mg/L (Daphnia magna)

Persistence and degradability

Substances	CAS Number	Persistence and Degradability
[redacted]	Proprietary	Readily biodegradable (69.4% @ 28d)

Bioaccumulative potential

Substances	CAS Number	Bioaccumulation
[redacted]	Proprietary	Log Pow=-0.11

Mobility in soil

Substances	CAS Number	Mobility
[redacted]	Proprietary	No information available

Other adverse effects

Does not contain any organically bound halogen. May not increase the AOX value when discharged from treatment plants or into natural waters.

Endocrine Disruptor Information

This product does not contain any known or suspected endocrine disruptors

13. Disposal considerations

Disposal methods

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.

Contaminated Packaging Follow all applicable national or local regulations.

14. Transportation information

Transportation Information

UN Number UN2735
UN proper shipping name: Amines, Liquid, Corrosive, N.O.S. (Contains N, N' -Methylenebis[5-methyl oxazolidine])
Transport Hazard Class(es): 8
Packing Group: III
Environmental Hazards: Not applicable

IMDG/IMO

UN Number UN2922
UN proper shipping name: Corrosive Liquid, Toxic, N.O.S. (reaction products of paraformaldehyde and 2-hydroxypropylamine (ratio 3:2); [MBO])
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. (reaction products of paraformaldehyde and 2-hydroxypropylamine (ratio 3:2); [MBO])

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 for user
None

HazChem Code
2X

15. Regulatory information

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.

Safety, health, and environmental regulations specific for the hazardous chemcial

Malaysia Occupation Safety and Health - Prohibition of Use Substances:	Does not apply
Malaysia Substances Requiring Medical Surveillance:	Does not apply
Malaysia Environmentally Hazardous Substances (EHS):	Does not apply

16. Other information

Revision Date: 27-Jul-2023
Revision Note
Update to Format
SDS sections updated:
2

Key literature references and sources for data
www.ChemADVISOR.com/
NZ CCID

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
STEL – Short Term Exposure Limit
SU – Sector of Use category
TWA – Time-Weighted Average
UN – United Nations
VOC – Volatile Organic Carbon
vPvB – very Persistent and very Bioaccumulative
VLA-ED - time-weighted average values for a whole work shift [Spain valores límite ambientales para la exposición diaria]
NDS - najwyisze dopuszczalne stkienie na stanowisku pracy
SZW - Netherlands Ministry of Social Affairs and Employment
ADR - The European Agreement concerning the International Carriage of Dangerous Goods by Road
AS/NZS 1715 - New Zeland Standard on Selection, use and maintenance of respiratory protective equipment
C - Celsius
EN 149 - European standard on filtering halfmasks to protect against particles
EN 374 - European standard on Protective gloves against chemicals and micro-organisms
FFP - Filtering Facepieces
h - hour
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
NDS - OEL-TWA [Poland najwyisze dopuszczalne stkienie na stanowisku pracy]
R/H-phrases - Risk/Hazard-phrases
RID - The European Agreement concerning the International Carriage of Dangerous Goods by Rail
UK - United Kingdom
w/w - weight/weight
VLA-EC - short-time excursion limits [Spain valores límite ambientales para la exposición de corta duración]
MAK - Maximum Workplace Concentration
d - day

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

Appendix E

Tracer Analytical Results

ANALYTICAL REPORT

Lab Number:	L2629674
Client:	Patina Energy, LLC 1906 Johanna Dr. Suite A Houston, TX 77055
ATTN:	Kurt Parker
Phone:	(281) 797-3660
Project Name:	Not Specified
Project Number:	Not Specified
Report Date:	05/21/26

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

Lab Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2629674-01	BLANK	WATER	Not Specified	05/14/26 15:00	05/15/26
L2629674-02	SAMPLE (TRACER)	WATER	Not Specified	05/14/26 15:00	05/15/26

Project Name:	Not Specified	**Lab Number:**	L2629674
Project Number:	Not Specified	**Report Date:**	05/21/26

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Pace Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments and solids are reported on a dry weight basis unless otherwise noted. Tissues are reported "as received" or on a wet weight basis, unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Pace's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Pace Project Manager and made arrangements for Pace to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name:	Not Specified	**Lab Number:**	L2629674
Project Number:	Not Specified	**Report Date:**	05/21/26

Case Narrative (continued)

Sample Receipt

L2629674-01 and -02: The collection date and time were obtained from the container labels.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Ashley Leitao Ashley Leitao

Title: Technical Director/Representative Date: 05/21/26

QC OUTLIER SUMMARY REPORT

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment

There are no QC Outliers associated with this report.

ORGANICS

SEMIVOLATILES

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

SAMPLE RESULTS

Lab ID: L2629674-01
Client ID: BLANK
Sample Location: Not Specified

Date Collected: 05/14/26 15:00
Date Received: 05/15/26
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 168,1633A
Analytical Date: 05/21/26 11:26
Analyst: AC

Extraction Method: EPA 1633
Extraction Date: 05/16/26 07:00

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	6.38	--	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	3.19	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.60	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	6.38	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.60	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.60	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.60	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.60	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.60	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	6.38	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.60	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.60	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.60	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.60	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	6.38	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.60	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.60	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.60	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.60	--	1
Perfluorooctanesulfonamide (PFOSA)	ND		ng/l	1.60	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.60	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.60	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.60	--	1
Perfluorotetradecanoic Acid (PFTeDA)	ND		ng/l	1.60	--	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		ng/l	6.38	--	1
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	6.38	--	1

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

SAMPLE RESULTS

Lab ID: L2629674-01
Client ID: BLANK
Sample Location: Not Specified

Date Collected: 05/14/26 15:00
Date Received: 05/15/26
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab						
Perfluorododecanesulfonic Acid (PFDoS)	ND		ng/l	1.60	--	1
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	6.38	--	1
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	6.38	--	1
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA)	ND		ng/l	1.60	--	1
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA)	ND		ng/l	1.60	--	1
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE)	ND		ng/l	16.0	--	1
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE)	ND		ng/l	16.0	--	1
Perfluoro-3-Methoxypropanoic Acid (PFMPA)	ND		ng/l	3.19	--	1
Perfluoro-4-Methoxybutanoic Acid (PFMBA)	ND		ng/l	3.19	--	1
Perfluoro(2-Ethoxyethane)Sulfonic Acid (PFEESA)	ND		ng/l	3.19	--	1
Nonafluoro-3,6-Dioxaheptanoic Acid (NFDHA)	ND		ng/l	3.19	--	1
3-Perfluoropropyl Propanoic Acid (3:3FTCA)	ND		ng/l	7.98	--	1
2H,2H,3H,3H-Perfluorooctanoic Acid (5:3FTCA)	ND		ng/l	39.9	--	1
3-Perfluoroheptyl Propanoic Acid (7:3FTCA)	ND		ng/l	39.9	--	1

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

SAMPLE RESULTS

Lab ID: L2629674-01
Client ID: BLANK
Sample Location: Not Specified

Date Collected: 05/14/26 15:00
Date Received: 05/15/26
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor

Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[13C4]Butanoic Acid (13C4-PFBA)	90		5-130
Perfluoro-n-[13C5]Pentanoic Acid (13C5-PFPeA)	88		40-130
Perfluoro-1-[2,3,4-13C3]Butanesulfonic Acid (13C3-PFBS)	75		40-135
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Hexanesulfonic Acid (13C2-4:2FTS)	82		40-200
Perfluoro-n-[1,2,3,4,6-13C5]Hexanoic Acid (13C5-PFHxA)	83		40-130
Perfluoro-n-[1,2,3,4-13C4]Heptanoic Acid (13C4-PFHpA)	101		40-130
Perfluoro-1-[1,2,3-13C3]Hexanesulfonic Acid (13C3-PFHxS)	75		40-130
Perfluoro-n-[13C8]Octanoic Acid (13C8-PFOA)	82		40-130
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Octanesulfonic Acid (13C2-6:2FTS)	87		40-200
Perfluoro-n-[13C9]Nonanoic Acid (13C9-PFNA)	87		40-130
Perfluoro-1-[13C8]Octanesulfonic Acid (13C8-PFOS)	61		40-130
Perfluoro-n-[1,2,3,4,5,6-13C6]Decanoic Acid (13C6-PFDA)	70		40-130
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Decanesulfonic Acid (13C2-8:2FTS)	65		40-300
N-Methyl-d3-perfluoro-1-octanesulfonamidoacetic Acid (D3-NMeFOSAA)	57		40-170
Perfluoro-n-[1,2,3,4,5,6,7-13C7]Undecanoic Acid (13C7-PFUnA)	82		30-130
Perfluoro-1-[13C8]Octanesulfonamide (13C8-PFOSA)	85		40-130
N-Ethyl-d5-perfluoro-1-octanesulfonamidoacetic Acid (D5-NEtFOSAA)	58		25-135
Perfluoro-n-[1,2-13C2]Dodecanoic Acid (13C2-PFDoA)	62		10-130
Perfluoro-n-[1,2-13C2]Tetradecanoic Acid (13C2-PFTeDA)	52		10-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	81		40-130
N-Methyl-d3-Perfluoro-1-Octanesulfonamide (D3-NMeFOSA)	77		10-130
N-Ethyl-d5-Perfluoro-1-Octanesulfonamide (D5-NEtFOSA)	83		10-130
N-Methyl-d7-Perfluorooctanesulfonamidoethanol (D7-NMeFOSE)	100		10-130
N-Ethyl-d9-Perfluorooctanesulfonamidoethanol (D9-NEtFOSE)	99		10-130

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

SAMPLE RESULTS

Lab ID: L2629674-02
Client ID: SAMPLE (TRACER)
Sample Location: Not Specified

Date Collected: 05/14/26 15:00
Date Received: 05/15/26
Field Prep: Not Specified

Sample Depth:
Matrix: Water
Analytical Method: 168,1633A
Analytical Date: 05/21/26 11:34
Analyst: AC

Extraction Method: EPA 1633
Extraction Date: 05/16/26 07:00

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	ND		ng/l	6.01	--	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	3.00	--	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.50	--	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	6.01	--	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.50	--	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.50	--	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.50	--	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.50	--	1
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.50	--	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	6.01	--	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.50	--	1
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.50	--	1
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.50	--	1
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.50	--	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	6.01	--	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.50	--	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.50	--	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.50	--	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.50	--	1
Perfluorooctanesulfonamide (PFOSA)	ND		ng/l	1.50	--	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.50	--	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.50	--	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.50	--	1
Perfluorotetradecanoic Acid (PFTeDA)	ND		ng/l	1.50	--	1
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		ng/l	6.01	--	1
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	6.01	--	1

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

SAMPLE RESULTS

Lab ID: L2629674-02
Client ID: SAMPLE (TRACER)
Sample Location: Not Specified

Date Collected: 05/14/26 15:00
Date Received: 05/15/26
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab						
Perfluorododecanesulfonic Acid (PFDoS)	ND		ng/l	1.50	--	1
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	6.01	--	1
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	6.01	--	1
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA)	ND		ng/l	1.50	--	1
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA)	ND		ng/l	1.50	--	1
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE)	ND		ng/l	15.0	--	1
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE)	ND		ng/l	15.0	--	1
Perfluoro-3-Methoxypropanoic Acid (PFMPA)	ND		ng/l	3.00	--	1
Perfluoro-4-Methoxybutanoic Acid (PFMBA)	ND		ng/l	3.00	--	1
Perfluoro(2-Ethoxyethane)Sulfonic Acid (PFEESA)	ND		ng/l	3.00	--	1
Nonafluoro-3,6-Dioxaheptanoic Acid (NFDHA)	ND		ng/l	3.00	--	1
3-Perfluoropropyl Propanoic Acid (3:3FTCA)	ND		ng/l	7.51	--	1
2H,2H,3H,3H-Perfluorooctanoic Acid (5:3FTCA)	ND		ng/l	37.6	--	1
3-Perfluoroheptyl Propanoic Acid (7:3FTCA)	ND		ng/l	37.6	--	1

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L2629674
Report Date: 05/21/26

SAMPLE RESULTS

Lab ID: L2629674-02
Client ID: SAMPLE (TRACER)
Sample Location: Not Specified
Date Collected: 05/14/26 15:00
Date Received: 05/15/26
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab						

Surrogate	% Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[13C4]Butanoic Acid (13C4-PFBA)	90		5-130
Perfluoro-n-[13C5]Pentanoic Acid (13C5-PFPeA)	88		40-130
Perfluoro-1-[2,3,4-13C3]Butanesulfonic Acid (13C3-PFBS)	85		40-135
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Hexanesulfonic Acid (13C2-4:2FTS)	74		40-200
Perfluoro-n-[1,2,3,4,6-13C5]Hexanoic Acid (13C5-PFHxA)	84		40-130
Perfluoro-n-[1,2,3,4-13C4]Heptanoic Acid (13C4-PFHpA)	95		40-130
Perfluoro-1-[1,2,3-13C3]Hexanesulfonic Acid (13C3-PFHxS)	84		40-130
Perfluoro-n-[13C8]Octanoic Acid (13C8-PFOA)	82		40-130
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Octanesulfonic Acid (13C2-6:2FTS)	85		40-200
Perfluoro-n-[13C9]Nonanoic Acid (13C9-PFNA)	95		40-130
Perfluoro-1-[13C8]Octanesulfonic Acid (13C8-PFOS)	68		40-130
Perfluoro-n-[1,2,3,4,5,6-13C6]Decanoic Acid (13C6-PFDA)	81		40-130
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Decanesulfonic Acid (13C2-8:2FTS)	66		40-300
N-Methyl-d3-perfluoro-1-octanesulfonamidoacetic Acid (D3-NMeFOSAA)	53		40-170
Perfluoro-n-[1,2,3,4,5,6,7-13C7]Undecanoic Acid (13C7-PFUnA)	77		30-130
Perfluoro-1-[13C8]Octanesulfonamide (13C8-PFOSA)	67		40-130
N-Ethyl-d5-perfluoro-1-octanesulfonamidoacetic Acid (D5-NEtFOSAA)	56		25-135
Perfluoro-n-[1,2-13C2]Dodecanoic Acid (13C2-PFDoA)	67		10-130
Perfluoro-n-[1,2-13C2]Tetradecanoic Acid (13C2-PFTeDA)	52		10-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	76		40-130
N-Methyl-d3-Perfluoro-1-Octanesulfonamide (D3-NMeFOSA)	67		10-130
N-Ethyl-d5-Perfluoro-1-Octanesulfonamide (D5-NEtFOSA)	71		10-130
N-Methyl-d7-Perfluorooctanesulfonamidoethanol (D7-NMeFOSE)	86		10-130
N-Ethyl-d9-Perfluorooctanesulfonamidoethanol (D9-NEtFOSE)	81		10-130

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

Method Blank Analysis
Batch Quality Control

Analytical Method: 168,1633A
Analytical Date: 05/21/26 09:47
Analyst: AC

Extraction Method: EPA 1633
Extraction Date: 05/16/26 07:00

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab for sample(s): 01-02 Batch: WG2214086-1					
Perfluorobutanoic Acid (PFBA)	ND		ng/l	6.40	--
Perfluoropentanoic Acid (PFPeA)	ND		ng/l	3.20	--
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/l	1.60	--
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/l	6.40	--
Perfluorohexanoic Acid (PFHxA)	ND		ng/l	1.60	--
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/l	1.60	--
Perfluoroheptanoic Acid (PFHpA)	ND		ng/l	1.60	--
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/l	1.60	--
Perfluorooctanoic Acid (PFOA)	ND		ng/l	1.60	--
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/l	6.40	--
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/l	1.60	--
Perfluorononanoic Acid (PFNA)	ND		ng/l	1.60	--
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/l	1.60	--
Perfluorodecanoic Acid (PFDA)	ND		ng/l	1.60	--
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/l	6.40	--
Perfluorononanesulfonic Acid (PFNS)	ND		ng/l	1.60	--
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/l	1.60	--
Perfluoroundecanoic Acid (PFUnA)	ND		ng/l	1.60	--
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/l	1.60	--
Perfluorooctanesulfonamide (PFOSA)	ND		ng/l	1.60	--
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/l	1.60	--
Perfluorododecanoic Acid (PFDoA)	ND		ng/l	1.60	--
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/l	1.60	--

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

Method Blank Analysis
Batch Quality Control

Analytical Method: 168,1633A
Analytical Date: 05/21/26 09:47
Analyst: AC

Extraction Method: EPA 1633
Extraction Date: 05/16/26 07:00

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab for sample(s): 01-02 Batch: WG2214086-1					
Perfluorotetradecanoic Acid (PFTeDA)	ND		ng/l	1.60	--
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	ND		ng/l	6.40	--
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	ND		ng/l	6.40	--
Perfluorododecanesulfonic Acid (PFDoS)	ND		ng/l	1.60	--
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	ND		ng/l	6.40	--
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	ND		ng/l	6.40	--
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA)	ND		ng/l	1.60	--
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA)	ND		ng/l	1.60	--
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE)	ND		ng/l	16.0	--
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE)	ND		ng/l	16.0	--
Perfluoro-3-Methoxypropanoic Acid (PFMPA)	ND		ng/l	3.20	--
Perfluoro-4-Methoxybutanoic Acid (PFMBA)	ND		ng/l	3.20	--
Perfluoro(2-Ethoxyethane)Sulfonic Acid (PFEESA)	ND		ng/l	3.20	--
Nonafluoro-3,6-Dioxaheptanoic Acid (NFDHA)	ND		ng/l	3.20	--
3-Perfluoropropyl Propanoic Acid (3:3FTCA)	ND		ng/l	8.00	--
2H,2H,3H,3H-Perfluorooctanoic Acid (5:3FTCA)	ND		ng/l	40.0	--
3-Perfluoroheptyl Propanoic Acid (7:3FTCA)	ND		ng/l	40.0	--

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

Method Blank Analysis
Batch Quality Control

Analytical Method: 168,1633A
Analytical Date: 05/21/26 09:47
Analyst: AC

Extraction Method: EPA 1633
Extraction Date: 05/16/26 07:00

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab for sample(s): 01-02 Batch: WG2214086-1					

Surrogate	%Recovery	Qualifier	Acceptance Criteria
Perfluoro-n-[13C4]Butanoic Acid (13C4-PFBA)	87		5-130
Perfluoro-n-[13C5]Pentanoic Acid (13C5-PFPeA)	85		40-130
Perfluoro-1-[2,3,4-13C3]Butanesulfonic Acid (13C3-PFBS)	66		40-135
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Hexanesulfonic Acid (13C2-4:2FTS)	76		40-200
Perfluoro-n-[1,2,3,4,6-13C5]Hexanoic Acid (13C5-PFHxA)	84		40-130
Perfluoro-n-[1,2,3,4-13C4]Heptanoic Acid (13C4-PFHpA)	99		40-130
Perfluoro-1-[1,2,3-13C3]Hexanesulfonic Acid (13C3-PFHxS)	70		40-130
Perfluoro-n-[13C8]Octanoic Acid (13C8-PFOA)	81		40-130
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Octanesulfonic Acid (13C2-6:2FTS)	78		40-200
Perfluoro-n-[13C9]Nonanoic Acid (13C9-PFNA)	92		40-130
Perfluoro-1-[13C8]Octanesulfonic Acid (13C8-PFOS)	59		40-130
Perfluoro-n-[1,2,3,4,5,6-13C6]Decanoic Acid (13C6-PFDA)	79		40-130
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Decanesulfonic Acid (13C2-8:2FTS)	69		40-300
N-Methyl-d3-perfluoro-1-octanesulfonamidoacetic Acid (D3-NMeFOSAA)	50		40-170
Perfluoro-n-[1,2,3,4,5,6,7-13C7]Undecanoic Acid (13C7-PFUnA)	78		30-130
Perfluoro-1-[13C8]Octanesulfonamide (13C8-PFOSA)	75		40-130
N-Ethyl-d5-perfluoro-1-octanesulfonamidoacetic Acid (D5-NEtFOSAA)	56		25-135
Perfluoro-n-[1,2-13C2]Dodecanoic Acid (13C2-PFDoA)	63		10-130
Perfluoro-n-[1,2-13C2]Tetradecanoic Acid (13C2-PFTeDA)	49		10-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	75		40-130
N-Methyl-d3-Perfluoro-1-Octanesulfonamide (D3-NMeFOSA)	71		10-130
N-Ethyl-d5-Perfluoro-1-Octanesulfonamide (D5-NEtFOSA)	72		10-130
N-Methyl-d7-Perfluorooctanesulfonamidoethanol (D7-NMeFOSE)	94		10-130
N-Ethyl-d9-Perfluorooctanesulfonamidoethanol (D9-NEtFOSE)	89		10-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

Parameter	Low Level LCS %Recovery	Qual	Low Level LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab Associated sample(s): 01-02 Batch: WG2214086-2 LOW LEVEL								
Perfluorobutanoic Acid (PFBA)	114		-		70-140	-		
Perfluoropentanoic Acid (PFPeA)	104		-		65-135	-		
Perfluorobutanesulfonic Acid (PFBS)	111		-		60-145	-		
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	104		-		70-145	-		
Perfluorohexanoic Acid (PFHxA)	104		-		70-145	-		
Perfluoropentanesulfonic Acid (PFPeS)	94		-		65-140	-		
Perfluoroheptanoic Acid (PFHpA)	106		-		70-150	-		
Perfluorohexanesulfonic Acid (PFHxS)	107		-		65-145	-		
Perfluorooctanoic Acid (PFOA)	100		-		70-150	-		
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	96		-		65-155	-		
Perfluoroheptanesulfonic Acid (PFHpS)	119		-		70-150	-		
Perfluorononanoic Acid (PFNA)	90		-		70-150	-		
Perfluorooctanesulfonic Acid (PFOS)	122		-		55-150	-		
Perfluorodecanoic Acid (PFDA)	104		-		70-140	-		
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	92		-		60-150	-		
Perfluorononanesulfonic Acid (PFNS)	98		-		65-145	-		
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	119		-		50-140	-		
Perfluoroundecanoic Acid (PFUnA)	96		-		70-145	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

Parameter	Low Level LCS %Recovery	Qual	Low Level LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab Associated sample(s): 01-02 Batch: WG2214086-2 LOW LEVEL								
Perfluorodecanesulfonic Acid (PFDS)	78		-		60-145	-		
Perfluorooctanesulfonamide (PFOSA)	110		-		70-145	-		
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	107		-		70-145	-		
Perfluorododecanoic Acid (PFDoA)	94		-		70-140	-		
Perfluorotridecanoic Acid (PFTrDA)	88		-		65-140	-		
Perfluorotetradecanoic Acid (PFTeDA)	108		-		60-140	-		
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	117		-		70-140	-		
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	96		-		65-145	-		
Perfluorododecanesulfonic Acid (PFDoS)	64		-		50-145	-		
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	105		-		70-155	-		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	71		-		55-160	-		
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA)	98		-		60-150	-		
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA)	102		-		65-145	-		
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE)	96		-		70-145	-		
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE)	97		-		70-135	-		
Perfluoro-3-Methoxypropanoic Acid (PFMPA)	105		-		55-140	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

Parameter	Low Level LCS %Recovery	Qual	Low Level LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab Associated sample(s): 01-02 Batch: WG2214086-2 LOW LEVEL								
Perfluoro-4-Methoxybutanoic Acid (PFMBA)	108		-		60-150	-		
Perfluoro(2-Ethoxyethane)Sulfonic Acid (PFEESA)	90		-		70-140	-		
Nonafluoro-3,6-Dioxaheptanoic Acid (NFDHA)	105		-		50-150	-		
3-Perfluoropropyl Propanoic Acid (3:3FTCA)	106		-		65-130	-		
2H,2H,3H,3H-Perfluorooctanoic Acid (5:3FTCA)	106		-		70-135	-		
3-Perfluoroheptyl Propanoic Acid (7:3FTCA)	70		-		50-145	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

Parameter	Low Level LCS %Recovery	Qual	Low Level LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab Associated sample(s): 01-02 Batch: WG2214086-2 LOW LEVEL								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro-n-[13C4]Butanoic Acid (13C4-PFBA)	90				5-130
Perfluoro-n-[13C5]Pentanoic Acid (13C5-PFPeA)	82				40-130
Perfluoro-1-[2,3,4-13C3]Butanesulfonic Acid (13C3-PFBS)	71				40-135
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Hexanesulfonic Acid (13C2-4:2FTS)	77				40-200
Perfluoro-n-[1,2,3,4,6-13C5]Hexanoic Acid (13C5-PFHxA)	87				40-130
Perfluoro-n-[1,2,3,4-13C4]Heptanoic Acid (13C4-PFHpA)	96				40-130
Perfluoro-1-[1,2,3-13C3]Hexanesulfonic Acid (13C3-PFHxS)	71				40-130
Perfluoro-n-[13C8]Octanoic Acid (13C8-PFOA)	84				40-130
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Octanesulfonic Acid (13C2-6:2FTS)	84				40-200
Perfluoro-n-[13C9]Nonanoic Acid (13C9-PFNA)	94				40-130
Perfluoro-1-[13C8]Octanesulfonic Acid (13C8-PFOS)	62				40-130
Perfluoro-n-[1,2,3,4,5,6-13C6]Decanoic Acid (13C6-PFDA)	84				40-130
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Decanesulfonic Acid (13C2-8:2FTS)	67				40-300
N-Methyl-d3-perfluoro-1-octanesulfonamidoacetic Acid (D3-NMeFOSAA)	52				40-170
Perfluoro-n-[1,2,3,4,5,6,7-13C7]Undecanoic Acid (13C7-PFUnA)	78				30-130
Perfluoro-1-[13C8]Octanesulfonamide (13C8-PFOSA)	77				40-130
N-Ethyl-d5-perfluoro-1-octanesulfonamidoacetic Acid (D5-NEtFOSAA)	58				25-135
Perfluoro-n-[1,2-13C2]Dodecanoic Acid (13C2-PFDoA)	62				10-130
Perfluoro-n-[1,2-13C2]Tetradecanoic Acid (13C2-PFTeDA)	53				10-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	76				40-130
N-Methyl-d3-Perfluoro-1-Octanesulfonamide (D3-NMeFOSA)	63				10-130
N-Ethyl-d5-Perfluoro-1-Octanesulfonamide (D5-NEtFOSA)	68				10-130
N-Methyl-d7-Perfluorooctanesulfonamidoethanol (D7-NMeFOSE)	90				10-130
N-Ethyl-d9-Perfluorooctanesulfonamidoethanol (D9-NEtFOSE)	85				10-130

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab Associated sample(s): 01-02 Batch: WG2214086-3								
Perfluorobutanoic Acid (PFBA)	112		-		70-140	-		
Perfluoropentanoic Acid (PFPeA)	110		-		65-135	-		
Perfluorobutanesulfonic Acid (PFBS)	100		-		60-145	-		
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	114		-		70-145	-		
Perfluorohexanoic Acid (PFHxA)	101		-		70-145	-		
Perfluoropentanesulfonic Acid (PFPeS)	104		-		65-140	-		
Perfluoroheptanoic Acid (PFHpA)	102		-		70-150	-		
Perfluorohexanesulfonic Acid (PFHxS)	109		-		65-145	-		
Perfluorooctanoic Acid (PFOA)	101		-		70-150	-		
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	110		-		65-155	-		
Perfluoroheptanesulfonic Acid (PFHpS)	108		-		70-150	-		
Perfluorononanoic Acid (PFNA)	82		-		70-150	-		
Perfluorooctanesulfonic Acid (PFOS)	100		-		55-150	-		
Perfluorodecanoic Acid (PFDA)	111		-		70-140	-		
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	108		-		60-150	-		
Perfluorononanesulfonic Acid (PFNS)	93		-		65-145	-		
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	125		-		50-140	-		
Perfluoroundecanoic Acid (PFUnA)	96		-		70-145	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab Associated sample(s): 01-02 Batch: WG2214086-3								
Perfluorodecanesulfonic Acid (PFDS)	72		-		60-145	-		
Perfluorooctanesulfonamide (PFOSA)	103		-		70-145	-		
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	110		-		70-145	-		
Perfluorododecanoic Acid (PFDoA)	94		-		70-140	-		
Perfluorotridecanoic Acid (PFTrDA)	91		-		65-140	-		
Perfluorotetradecanoic Acid (PFTeDA)	109		-		60-140	-		
Hexafluoropropylene Oxide Dimer Acid (HFPO-DA)	117		-		70-140	-		
4,8-Dioxa-3h-Perfluorononanoic Acid (ADONA)	90		-		65-145	-		
Perfluorododecanesulfonic Acid (PFDoS)	52		-		50-145	-		
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid (9Cl-PF3ONS)	94		-		70-155	-		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid (11Cl-PF3OUdS)	68		-		55-160	-		
N-Methyl Perfluorooctane Sulfonamide (NMeFOSA)	103		-		60-150	-		
N-Ethyl Perfluorooctane Sulfonamide (NEtFOSA)	97		-		65-145	-		
N-Methyl Perfluorooctanesulfonamido Ethanol (NMeFOSE)	95		-		70-145	-		
N-Ethyl Perfluorooctanesulfonamido Ethanol (NEtFOSE)	98		-		70-135	-		
Perfluoro-3-Methoxypropanoic Acid (PFMPA)	102		-		55-140	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab Associated sample(s): 01-02 Batch: WG2214086-3								
Perfluoro-4-Methoxybutanoic Acid (PFMBA)	110		-		60-150	-		
Perfluoro(2-Ethoxyethane)Sulfonic Acid (PFEESA)	77		-		70-140	-		
Nonafluoro-3,6-Dioxaheptanoic Acid (NFDHA)	114		-		50-150	-		
3-Perfluoropropyl Propanoic Acid (3:3FTCA)	114		-		65-130	-		
2H,2H,3H,3H-Perfluorooctanoic Acid (5:3FTCA)	106		-		70-135	-		
3-Perfluoroheptyl Propanoic Acid (7:3FTCA)	76		-		50-145	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by EPA 1633 - Mansfield Lab Associated sample(s): 01-02 Batch: WG2214086-3								

Surrogate	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro-n-[13C4]Butanoic Acid (13C4-PFBA)	86				5-130
Perfluoro-n-[13C5]Pentanoic Acid (13C5-PFPeA)	80				40-130
Perfluoro-1-[2,3,4-13C3]Butanesulfonic Acid (13C3-PFBS)	58				40-135
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Hexanesulfonic Acid (13C2-4:2FTS)	67				40-200
Perfluoro-n-[1,2,3,4,6-13C5]Hexanoic Acid (13C5-PFHxA)	90				40-130
Perfluoro-n-[1,2,3,4-13C4]Heptanoic Acid (13C4-PFHpA)	99				40-130
Perfluoro-1-[1,2,3-13C3]Hexanesulfonic Acid (13C3-PFHxS)	49				40-130
Perfluoro-n-[13C8]Octanoic Acid (13C8-PFOA)	78				40-130
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Octanesulfonic Acid (13C2-6:2FTS)	78				40-200
Perfluoro-n-[13C9]Nonanoic Acid (13C9-PFNA)	83				40-130
Perfluoro-1-[13C8]Octanesulfonic Acid (13C8-PFOS)	47				40-130
Perfluoro-n-[1,2,3,4,5,6-13C6]Decanoic Acid (13C6-PFDA)	73				40-130
1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]Decanesulfonic Acid (13C2-8:2FTS)	60				40-300
N-Methyl-d3-perfluoro-1-octanesulfonamidoacetic Acid (D3-NMeFOSAA)	47				40-170
Perfluoro-n-[1,2,3,4,5,6,7-13C7]Undecanoic Acid (13C7-PFUnA)	74				30-130
Perfluoro-1-[13C8]Octanesulfonamide (13C8-PFOSA)	64				40-130
N-Ethyl-d5-perfluoro-1-octanesulfonamidoacetic Acid (D5-NEtFOSAA)	49				25-135
Perfluoro-n-[1,2-13C2]Dodecanoic Acid (13C2-PFDoA)	57				10-130
Perfluoro-n-[1,2-13C2]Tetradecanoic Acid (13C2-PFTeDA)	44				10-130
Tetrafluoro-2-heptafluoropropoxy-[13C3]-propanoic acid (13C3-HFPO-DA)	74				40-130
N-Methyl-d3-Perfluoro-1-Octanesulfonamide (D3-NMeFOSA)	57				10-130
N-Ethyl-d5-Perfluoro-1-Octanesulfonamide (D5-NEtFOSA)	60				10-130
N-Methyl-d7-Perfluorooctanesulfonamidoethanol (D7-NMeFOSE)	86				10-130
N-Ethyl-d9-Perfluorooctanesulfonamidoethanol (D9-NEtFOSE)	78				10-130

Project Name: Not Specified
Project Number: Not Specified

Lab Number: L2629674
Report Date: 05/21/26

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Cooler Information

Cooler	Custody Seal
A	Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2629674-01A	Plastic 250ml unpreserved	NA	NA			Y	Absent		A2-1633(28)
L2629674-02A	Plastic 250ml unpreserved	NA	NA			Y	Absent		A2-1633(28)

*Values in parentheses indicate holding time in days

Project Name: Not Specified
Project Number:

Lab Number: L2629674
Report Date: 05/21/26

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA/PFTeDA	376-06-7
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS/PFDoS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
Perfluoropropanesulfonic Acid	PFPrS	423-41-6
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA/PFOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1
PERFLUOROETHER SULFONIC ACIDS (PFESAs)		
Perfluoro(2-Ethoxyethane)Sulfonic Acid	PFEESA	113507-82-7
PERFLUOROETHER/POLYETHER CARBOXYLIC ACIDS (PFPCAs)		
Perfluoro-3-Methoxypropanoic Acid	PFMPA	377-73-1
Perfluoro-4-Methoxybutanoic Acid	PFMBA	863090-89-5
Nonafluoro-3,6-Dioxaheptanoic Acid	NFDHA	151772-58-6

Project Name: Not Specified
Project Number:

Lab Number: L2629674
Report Date: 05/21/26

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
FLUOROTELOMER CARBOXYLIC ACIDS (FTCAs)		
3-Perfluoroheptyl Propanoic Acid	7:3FTCA	812-70-4
2H,2H,3H,3H-Perfluorooctanoic Acid	5:3FTCA	914637-49-3
3-Perfluoropropyl Propanoic Acid	3:3FTCA	356-02-5

Project Name:	Not Specified	**Lab Number:**	L2629674
Project Number:	Not Specified	**Report Date:**	05/21/26

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: Data Usability Report

Project Name:	Not Specified	**Lab Number:**	L2629674
Project Number:	Not Specified	**Report Date:**	05/21/26

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

A - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

F - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The lower value for the two columns has been reported due to obvious interference.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

Report Format: Data Usability Report

Project Name:	Not Specified	**Lab Number:**	L2629674
Project Number:	Not Specified	**Report Date:**	05/21/26

Data Qualifiers

ND	- Not detected at the reporting limit (RL) for the sample.
NJ	- Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
P	- The RPD between the results for the two columns exceeds the method-specified criteria.
Q	- The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
R	- Analytical results are from sample re-analysis.
RE	- Analytical results are from sample re-extraction.
S	- Analytical results are from modified screening analysis.
V	- The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)
Z	- The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Project Name: Not Specified
Project Number: Not Specified
Lab Number: L2629674
Report Date: 05/21/26

REFERENCES

168 Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS. EPA Method 1633A, EPA 820-R-24-007, December 2024. For Massachusetts Contingency Plan, WSC-CAM-XA, September 2025.

LIMITATION OF LIABILITIES

Pace Analytical Services performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Pace Analytical Services shall be to re-perform the work at it's own expense. In no event shall Pace Analytical Services be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Pace Analytical Services.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

ENV-FORM-WES2-0065 v03 Certificate/Approval Program Summary

Certification Information

The following analytes are not included in our Primary NELAP Scope of Accreditation:

PAS-WES2 Westborough Facility – 8 Walkup Dr. Westborough, MA 01581
EPA 8260D: NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
EPA 8270E: NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
SM4500: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

PAS-MANS Mansfield Facility – 320 Forbes Blvd. Mansfield, MA 02048
SM 2540D: TSS.
Biological Tissue Matrix: EPA 3050B

PAS-MAN1 Mansfield Facility – 120 Forbes Blvd. Mansfield, MA 02048
EPA TO-15: Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
MADEP-APH.

PAS-ELON East Longmeadow Facility – 39 Spruce Street East Longmeadow, MA 01028
EPA 524.2: 1,3,5-Trichlorobenzene, m/p-Xylene, o-xylene.
EPA 625.1: 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, N-Nitrosodiphenylamine.
EPA 8081B NPW and SCM: Alachlor, Endrin Ketone, Hexachlorobenzene.
EPA 8260D NPW: Tetrahydrofuran, 1,3,5-Trichlorobenzene; **SCM:** TAME, TBEE, Diethyl ether, DIPE, Tetrahydrofuran. 1,3,5-Trichlorobenzene, Freon-113.
EPA 8270E: NPW: Carbazole, 1-Methylnaphthalene, Pentachloronitrobenzene; **SCM:** Carbazole, 1-Methylnaphthalene.
EPA TO-13: Air: Benzo(e)pyrene, 1-Methylnaphthalene, 2-Methylnaphthalene, Perylene.
EPA TO-4A Pesticide Air: delta-BHC, Endosulfan I, Endosulfan II, Endosulfan Sulfate, Endrin, Endrin Aldehyde, Endrin Ketone, Hexachlorobenzene, Methoxychlor.
SM4500: NPW: Amenable Cyanide; **SCM:** Total Phosphorus, TKN, NH3, NECi: NO2, NO3, ASTMD516.

The following test method is not included in our New Jersey Secondary NELAP Scope of Accreditation:

PAS-MANS Mansfield Facility – 320 Forbes Blvd. Mansfield, MA 02048
Determination of Selected Perfluorinated Alkyl Substances by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry Isotope Dilution (via Alpha SOP 23528)

The following analytes are included in our Massachusetts DEP Scope of Accreditation:

PAS-WES2 Westborough Facility – 8 Walkup Dr. Westborough, MA 01581

Drinking Water
EPA 300.0: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
EPA 504.1: EDB, DBCP.
Microbiology: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,**.

Non-Potable Water
SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH: Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM4500CL-G, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
Microbiology: **SM9223B-Colilert-QT; Enterolert-QT.**

PAS-MANS Mansfield Facility – 320 Forbes Blvd. Mansfield, MA 02048

Drinking Water
EPA 200.7: Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
EPA 522, EPA 537.1.

Non-Potable Water
EPA 200.7: Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
EPA 200.8: Al, Sb, As, Be, Cd, Ca, Cr, Cu, Fe, Pb, Mg, Mn, Ni, K, Se, Ag, Na, TL, Zn.
EPA 245.1: Hg. **EPA 245.7:** Hg.
SM2340B

ENV-FORM-WES2-0065 v03 Certificate/Approval Program Summary

PAS-ELON East Longmeadow Facility – 39 Spruce Street East Longmeadow, MA 01028

Drinking Water
EPA 300.0: NO3, NO2, Fl, Cl, SO4. **NECI Reductase**: NO3, NO2.
SM4500F-C, SM4500Cl-B, SM4500CN-C,E, EPA 180.1, SM2320B, SM 2540C, SM4500H-B, SM4500SO4-E.
EPA 537.1; EPA 524.2: THMs and VOCs; **EPA 504.1:** EDB, DBCP.
Microbiology: SM9223-P/A: TC/EC; SM9223B-Colilert-enumeration: TC/EC; HPC-Simplate.

Non-Potable Water
SM4500H-B, SM2510B, SM2540C, SM2320B, SM4500Cl-B, SM4500NH3-B, C, EPA 350.1, NECi: NO3, **SM4500NH3-B, C: TKN, SM4500P-E: Ortho Phosphate, SM4500P-B, E: Total Phosphorus, EPA 410.4, SM5210B, SM5310C, SM4500CN-C, E, SM2540D, SM4500Cl-G, SM4500SO4-E, EPA 1664, EPA 420.1, EPA 300.0:** Cl, SO4, NO3.
EPA 624.1: Volatile Halocarbons, Volatile Aromatics.
EPA 608.3: Chlordane, Toxaphene, Aldrin, Alpha-BHC, Beta-BHC, Gamma-BHC, Delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan Sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs.
EPA 625.1: SVOC-Acid Extractables and Base/Neutrals
Microbiology: SM9223B-Colilert: E. coli (Ambient and Wastewater), **SM9223B-Colilert-18:** Fecal Coliform (Wastewater).

Certification IDs:

PAS-WES2 Westborough Facility – 8 Walkup Dr. Westborough, MA 01581
CT PH-0826, IL 200077, IN C-MA-03, KY KY98045, ME MA00086, MD 348, MA M-MA086, NH 2064, NJ MA935, NY 11148, NC (NPW/SCM) 666, OR MA-1316, PA 68-03671, RI LAO00065, TX T104704476, VT VT-0935, VA 460195.

PAS-MANS Mansfield Facility – 320 Forbes Blvd. Mansfield, MA 02048
ANAB/DoD L2474, CA 3117, CO MA00030, CT PH-0825, IL 200081, IN C-MA-04, KY KY98046, LA 85084, ME MA00030, MD 350, MA M-MA00030, MI 9110, MN 025-999-495, NV MA00030, NH 2062, NJ MA015, NY 11627, NC (NPW/SCM) 685, OR MA-0262, PA 68-02089, RI LAO00299, TX T-104704419, UT MA00030, VT VT-0015, VA 460194, WA C954.

PAS-MAN1 Mansfield Air Lab Facility – 120 Forbes Blvd. Mansfield, MA 02048
ANAB/DoD L2474, LA 245052, ME MA01156, MN 025-999-498, NH 2249, NJ MA025, NY 12191, OR 4203, TX T104704583, VA 460311, WA C1104.

PAS-ELON East Longmeadow Facility – 39 Spruce St. East Longmeadow, MA 01028
CT PH-0821, ME MA00100, MI 9100, NC (DENR) 652, NC (DW) 25703, MA M-MA100, NH (Secondary) 2516, NH (Primary) 2557, NJ MA007, NY 10899, PA 68-05812, RI LAO00373, VA 460217, VT-255716, WV DEP 419, WV-DW 9979C, LA 05130, LA-DW LA042, MD-DW 373, OH 87781.

For a complete listing of analytes and methods, please contact your Project Manager.

5/15/26 L2629674

Pace® Location Requested (City/State): Mansfield, MA

CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevant fields

LAB USE ONLY- Affix Workorder/Login Label Here

Scan QR Code for instructions

Company Name:	Patina Energy
Street Address:	8640 N. Eldridge Pkwy Houston, TX 77041
Contact/Report To:	Jeff Pechiney
Phone #:	281-797-3460
E-Mail:	Jeff@patinaenergy.com
Cc E-Mail:	
Customer Project #:	
Project Name:	
Site Collection Info/Facility ID (as applicable):	
Invoice to:	
Invoice E-mail:	
Purchase Order # (if applicable):	
Quote #:	
Time Zone Collected:	[ ] AK [ ] PT [ ] MT [ ] CT [ ] ET
County / State origin of sample(s):	
Data Deliverables:	[ ] Level II [ ] Level III [ ] Level IV [ ] EQUIS [ ] Other
Regulatory Program (DW, RCRA, etc.) as applicable:	Reportable [ ] Yes [ ] No
Rush (Pre-approval required):	[ ] Same Day [ ] 1 Day [ ] 2 Day [ ] 3 Day Other
Date Results Requested:	
DW PWSID # or WW Permit # as applicable:	
Field Filtered (if applicable):	[ ] Yes [ ] No
Analysis:	

Specify Container Size**: 3

Identify Container Preservative Type***: Az - 1633

Analysis Requested: X X

**Container Size: (1) 1L, (2) 500mL, (3) 250mL, (4) 125mL, (5) 100mL, (6) 40mL vial, (7) EnCore, (8) TerraCore, (9) 90mL, (10) Other

*** Preservative Types: (1) None, (2) HNO3, (3) H2SO4, (4) HCl, (5) NaOH, (6) ZnAcetate, (7) NaHSO4, (8) Sod. Thiosulfate, (9) Ascorbic Acid, (10) MeOH, (11) Other

Lab Use Only: Proj. Mgr: / Acct.Num / Client ID: / Table #: / Profile / Template: / Prelog / Bottle Ord.ID:

Preservation non-conformance identified for sample.

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SS), Oil (OL), Wipe (WP), Tissue (TS), Bioassay (B), Vapor (V), Surface Water (SW), Sediment (SED), Sludge (SL), Caulk (CK), Leachate (LL), Biosolid (BS), Other (OT)

	Customer Sample ID	Matrix *	Comp / Grab	Composite Start Date	Composite Start Time	Collected or Composite End Date	Collected or Composite End Time	# Cont.	Residual Chlorine Result	Residual Chlorine Units	Sample Comment
-01	Blank	NAW									
-02	[redacted] Sample (Tracer)	NAW									

Additional Instructions from Pace*:

Collected By: Printed Name / Signature

Customer Remarks / Special Conditions / Possible Hazards:

Coolers: / Thermometer ID: / Correction Factor (°C): / Obs. Temp (°C): / Corrected Temp (°C): / [ ] On Ice

	Date/Time:	Received by/Company: (Signature)	Date/Time:	Tracking Number:
Relinquished by/Company: (Signature)		UPS		
Relinquished by/Company: (Signature) UPS	5/15/26 10:00		5/15/26 10:00	Delivered by: [ ] In-Person [ ] Courier [ ] FedEx [ ] UPS [ ] Other
Relinquished by/Company: (Signature)				
Relinquished by/Company: (Signature)				Page: of

Submitting a sample via this chain of custody constitutes acknowledgment and acceptance of the Pace® Terms and Conditions found at https://info.pacelabs.com/hubfs/pas-standard-terms.pdf.

ENV-FRM-CORQ-0019_v02_110123 ©

View/Print Label

1. **Ensure there are no other shipping or tracking labels attached to your package.** Select the Print button on the print dialogue box that appears. Note: If your browser does not support this function, select Print from the File menu to print the label.

2. **Fold the printed label at the solid line below.** Place the label in a UPS Shipping Pouch. If you do not have a pouch, affix the folded label using clear plastic shipping tape over the entire label.

3. **GETTING YOUR SHIPMENT TO UPS**
   Customers with a scheduled Pickup
   - Your driver will pickup your shipment(s) as usual.

   Customers without a scheduled Pickup
   - Schedule a Pickup on ups.com to have a UPS driver pickup all of your packages.
   - Take your package to any location of The UPS Store®, UPS Access Point(TM) location, UPS Drop Box, UPS Customer Center, Staples® or Authorized Shipping Outlet near you. To find the location nearest you, please visit the 'Locations' Quick link at ups.com.

UPS Access Point™
CVS STORE # 7364
8620 JONES RD
HOUSTON TX 77065-5394

UPS Access Point™
THE UPS STORE
9597 JONES RD
HOUSTON TX 77065-4815

UPS Access Point™
THE UPS STORE
12620 FM 1960 RD W
HOUSTON TX 77065-5365

FOLD HERE

Sample Delivery Group Summary

Pace Job Number : L2629674

Account Name : Patina Energy, LLC
Project Number :
Project Name :

Received : 15-MAY-2026
Reviewer : Jessica Ramos

Delivery Information

Samples Delivered By : Express Ship
UPS (1ZB34F430126882305)

Chain of Custody : Present

Cooler Information

Cooler	Seal/Seal#	Preservation	Temperature(°C)	Additional Information
A	Absent/	Ice	5.4	

Condition Information

1) All samples on COC received?	**YES**
2) Extra samples received?	**NO**
3) Are there any sample container discrepancies?	**NO**
4) Are there any discrepancies between COC & sample labels?	**NO**
5) Are samples in appropriate containers for requested analysis?	**YES**
6) Are samples properly preserved for requested analysis?	**YES**
7) Are samples within holding time for requested analysis?	**YES**
8) All sampling equipment returned?	**NA**

Volatile Organics/VPH

1) Reagent Water Vials Frozen by Client?	**NA**