

# Shenandoah S2-2H Flowback Report EP 98

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## Attachment

Attachment A Flowback Assessment Report (EHS 2025)

## 1 Introduction

Tamboran B2 Ltd (Tamboran) was granted approval for the *TAM1-3 Beetaloo Basin Shenandoah South E&A Program Environment Management Plan* on 23 May 2024.

The Shenandoah S2-2H (SS2-2H) well was successfully stimulated in May 2024, with flowback operations commencing on 12 May 2024 post well clean up and soak. In accordance with the Northern Territory (NT) Petroleum (Environment) Regulation 2016 (PER), a report on the quality of hydraulic flowback fluid (Section 37A) and produced water (Section 37B) must be submitted to the Minister within six (6) months of flowback occurring.

The following section satisfies these regulatory reporting requirements.

## 2 Reporting Requirements

### 2.1 37A Report about flowback fluid

In accordance with section 37A, Tamboran is required to provide certain information relating to chemicals or Naturally Occurring Radioactive Material (NORM) found within flowback fluid within six (6) months of commencing flowback operations. The information required under section 37A of the PER, is provided in Table 1.

**Table 1 37A Report about flowback fluid**

Reporting requirement	Shenandoah S2-2H information
(a) The identity of any chemical or NORM found in the flowback fluid	Characterisation of the flowback was completed with the analytes listed in the Code of Practice: Onshore Petroleum Activities in the Northern Territory (Code of Practice) - C.8 Wastewater chemistry analytes. The full list of analytes is provided in <i>Appendix A-1</i> of the EHS Flowback Assessment report (refer Attachment 1).
(b) The concentration of any chemical or NORM found in the flowback fluid	Characterisation of the flowback was completed for the analytes listed in the Code of Practice - C.8 Wastewater chemistry analytes. The results of the flowback analysis is provided in <i>Appendix A-1</i> of the EHS Flowback Assessment report (refer Attachment 1).
(c) Details regarding how any chemical or NORM has been or will be managed	<p>Flowback from SS2-2H, including chemical and NORM constituents, are stored within a double lined, 13 ML enclosed wastewater tank located on SS2 well site as per the Code of Practice. The enclosed tank has continuous leak detection and level monitoring.</p> <p>The waste storage area on the well site has been constructed to bund 110% of the largest tank onsite.</p> <p>As detailed in section 3.8.3 of the TAM1-3 EMP, ongoing management of the flowback storage is underway with options for either reuse and/or evaporation.</p> <p>Where evaporation is considered, the tank may be opened to allow evaporation. Wet season and dry season freeboard requirements will be in place (i.e. 1.3 m wet season and 0.3 m dry season) were this is to occur.</p> <p>At completion of SS2 activities, flowback will be evaporated and then transported offsite to a licenced wastewater handling facility for final disposal.</p>

Reporting requirement	Shenandoah S2-2H information
(d) Details regarding how any chemical or NORM has been or will be transported	<p>At this stage, flowback from SS2-2H will remain onsite within the 13ML wastewater tank with options for reuse on future stimulation activities. Controls to carry out reuse are described in the TAM1-3 EMP. Where reuse may be considered, Tamboran are required to provide a separate flowback risk assessment of the returned flow back fluid following reuse Ministerial Condition 15).</p> <p>At completion of the activities, flowback and any associate chemical and NORM constituents, will be transported by licenced listed water transport provider, in accordance with the NT Waste Management and Pollution Control Act 1998.</p>
(e) Details regarding how any chemical or NORM has been or will be treated	<p>Flowback, including chemical and NORM constituents, are currently stored in an enclosed tank and are monitored.</p> <p>The TAM1-3 EMP allows for flowback to be reused or treated in open wastewater tanks to reduce the volume of flowback through evaporation.</p>
(f) Details regarding any action proposed to be taken to prevent any chemical or NORM spill	<p>A spill management plan and emergency management has been implemented, as a part of the approved TAM1-3 EMP. Actions implemented to prevent the spill of chemical or NORM from flowback water include:</p> <ul style="list-style-type: none"> <li>• Use of double lined enclosed tanks</li> <li>• Use of secondary containment for all transfer points</li> <li>• Use of continuous leak detection and level monitoring on wastewater tank fluid levels with alarms</li> <li>• Well site pad that is fully bunded to contain 110% of the volume of the largest tank</li> <li>• Routine (daily during wet season and weekly during dry season) site inspections</li> <li>• Procedures in place to manage significant rainfall events.</li> </ul>
(g) Details of the emergency contingency plan included in the environment management plan to which the activity relates	<p>An emergency management plan (TBN-HSE-MP-05) was developed, as a part of the TAM1-3 EMP.</p> <p>Contingent plans include:</p> <ul style="list-style-type: none"> <li>• Response processes for onsite and offsite spills</li> <li>• Onsite wastewater transfer equipment to transfer wastewater in case of a spill</li> <li>• First response civil equipment onsite to contain a spill</li> </ul>
(h) The requirements in relation to the management of any chemical or NORM of the prescribed chemical legislation	<p>The management of flowback wastewater must be undertaken in accordance with the approved TAM1-3 E&amp;A EMP and the Code of Practice for Onshore Petroleum Activities in the Northern Territory.</p> <p>This includes requirements to manage the environmental risks associated with generation, storage, treatment and disposal.</p> <p>All flowback wastewater is classified as a listed waste under the Waste Management and Pollution Control Act 1998. Transport and disposal of flowback must be undertaken in accordance with this Act.</p>

Reporting requirement	Shenandoah S2-2H information
	The NORM levels observed are consistent with historical assessments, indicating the levels within the flowback do not meet the limits as described in the NT Radiation Protection Regulation 2007

## 2.2 37B Report about produced water

In accordance with section 37B, Tamboran is required to provide certain information relating to chemicals or NORM found within produced water within 6 months of produced water being extracted. The information required under section 37B of the PER, is provided in Table 2.

**Table 2 Report about produced water**

Reporting requirement	Shenandoah S2-2H information
(a) The identity of any chemical or NORM found in the flowback fluid	N/A - no produced water has been encountered during the Shenandoah S2-2H flowback activities.
(b) The concentration of any chemical or NORM found in the flowback fluid	N/A - no produced water has been encountered during the Shenandoah S 1H flowback activities. N/A - no produced water has been encountered during the Shenandoah S2-2H flowback activities.
(c) Details regarding how any chemical or NORM has been or will be managed	N/A - no produced water has been encountered during the Shenandoah S2-2H flowback activities.
(d) Details regarding how any chemical or NORM has been or will be transported	N/A - no produced water has been encountered during the Shenandoah S2-2H flowback activities.
(e) Details regarding how any chemical or NORM has been or will be treated	N/A - no produced water has been encountered during the Shenandoah S2-2H flowback activities.
(f) Details regarding any action proposed to be taken to prevent any chemical or NORM spill	N/A - no produced water has been encountered during the Shenandoah S2-2H flowback activities.
(g) Details of the emergency contingency plan included in the environment management plan to which the activity relates	N/A - no produced water has been encountered during the Shenandoah S2-2H flowback activities.
(h) The requirements in relation to the management of any chemical or NORM of the prescribed chemical legislation	N/A - no produced water has been encountered during the Shenandoah S2-2H flowback activities.

# ATTACHMENT A

## Shenandoah S2-2H Flowback Assessment Report

# Flowback Assessment

Beetaloo Sub-basin  
Project Area  
Northern Territory,  
Australia

Prepared for:

Tamboran Resources

Prepared by:

**EHS**  **Support**<sup>™</sup>

November 2025



## Document Control

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### REVISION HISTORY

Date	Revision No.	Key Changes
15/10/2025	1	Assessment of Shenandoah S2-2H flowback data
28/10/2025	2	Revised with client comments
10/11/2025	3	Revised with client comments

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## Acronyms

ADWG	Australian Drinking Water Guidelines
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999
BTEX	benzene, toluene, ethylbenzene, and xylene
CEM	Conceptual Exposure Model
DENR	Department of Environment and Natural Resources
DPIR	Department of Primary Industry and Resources
EMP	Environmental Management Plan
EP	Exploration Permit
EPA	Environment Protection Authority
HI	hazard index
HIL	Health Investigation Level
HQ	hazard quotient
NEPC	National Environment Protection Council
NHMRC	National Health and Medical Research Council
NORM	naturally occurring radioactive materials
NT	Northern Territory
RBSL	risk-based screening level
RSL	Regional Screening Level
USEPA	United States Environmental Protection Agency
WHO	World Health Organization

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## Units of Measure

<b>Area</b>	
ha	hectare
m <sup>2</sup>	square metres
<b>Density</b>	
kg/m <sup>3</sup>	kilograms per cubic metre
<b>Electrical Conductance</b>	
µS/cm	microsiemen per centimetre
dS/m	decisiemen per metre
mS/cm	millisiemen per centimetre
mV	millivolt
<b>Length</b>	
µm	micrometres
cm	centimetres
km	kilometres
m	metres
mm	millimetres
<b>Mass</b>	
µg	micrograms
g	grams
kg	kilograms
mg	milligrams
t	metric tonnes
<b>Concentration by Mass</b>	
µg/kg	microgram per kilogram
mg/kg	milligram per kilogram

<b>Pressure</b>	
kPa	kilopascals
Pa	Pascals
<b>Temperature</b>	
°C	degrees Celsius
°F	degrees Fahrenheit
K	kelvin
<b>Velocity</b>	
m/s	metres per second
<b>Volume</b>	
µL	microlitres
cL	centilitres
cm <sup>3</sup>	cubic centimetre
GL	gigalitre
L	litres
m <sup>3</sup>	cubic metre
mL	millilitres
ML	megalitre
<b>Concentration by Volume</b>	
µg/L	microgram per litre
mg/L	milligram per litre
ppmv	parts per million by volume
ppbv	parts per billion by volume



## 1 Introduction

Tamboran Resources (“Tamboran B2 Pty Ltd”) is conducting an exploration and appraisal program within Exploration Permit (EP) 98, EP76 and EP117 in the Beetaloo Sub-basin of the broader McArthur Basin in the Northern Territory (NT).

EHS Support PTY Ltd (“EHS Support”) was engaged to perform a risk assessment on flowback water from wells advanced and hydraulically stimulated within EP98 and EP117. **Table 1-1** presents the wells with flowback water assessed as part of this risk assessment.

**Table 1-1 Summary of Wells with Assessed Flowback Data**

Exploration Permit	Well Pad	Wells
98	Shenandoah S2	Shenandoah S2-2H
117	Kyalla 117 N2	Shenandoah S-1H

This risk assessment was completed to satisfy Item 2A of Regulation 37A under part 3A (reporting requirements for hydraulic fracturing) of the Northern Territory *Petroleum (Environment) Regulations* (2016), and of the Code of Practice (NT, 2025a). Regulation 37A states: *A report under subregulation (2) must be accompanied by a full human health risk assessment relating to any chemical found in the flowback fluid. Flowback fluid is defined as: fluid that is a mixture of hydraulic fracturing fluid and formation fluid that is allowed to flow from the well following hydraulic fracturing.*

Flowback fluid was generated because of stimulation activities completed on the Shenandoah S-1H well on the Kyalla 117 N2 well site and Shenandoah S2-2H well on the Shenandoah S2 well site. The stimulation activities were completed under the conditions of the approval for ORI6-3: Beetaloo Sub-basin Kyalla 117 N2 Multi-well Drilling, Stimulation and Well Testing Program Environment Management Plan (Origin, 2021) and TAM1-3: Beetaloo Basin Shenandoah South Exploration & Appraisal (E&A) Program Environment Management Plan (Tamboran, 2024). On approval of the TAM1-3 EMP, all activities under ORI6-3 EMP were superseded.

This assessment leverages information from the most recent compilation of documents under TAM1-3 EMP Appendix E:

- ORI6-3 Beetaloo Sub-basin Kyalla 117 N2 Multi-well Drilling, Hydraulic Fracturing and Well Testing Program EMP (Origin, 2021)
- TAM1-3 Modifications 1, 2, 3, 4, 5 and 8 – Beetaloo Sub-basin Shenandoah South E&A Program Environment Management Plan (TAM1-3): Regulation 22 – chemical risk assessment update (Tamboran, 2025)
- Beetaloo Exploration and Appraisal Program - Hydraulic Fracturing Chemical Risk Assessment, Rev 11, prepared for Tamboran Resources (AECOM, 2025).
- Stimulation Chemical Risk Assessment (EHS Support, 2023).
- Shenandoah S-1H Flowback Wastewater Assessment (EHS Support, 2024).



## 2 Conceptual Exposure Model

In development of Tamboran's EMPs, potential exposures to humans and the environment to flowback water were evaluated (Tamboran, 2024; Tamboran, 2025). Multiple mitigation measures and control measures were specified within the EMPs and associated Spill Management Plans (Appendix F of EMP TAM1-3) and Wastewater Management Plan (Appendix G of EMP TAM1-3) to reduce residual risks from exposure to flowback water to As Low As Reasonably Practical (ALARP).

**Appendix A** depicts the general well pad layout for the EPs as presented in EMP TAM1-3. A combination of enclosed and open above-ground tanks are used to manage flowback water and will vary between well pads based on season. Whilst volume of flowback per well was estimated approximately 10.8 ML in EMP TAM1-3, only approximately 2 megalitres (ML) of flowback was generated from Shenandoah S-1H (EHS Support, 2024) and only 4.51 ML of flowback was generated from Shenandoah S2-2H.

Flowback storage are double lined with impermeable membranes and leak detection systems (Tamboran, 2024; Tamboran 2025). Flowback water is conveyed from the wells along the flowlines to tanks located on the well pad and managed in up to three tanks. The tank storage area is surrounded by a bund to provide secondary containment for water storages. Should a catastrophic tank failure occur, the bund area is of sufficient capacity to retain 110 percent of the largest storage tank capacity. Further, depending upon well site conditions, the entire well pad area (up to approximately 5.5 hectares) is banded with a berm ranging from 300 millimetre to greater than one metre (m). The well pad is compacted during construction to reduce permeability to limit potential vertical migration of spilled materials.

In Tamboran's EMPs, flowback disposal consisted of either off-site transport to a licenced facility by truck or potential recycling of flowback water as makeup water for hydraulic stimulation activities (Tamboran, 2024). At this time, flowback water generated from wells advanced under EMP TAM1-3 has not been used as makeup water for hydraulic stimulation activities.

Mechanical evaporation to enhance evaporation and reduce volume of the flowback water from hydraulic stimulation activities was evaluated in the EMP (Tamboran, 2024). According to the EMP, evaporator units will be equipped with automated wind speed and direction cut-off mechanisms to stop operations during periods of moderate (i.e., 11 – 16 knots) to minimise potential drift of wastewater outside of the storage tanks during mechanical evaporation. At this time, Tamboran is not planning on conducting mechanical evaporation.

Human receptors identified in the EMP with potential exposure to flowback water stored in tanks or during re-use and off-site disposal activities included oil and gas workers (Origin, 2021; Tamboran, 2024). Potentially complete exposure pathways include incidental ingestion and dermal contact with flowback during re-use and off-site disposal activities. Should disposal off-site occur, it is expected to be completed in approximately 14 days assuming 3 ML of water trucked to Hydrera facility using 65,000 litre trucks at Tennant Creek. Activities associated with hydraulic fracturing stimulation are assumed to occur for 20 days (5 days per week for 1 month; Origin 2021). Because the length of exposure is longer for recycling of flowback water scenario, this exposure pathway will be conservatively evaluated and is protective of off-site worker exposure.

As stated previously, Tamboran is not planning on conducting mechanical evaporation; however, inhalation of mist during mechanical evaporation was conservatively retained as a potentially complete exposure scenario.

Well pads are fenced and flowback tanks are either enclosed or have raised walls to minimise fauna access to flowback water (Tamboran, 2024; Tamboran, 2025). The typically hypersaline characteristic of flowback water is a deterrent for avian receptors and other fauna from consuming and interacting with wastewater. Based on previous lack of observations of avian receptors contacting flowback water in open top tanks and



hypersaline nature of flowback water, potential exposure to avian receptors is considered low; however, as a conservative measure, potential exposure to avian receptors via incidental ingestion was evaluated in this risk assessment.

Management controls and mitigation measures outlined in the EMP are used to minimise potential for releases, including catastrophic failure, from storage tanks. A recent CSIRO study on the fate of geogenic chemicals in flowback water also found the majority of organic geogenic compounds rapidly degraded in surface facilities (e.g., flowback tanks and storage ponds; Lupton, et al., 2024). As a conservative measure, however, evaluation of potential release of liquids to soils within the containment area was performed for the Beetaloo Sub-basin Project Area and exposure to terrestrial receptors was included in this flowback risk assessment.



### 3 Data Used in the Risk Assessment

Samples of flowback water from the wells identified in **Table 3-1** were evaluated in this risk assessment. **Appendix B, Table B-1** presents the analytical data from the weekly sampling of the storage tanks.

**Table 3-1 Summary of Assessed Flowback Samples**

Well	Sample Date Range	Number of Samples
Shenandoah S-1H	20/12/2023 – 24/4/2024	12
Shenandoah S2-2H	27/01/2025 – 10/08/2025	35

Based on the CEM, the point of exposure for human receptors is flowback water used as make up water for hydraulic stimulation of future wells. While mechanical evaporation is not currently planned by Tamboran, the point of exposure of inhalation of mist from the flowback tanks during mechanical evaporation was also considered in this assessment. For avian receptors, the point of exposure is flowback water stored in open-top tanks during evaporation. The terrestrial assessment also evaluates releases of flowback water from these tanks.



## 4 Human Health Risk Assessment

To evaluate potential human health hazards associated with the flowback data, a Tier 1 screening assessment was performed. The objective of the Tier 1 assessment was to identify chemicals of low human health concern that did not require additional chemical risk assessment in a Tier 2 assessment. Chemicals that warranted a Tier 2 assessment were quantitatively evaluated based on potential complete exposure scenarios for human receptors discussed above. Consistent with the NT Radiation Protection Act (2004), an evaluation of potential exposure to radionuclides in flowback water was conducted in addition to the Tier 1 and Tier 2 assessments of chemicals in flowback water. **Appendix C** presents the Tier 1 and Tier 2 assessments of chemicals and radiological parameters in flowback water for the wells listed in **Table 1-1**.

### 4.1 Tier 1 Screening Assessment

Analytical data of flowback water was compared to human health risk-based screening levels (RBSLs) using the National Water Quality Management Strategy Australian Drinking Water Guidelines (ADWG; 2011, updated June 2025). Where Australian guidelines were not available, international guidelines were used to supplement the risk-based levels including World Health Organization (WHO) Guidelines for drinking-water quality (WHO, 2022) and United States Environmental Protection Agency (USEPA) Regional Screening Levels (RSLs) for tap water (November 2024, and as updated).

**Appendix C, Table C-1** presents the Tier 1 screening assessment of flowback data. The following chemicals exceeded RBSL:

- Naphthalene
- Iron
- Lead
- Manganese
- Selenium
- Chromium (III + VI)
- Strontium
- Gross beta activity minus K40
- Gross alpha activity

A quantitative Tier 2 evaluation of these chemicals was completed, except for radiological parameters. Evaluation of potential exposure to radiological parameters is included in the following sections.

Concentrations of chloride and total dissolved solids exceed the ADWG for aesthetics; however, there is insufficient data to develop a health-based guideline. Therefore, these chemicals were not assessed in the quantitative Tier 2 evaluation.

#### 4.1.1 Radiological Exposure

The alternative RBSLs for gross alpha and gross beta are only generic screening values (0.5 Becquerels per litre [Bq/L]). Consistent with the ADWG (NHMRC, 2025), if these RBSLs are exceeded, a more detailed assessment is triggered. As outlined in the assessment framework under ADWG for radiological exposures, an order-of-magnitude higher radiological exposure is acceptable as the natural background is higher than the screening level, and thresholds for active intervention have been established at corresponding doses 10 to 50 times higher than the corresponding screening value.

In samples of assessed flowback, gross alpha and gross beta ranged from 0.27 Bq/L to 21 Bq/L and 0.17 Bq/L to 9.64 Bq/L, respectively (**Appendix B**). Gross beta activity is corrected for potassium-40 (K40) because K40 is a natural beta emitter. As potassium does not accumulate in the body despite intake (NHMRC, 2025), gross beta – K40 activity was used to assess potential exposures to gross beta in flowback water. Gross beta - K40 activity ranged from 0.18 Bq/L to 6.37 Bq/L. Analysis of radionuclides was not completed for the flowback water, except for radium-226 (Ra-226) and radium-228 (Ra-228; **Appendix C, Table C-2**).



Using the methodology in the ADWG (NHMRC, 2025), an annual dose was calculated for Ra-226 and Ra-228, assuming individual radionuclides consumed in water based on annual residential water consumption of drinking water (750 litres per year [L/year], NHMRC, 2025) and worker water consumption (0.00208 L/year; Tamboran, 2023) and the maximum radionuclide concentration. The recommended Guideline total annual dose is 1 millisievert per year (mSv/year) for radioactivity in drinking water. The recommended dose considers the total estimated dose per year from all radionuclides in drinking water (exclusive of K40). Using the annual water consumption of drinking water for residential receptors, the total dose did not exceed the recommended Guideline of 1 mSv/year in drinking water, nor did the total dose calculated using worker annual water consumption exceed 1 mSv/year. Assuming the source of gross alpha and gross beta in the flowback water is Ra-226 and Ra-228, a worker would need to consume 300 L/year of flowback water to equal 1 mSv/year. Background exposure to radionuclides is around 2.5 mSv/year and exposures greater than 10 mSv/year pose potential risks that warrant action. Given that the annual dose calculated using worker exposure assumptions is significantly less than 1 mSv/year and ingestion of flowback water by a worker is multiple orders of magnitude less than 300 L/year, no additional action is warranted.

Further reduction of concentrations is also anticipated if blending with bore water occurs as part of re-use of flowback as makeup water. Precipitation of naturally occurring radioactive materials (NORMs) typically occurs in the flowback tank and accompany non-NORM solids that were produced with the flowback, rather than remaining dissolved in flowback water (Australian Radiation Protection and Nuclear Safety Agency [ARPANSA], 2008). Residual solids within the frac tank will be managed in accordance with the EMP TAM1-3.

## 4.2 Tier 2 Quantitative Assessment

A Tier 2 assessment was completed for workers potentially exposed to chemicals in flowback identified in the Tier 1 assessment. Potentially complete exposure pathways were consistent with the EMP and included incidental ingestion and dermal contact with flowback during re-use or disposal activities. As stated previously, Tamboran is not planning on conducting mechanical evaporation; however, inhalation of mist during mechanical evaporation was also considered a complete pathway.

Cumulative risks were calculated and specifically refers to the summation of risks for each receptor across exposure pathways, routes of exposure (e.g., ingestion, inhalation, dermal contact), and chemicals. Exposure assumptions used in the Tier 2 assessment were consistent with those used in the EMP to evaluate worker exposure to stimulation chemicals (AECOM, 2024; **Appendix C, Table C-3**). For the worker potentially exposed to flowback water during re-use activities, the stimulation period is assumed to be 1 month, with work occurring 5 days per week. For the mechanical evaporation scenario, a worker is assumed to be within the vicinity of the tanks at the Site for 1 hour per day, 5 days per week, for 6 months of year or during the wet season (or 120 days).

Threshold (noncarcinogenic) risk estimates were based on the ratio of the intake of each constituent for each exposure pathway and exposure route divided by the appropriate toxicity criteria to produce a hazard quotient (HQ). The HQs for all exposure pathways for each constituent were summed for each receptor to produce a hazard index (HI). The target hazard level of noncarcinogenic risk estimates is an HI of 1 (enHealth, 2012a; NEPM, 2013); cumulative HI greater than 1 indicate the potential for adverse health effects.

For non-threshold (carcinogenic) risk estimates, risks are identified as the additional probability of an individual developing cancer over a lifetime as a result of exposure. Cumulative cancer risks were calculated by summing the individual constituent cancer risk estimates for the exposure pathways for each receptor. The target risk level of carcinogenic risk estimates is 1 in 100,000 or  $10^{-5}$  (enHealth, 2012a; NEPM, 2013).

Risk estimates for the worker exposed to flowback during re-use activities is presented on **Appendix C, Table C-4**. **Table C-5** presents risk estimates for workers during use of mechanical evaporators to facilitate evaporation of flowback water. Neither estimated cancer risk or HI exceeded the respective thresholds for



the worker exposed to flowback water during reuse activities (**Appendix C, Table C-4**). Estimated cancer risk also did not exceed the threshold of  $10^{-5}$  for inhalation of mists during mechanical evaporation (**Appendix C, Table C-5**). Given that there were no exceedances of the thresholds for the ELCR and HI, no further action is needed.



## 5 Avian Risk Assessment

According to the EMPs, multiple mitigation measures are in place to limit potential fauna interaction with flowback water (Tamboran, 2024; Tamboran, 2025); however, as a conservative measure, an avian risk assessment was completed to evaluate potential exposure of avian receptors to chemicals detected above screening criteria in flowback water samples.

Laboratory analyses of these wastewater samples for inorganic, organic, and radionuclide analytes was completed pursuant to the monitoring wastewater chemistry analytes specified in Section C.8 of the Code of Practice (NT, 2025b).

Consistent with the avian risk assessment completed for the stimulation chemical risk assessment (EHS Support, 2023), this avian risk assessment conducted on the flowback/produced water samples included the following two steps:

1. Screening Assessment – Identify chemicals of low ecological concern that do not require additional evaluation in the risk assessment process based on a comparison to the Australian and New Zealand Guidelines (ANZG) for Fresh & Marine Water Quality (ANZG, 2018) trigger values or, absent such values, alternative screening criteria as noted in **Appendix D**; and
2. Quantitative Risk Evaluation – Identify chemicals that are a concern for avian receptors and therefore require an additional evaluation to characterise the potential risks. The potential exposure was assessed using a quantitative evaluation of the potentially complete avian exposure pathway and the screening assessment.

### 5.1 Tier 1 Screening Assessment

The screening assessment consisted of a focused evaluation of the potential risks to avian receptors if exposed to chemicals detected in flowback water samples (**Appendix D Table D-1**). The objective of the screening assessment was to identify chemicals of low concern to avian receptors that do not require additional evaluation in the risk assessment process.

The screening assessment used freshwater trigger values (ANZG, 2018) which are deemed to be protective of aquatic species such as fish, invertebrates, and algae assuming chronic, continual, and prolonged contact with surface water at a 95 percent protection level. In instances where no trigger values were available, alternative screening criteria were employed and are noted as such in **Appendix D**. This approach is inherently considered highly conservative given the following:

- In toxicological testing, aquatic species are more sensitive than terrestrial species to chemicals due to their emersion within the fluid, additional modes of action (e.g., impacts on gill function) and the potential for secondary stressors to impact health; and
- Even if exposed, avian receptors will have limited periods of duration in contact with the fluids. Roosting, breeding, and continuous access will not occur on the water body; therefore, contact will be episodic in nature and possibly only involve ingestion during dry periods.

Chemicals detected in the flowback/produced water samples with concentrations exceeding the conservatively adopted water quality criteria were carried through the quantitative risk evaluation. The detected chemicals analysed in the wastewater samples that had concentrations exceeding the conservatively adopted water quality criteria and that may pose a potential risk to avian receptors include:

- Aluminium
- Ammonia as N
- Arsenic
- Barium
- Boron
- Chromium (III +VI)
- Cobalt
- Copper
- Mercury
- Molybdenum



- Nickel
- Nitrogen (Total)
- Silver
- Total Phosphorus as P  
(Organic Phosphate as P)
- Vanadium
- Zinc
- >C10-C16 Fraction (F2 minus Naphthalene)
- >C16-C34 Fraction (F3)

**Appendix D, Table D-1** presents the results of the Tier 1 screening level assessment.

## 5.2 Tier 2 Quantitative Risk Assessment

Potential exposure of avian receptors to the chemicals of concern in the flowback/produced water samples was quantitatively assessed for representative avian species that were previously evaluated in the stimulation chemical risk assessments (EHS Support, 2023). The potential avian exposure pathway was assessed based on the potential ingestion of flowback/produced water by avian receptors using standard methods and in accordance with the methodologies used in the previous avian risk assessments.

Potential dietary intake of water containing these chemicals was compared to toxicity reference values (TRVs) developed specifically for avian wildlife. Exposure assumptions for the dietary intake and TRV development were designed to be conservative to reduce uncertainty in the quantitative risk estimates. The potential risks were estimated using a chemical-specific HQ. As with the human health risk assessment, an HI is the sum of the HQs on an avian species-specific basis. A potential HI threshold level of less than 1 indicates there are no unacceptable exposures to the avian species.

**Table 5-1** summarises the results of the quantitative risk evaluation and includes a short-term (21-day) and long-term (1-year) scenario of fluid exposure that aligns with the current approach of off-site transportation, re-use, and management of fluids and a possible future scenario with possible longer-term storage on-site. The HIs for all the assessed avian species were orders of magnitude less than the threshold HI of 1 for the 21-day scenario exposure scenarios and did not exceed the HI target of 1 under the longer-term on-site storage scenario. Given the hypersaline nature of the flowback water and sufficient surface water resources in the vicinity of well pads except during periods of water scarcity of the dry season (i.e., limited 3 to 6 months per year), it is unlikely that avian receptors would ingest the flowback water stored in open top tanks. There were therefore no unacceptable exposures to the avian species from potential ingestion of chemicals in flowback/produced water.

**Table 5-1 Hazard Indices for Target Avian Species Exposed to Flowback Water**

Avian Species	Hazard Index for 21 Days of Storage	Hazard Index for 1 Year of Storage
Crested Pigeon	4E-02	7E-01
Willie Wagtail	5E-02	9E-01
Peaceful Dove	5E-02	8E-01
Cattle Egret	4E-02	7E-01
Brown Honeyeater	5E-02	9E-01

**Appendix , Table D-2** through **Table D-7** present the detailed calculations and outcomes of the quantitative risk evaluation for the target avian species in **Table 5-1**.



## 6 Terrestrial Risk Assessment

This terrestrial soil risk assessment was conducted assuming chemicals detected in flowback water samples would ultimately be incorporated into soils within the bund that could pose an exposure risk to terrestrial receptors. To assess a potential release of liquids to soil within the containment area, concentrations of chemicals in soil that would result from a release of flowback/produced water to soil within the bund area were calculated. These concentrations were compared, where possible, to ecological soil screening criteria.

### 6.1 Calculation of Chemical Concentrations in Soil

This terrestrial risk assessment evaluated the potential for a release of flowback from the tank to the bund area soils. The vertical depth of associated infiltration from this hypothetical release was estimated as 1 metre (m) based on modelling (EHS Support, 2023). Using this information, the bund well pad area (approximately 4.5 ha) and the depth of infiltration of the volume of affected soil with the bund area were calculated at 45000 cubic metres (m<sup>3</sup>). Maximum and median concentrations of detected chemicals in flowback/produced water from the sampled flowback/produced water samples were used to determine their respective maximum and median concentrations in soils (C<sub>soil</sub>) according to Equation 1 below.

$$C_{\text{soil}} = C_{\text{wat}} \times V_{\text{tank}} / M_{\text{soil}} / D_{\text{soil}} \quad \text{Eq. 1}$$

Where:

- C<sub>wat</sub> = maximum detected concentration of chemical in wastewater from four wells
- V<sub>tank</sub> = volume of the largest enclosed storage tank in the event of a complete release (litres [L])
- M<sub>soil</sub> = mass of soil (4.5 x 10<sup>4</sup> m<sup>3</sup>)
- D<sub>soil</sub> = bulk density of soil (1,350 kilograms per cubic metre [kg/m<sup>3</sup>])

The volume of flowback water in the tank, which is the maximum storage volume for one of the tanks within the bund area on the Site is approximately 5 ML (5 x 10<sup>6</sup> L) (correspondence from Tamboran). For uncovered tanks containing flowback, freeboard is increased to account for accumulation of precipitation. A maximum volume of 5 ML was used in the calculation of soil concentrations.

### 6.2 Tier 1 Screening Assessment

Chemical calculated maximum and median soil concentrations are presented in **Appendix E, Table E-1**. These concentrations reflect a range of chemical concentrations potentially expected in the 1-m stratum of soil adjacent to the enclosed storage tanks as a result of a release from a tank. Ecological soil screening levels defined by National Environment Protection (Assessment of Site Contamination) Measure (ASC NEPM) were used to determine a ratio of the calculated concentration in soil to screening criteria. In certain instances, where NEPM values were not available, other data available from the European Union, the USEPA, or background threshold values for the McArthur Basin surficial soils were used as the screening level.

To determine whether the maximum or median soil concentrations exceeded the screening level, a ratio of the soil concentration to the screening levels was calculated. If the ratio exceeded 1, the estimated concentration for the chemical exceeded the screening level. Calculated ratios for the maximum concentration of bromine slightly exceeded 1 at 2.3. Given that the predicted soil concentration was based on a potential maximum flowback volume it is unlikely that a potential release to soils within the bund area of stored flowback water would result in an unacceptable level of ecological risks.



## 7 Assessment of BTEX

In addition to the risk evaluations, assessment of benzene, toluene, ethylbenzene, and xylene (BTEX) in flowback water was conducted pursuant to Section B.5 of the Code of Practice (NT, 2025b). Section B.5 states that recycled produced water used in hydraulic fracturing fluids must not contain BTEX levels greater than those expected in produce water from the well being drilled, or in the event BTEX levels expected in produced water are unknown, then BTEX levels in water cannot exceed levels prescribed in Table 8 of Section B.5.

**Table 7-1** presents a comparison of the results from the flowback data to the BTEX levels in water used for stimulation and drilling fluids from Table 8 in Section 8.5 of the Code of Practice (NT, 2025). Results for BTEX did not exceed the Code of Practice thresholds, therefore conditions set forth in Section B.5 of the Code of Practice regarding BTEX are satisfied.

**Table 7-1 BTEX Evaluation**

Chemical	ANZG (99% Protection Level) (µg/L)	Maximum Concentration (µg/L)
Benzene	600	2
Toluene	180	14
Ethylbenzene	80	<5
Xylene	200	< 2

**Table Notes:**

% = percent

µg/L = micrograms per litre

< = less than limit of detection

ANZG = Australian and New Zealand Guidelines



## 8 Conclusions

In accordance with Regulation 37A under part 3A of the *Northern Territory Petroleum (Environment) Regulations* (2016) and pursuant to Condition 15 of the EMP TAM1-3 approval (NT, 2024), a risk assessment of flowback water from the hydraulic fracturing phase of wells advanced in the Beetaloo Sub-basin project area was conducted. This assessment included determination of potential risk to human and avian receptors exposed to flowback. An assessment was also conducted of a potential release of flowback water to soils within the bunded area. As noted above, the risk evaluation methods used are consistent with those used for the EMP and the hydraulic fracturing fluid risk assessment conducted prior to approval of the activities at the Kyalla 117 N2 and Shenandoah S2 well sites (Origin, 2021; Tamboran, 2023; EHS Support, 2023, Tamboran, 2024; Tamboran, 2025; AECOM, 2025).

Potentially complete exposure pathways for humans were identified during reuse of flowback water as make-up water for future stimulation activities and off-site disposal activities. Mechanical evaporation was also conservatively assessed in this assessment; however, Tamboran is not currently planning on utilising mechanical evaporation for flowback water. Because exposure to flowback water was longer for the reuse scenario than the off-site disposal scenario, the reuse scenario was evaluated in the Tier 2 assessment for human receptors. There were no unacceptable risks calculated for the reuse of flowback water exposure scenario. With respect to re-use of flowback water, and the approved Site activities and associated management controls, no further action is recommended.

This risk assessment conducted for the avian receptors potentially exposed to flowback water concluded there is no unacceptable risk to these receptors potentially exposed to chemicals in the assessed flowback water samples. Therefore, with respect to avian use of flowback water from wells and the approved Site activities and associated management controls, no further action is recommended.

Likewise, a screening assessment was performed to determine the potential risk to terrestrial receptors exposed to soils affected by flowback water based on a hypothetical release scenario. The assessment consisted of a screening level evaluation to determine if a further quantitative risk assessment would be required to assess the potential risk to terrestrial receptors. This screening level risk assessment concluded that no chemicals detected in the flowback water at their maximum or median concentrations, under a hypothetical maximum release scenario, would result in soil levels above screening criteria protective of terrestrial receptors, except for bromine. Given that the predicted soil concentration was based on a potential maximum flowback volume it is unlikely that a potential release to soils within the bunded area of stored flowback water would result in an unacceptable level of ecological risks; therefore, with the approved Site activities and associated management controls (e.g., maintenance of measures outlined in the EMP), no further action is recommended.

This risk assessment satisfies the requirement 3(a) of Regulation 37A of the *Petroleum (Environment) Regulations* 2016 (NT, 2023).



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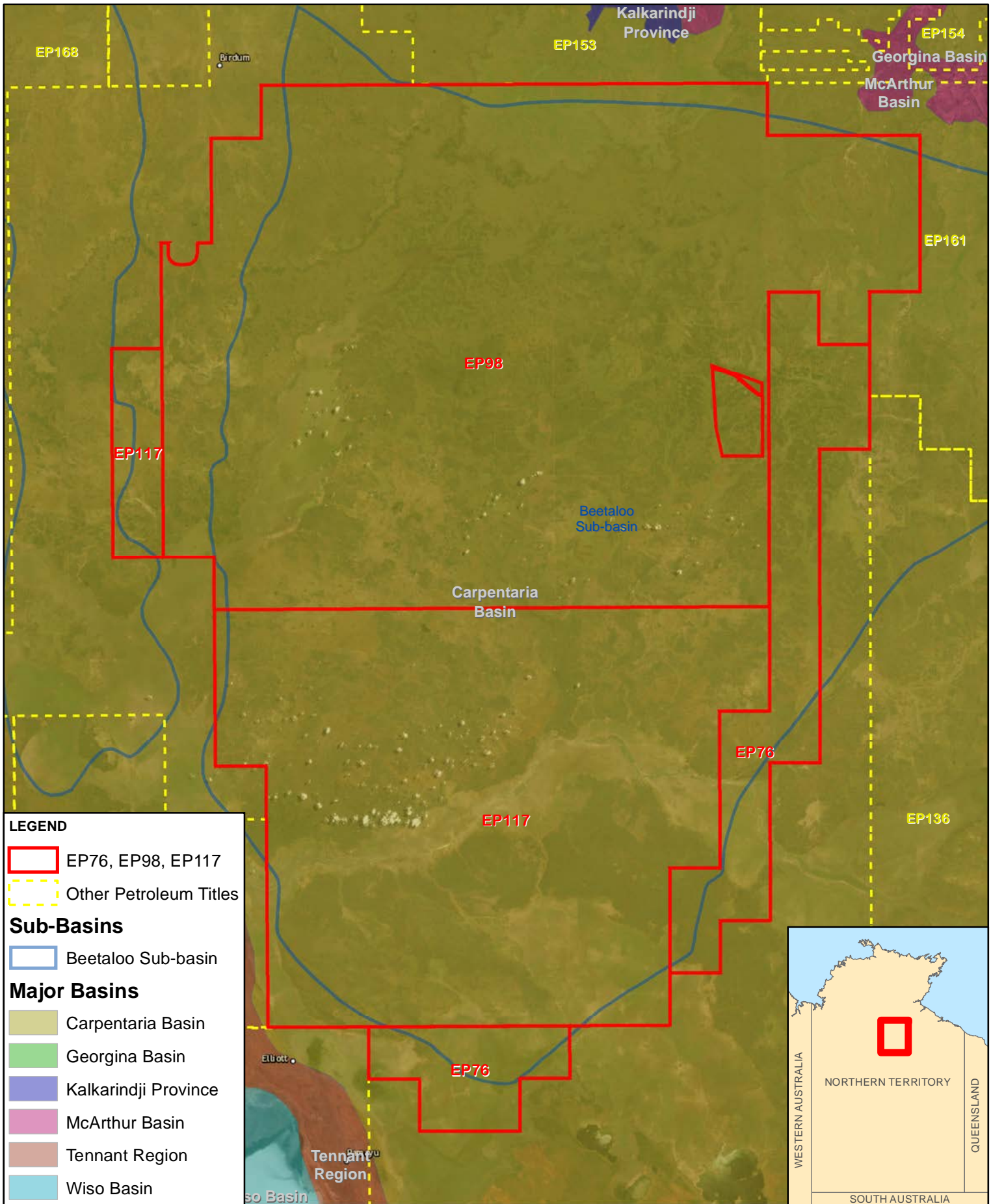
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## Figures



**LEGEND**

- EP76, EP98, EP117
- Other Petroleum Titles

**Sub-Basins**

- Beetaloo Sub-basin

**Major Basins**

- Carpentaria Basin
- Georgina Basin
- Kalkarindji Province
- McArthur Basin
- Tennant Region
- Wiso Basin

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<p>Tamboran Exploration Permits</p>	<p><b>Tamboran - Beetaloo Sub-Basin Flowback Assessment</b></p>	<p><b>Figure 1</b></p>														
<p>0 4.75 9.5 19 28.5 38 Kilometers 1 cm = 9 km [Page Size: A4]</p>		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"><b>CREATED BY:</b></td> <td>D. Barnes</td> </tr> <tr> <td><b>APPROVED BY:</b></td> <td>C. Peterson</td> </tr> <tr> <td><b>PROJECT REF. NO:</b></td> <td>PTY.05635</td> </tr> <tr> <td><b>MAP PROJECTION:</b></td> <td>Transverse Mercator</td> </tr> <tr> <td><b>GRID/DATUM:</b></td> <td>GDA 1994 MGA Zone 53</td> </tr> <tr> <td><b>SCALE:</b></td> <td>1:866,894</td> </tr> <tr> <td><b>AERIAL IMAGE SOURCE:</b></td> <td>ESRI Basemaps</td> </tr> </table>	<b>CREATED BY:</b>	D. Barnes	<b>APPROVED BY:</b>	C. Peterson	<b>PROJECT REF. NO:</b>	PTY.05635	<b>MAP PROJECTION:</b>	Transverse Mercator	<b>GRID/DATUM:</b>	GDA 1994 MGA Zone 53	<b>SCALE:</b>	1:866,894	<b>AERIAL IMAGE SOURCE:</b>	ESRI Basemaps
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## Appendix A Supplemental Information

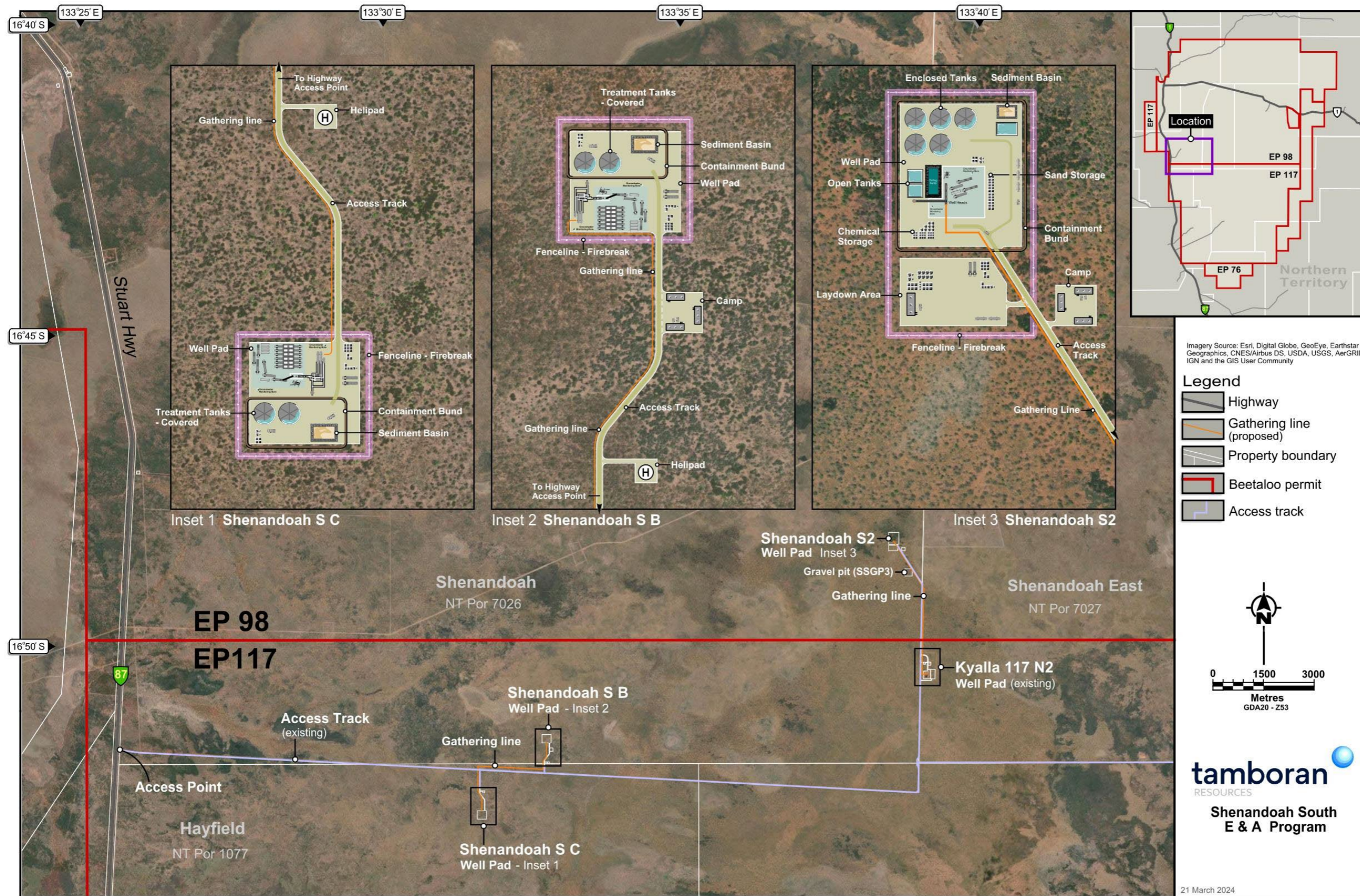


Figure 22: General site layout for new E&A well pads – Shenandoah S2, S B and S C

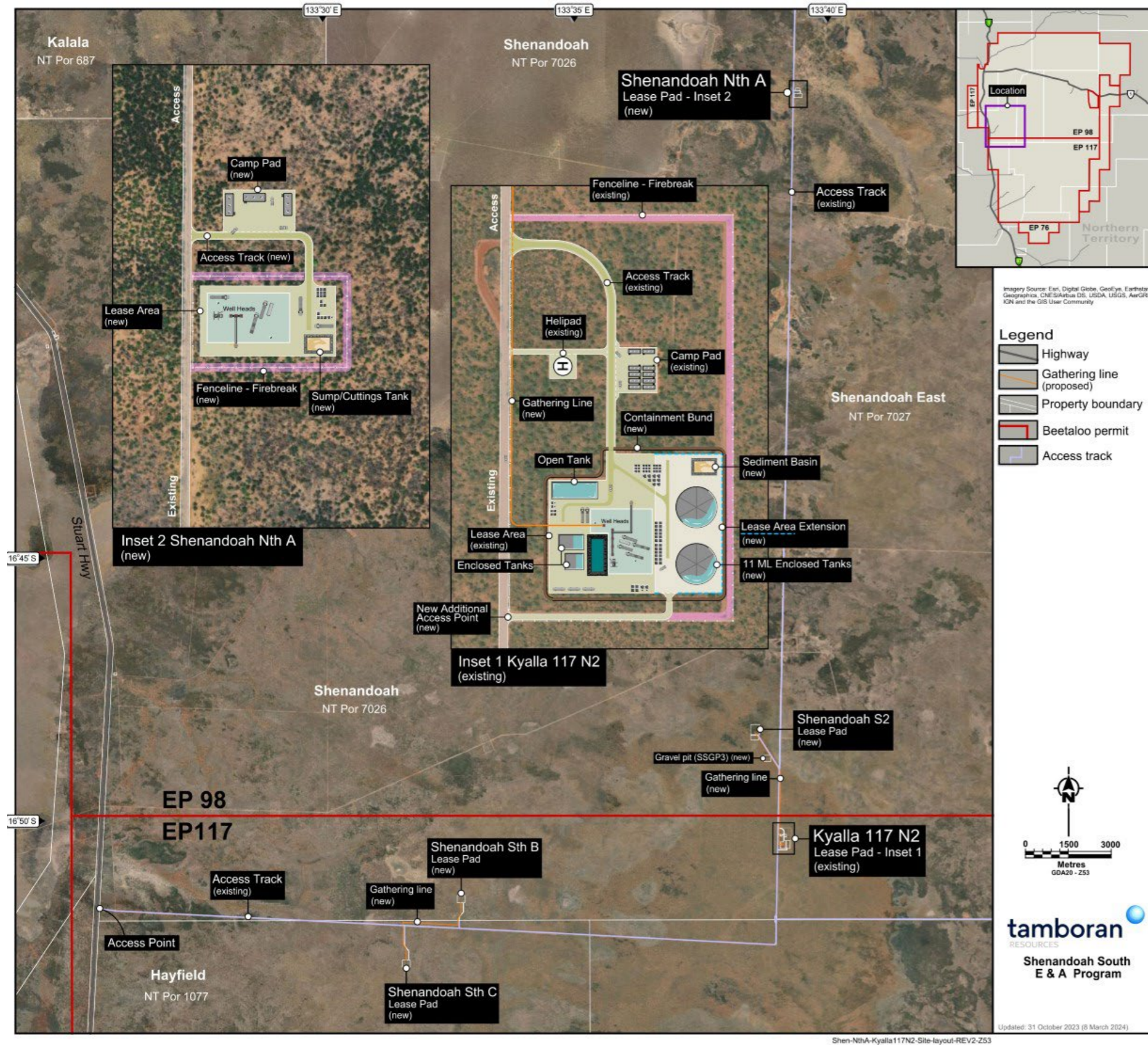


Figure 23: Generalised site layout for new E&A well pad Shenandoah N A and existing Kyalla 117 N2, including increased well pad



## Appendix B Analytical Data

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
Beetaloo Flowback Water Assessment  
Tamboran

EQL	BTEX								Explosives		Halogenated Benzenes	Herbicides	Total Phosphorus as P (Organic Phosphate as P)	Silicon as SiO2	Nitrite + Nitrate as N	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N
	Naphthalene (VOC)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	2,4-Dinitrotoluene	Nitrobenzene	Hexachlorobenzene	Dinoseb								
	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L								
0.005	1	2	2	2	2	2	1	4	2	0.5	50	0.01	0.1	0.01	1	1	1	1	0.01	

Field ID	Location Code	Date	Naphthalene (VOC)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	2,4-Dinitrotoluene	Nitrobenzene	Halogenated Benzenes	Herbicides	Total Phosphorus as P (Organic Phosphate as P)	Silicon as SiO2	Nitrite + Nitrate as N	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N	
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	0.007	<5	<5	<5	<10	<5	<2	<2	<4	<2	<2.5	<100	2.52	141	0.06	554	<1	<1	554	14.8	
		27 Dec 2023	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<1.3	<50	1.28	164	0.02	243	<1	<1	243	13
		28 Jan 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1					1.36	173	0.03	332	<1	<1	332	19.8
		04 Feb 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1					1.05	170	0.01	269	<1	<1	269	21.8
		13 Feb 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1					0.77	161	<0.01	223	<1	<1	223	18.8
		18 Feb 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.38	148	<0.01	201	<1	<1	201	0.04
		06 Mar 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.42	130	<0.01	162	<1	<1	162	20.9
		13 Mar 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	<0.10	131	<0.01	156	<1	<1	156	23.3
		20 Mar 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.41	115	<0.01	156	<1	<1	156	19.4
		27 Mar 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.3	88.2	<0.01	148	<1	<1	148	17.6
		17 Apr 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.2	53.4	<0.01	116	<1	<1	116	15.4
		24 Apr 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.15	45.4	0.02	102	<1	<1	102	14.4
2H-StG-02-XLB	BET-PW005	27 Jan 2025												1.84	23.4	<0.10	420	<1	<1	420	<0.10		
2H-STG-02-FR	BET-PW005	27 Jan 2025												10.3	22.5	0.07	280	<1	<1	280	4.75		
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025												11.4	21.3	0.04	200	<1	<1	200	22.2		
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025												11.9	21.4	0.04	220	<1	<1	220	9.8		
SS2-2H-21-XL	BET-PW005	02 Feb 2025												1.32	26	0.04	540	<1	<1	540	<0.10		
SS2-2H-21-XL	BET-PW005	02 Feb 2025												1.68	26.8	0.05	530	<1	<1	530	0.09		
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025																					
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	<0.005	<1	3	<2	<2	<2	<2	3	<4	<2	<0.5	<50	1.2	192	<0.020	303	<1	<1	303	23.9	
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025																					
SS2-2H Choke Water	BET-PW005	20 May 2025	<0.005	<1	4	<2	<2	<2	<2	4	<4	<2	<2.4	<90	1.11	220	0.007	364	<1	<1	364	21.9	
SS2-2H Choke Water	BET-PW005	20 May 2025																					
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	<0.005	<1	2	<2	<2	<2	<2	2	<4	<2	<0.5	<50	1.05	209	0.006	296	<1	<1	296	22.8	
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025																					
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025																					
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025												2.6	25	0.03	380	<1	<1	380	<0.10		
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025												8.65	21.3	0.13	290	<1	<1	290	1.26		
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025												8.87	21.9	0.04	320	<1	<1	320	2.05		
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025												1.42	24.4	0.02	530	<1	<1	530	0.41		
SS2-2H Water Sample	BET-PW005	10 Jun 2025	<0.005	<1	5	<2	<2	<2	<2	5	<4	<2	<0.5	<50	0.992	183	<0.020	320	<1	<1	320	23.7	
SS2-2H Water Sample	BET-PW005	10 Jun 2025																					
SS2H Water sample	BET-PW005	01 Jul 2025	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	1.25	182	<0.040	285	<1	<1	285	24	
SS2H Water sample	BET-PW005	01 Jul 2025																					
SS2H Water sample	BET-PW005	08 Jul 2025	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	1.02	169	<0.040	352	<1	<1	352	24.2	
SS2H Water sample	BET-PW005	08 Jul 2025																					
SS2H Water sample	BET-PW005	15 Jul 2025	<0.005	<1	9	<2	<2	<2	<2	9	<4	<2	<0.5	<50	0.605	168	<0.040	332	<1	<1	332	24	
SS2H Water sample	BET-PW005	15 Jul 2025																					
SS2H Water sample	BET-PW005	22 Jul 2025	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.606	157	<0.020	250	<1	<1	250	23.2	
SS2H Water sample	BET-PW005	22 Jul 2025																					
SS2H Water sample	BET-PW005	29 Jul 2025	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.482	162	<0.040	258	<1	<1	258	23.5	
SS2H Water sample	BET-PW005	29 Jul 2025																					
SS2H Water sample	BET-PW005	05 Aug 2025	<0.005	<1	2	<2	<2	<2	<2	2	<4	<2	<0.5	<50	0.587	140	<0.040	201	<1	<1	201	23.1	
SS2H Water sample	BET-PW005	05 Aug 2025																					
SS2H Water sample	BET-PW005	10 Aug 2025	0.008	2	14	<2	<2	<2	<2	16	<4	<2	<0.5	<50	0.506	140	<0.040	222	<1	<1	222	24.7	
SS2H Water sample	BET-PW005	10 Aug 2025																					
SS2H Water sample	BET-PW005	10 Aug 2025																					

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
Beetaloo Flowback Water Assessment  
Tamboran

	BTEX							Explosives		Halogenated Benzenes	Herbicides										
	Naphthalene (VOC)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	2,4-Dinitrotoluene	Nitrobenzene	Hexachlorobenzene	Dinoseb	Total Phosphorus as P (Organic Phosphate as P)	Silicon as SiO2	Nitrite + Nitrate as N	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Ammonia as N	
	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
<b>Statistics</b>																					
Number of Results	23	23	23	23	23	23	23	23	20	20	20	20	33	33	33	33	33	33	33	33	
Number of Detects	2	1	7	0	0	0	0	7	0	0	0	0	32	33	16	33	0	0	33	30	
Minimum Concentration	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	<0.1	21.3	0.006	102	<1	<1	102	0.04	
Minimum Detect	0.007	2	2	ND	ND	ND	ND	2	ND	ND	ND	ND	0.15	21.3	0.006	102	ND	ND	102	0.04	
Maximum Concentration	0.008	<5	14	<5	<10	<5	<2	16	<4	<2	<2.5	<100	11.9	220	0.13	554	<1	<1	554	24.7	
Maximum Detect	0.008	2	14	ND	ND	ND	ND	16	ND	ND	ND	ND	11.9	220	0.13	554	ND	ND	554	24.7	
Average Concentration *	0.00293478	0.65217391	2.45652174	1.06521739	1.17391304	1.06521739	1	2.15217391	2	1	0.3675	27.25	2.37206061	111.393939	0.02569697	289.545455	0.5	0.5	289.545455	15.119697	
Geometric Average *	0.00275008	0.56955612	1.62970742	1.04064293	1.07248197	1.04064293	1	1.00231766	2	1	0.307396726	26.6535545	1.08694344	81.8426903	0.01714068	265.856281	0.5	0.5	265.856281	5.94259222	
Median Concentration *	0.0025	0.5	1	1	1	1	1	0.5	2	1	0.25	25	1.05	140	0.02	280	0.5	0.5	280	19.4	
Standard Deviation *	0.00141655	0.49858021	3.07483843	0.30589668	0.81572448	0.30589668	0	3.57051568	0	0	0.298862427	6.79613861	3.40815196	67.8398736	0.02526764	119.173439	0	0	119.173439	9.36907404	
Geometric Standard Deviation *	1.4	1.5	2.2	1.2	1.4	1.2	1.0	2.9	1.0	1.0	1.7	1.2	3.4	2.4	2.5	1.5	1.0	1.0	1.5	8.9	
95% UCL (Student's-t) *	0.00344198	0.83069024	3.55746565	1.1747435	1.46598267	1.1747435	1	3.43059474	2	1	0.483053917	29.8776988	3.37701618	131.39776	0.03314759	324.68591	0.5	0.5	324.68591	17.8823388	
% of Detects	9%	4%	30%	0%	0%	0%	0%	30%	0%	0%	0%	0%	97%	100%	48%	100%	0%	0%	100%	91%	
% of Non-Detects	91%	96%	70%	100%	100%	100%	100%	70%	100%	100%	100%	100%	3%	0%	52%	0%	100%	100%	0%	9%	

\* A Non Detect Multiplier of 0.5 has been applied.

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
Beetaloo Flowback Water Assessment  
Tamboran

EQL	Inorganics															Aluminium	Antimony	Arsenic	Barium	Beryllium
	Anions Total	Bromide	Bromine	Cations Total	Chloride	Cyanide Total	Fluoride	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Reactive Phosphorus as P (Orthophosphate as P)	Total Dissolved Solids (Lab)	Total Suspended Solids (Lab)					
	meq/L	µg/L	µg/L	meq/L	mg/L	mg/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L					
	0.01	10	100	0.01	1	0.004	0.1	0.01	0.1	0.01	0.01	0.1	0.01	10	5	0.01	0.001	0.001	0.001	0.001

Field ID	Location Code	Date	203	84,600	75,800	199	6,690	1.6	1.12	34.8	0.06	<0.01	34.9	0.21	12,800	115	0.1	0.007	0.023	3.97	<0.001		
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	203	84,600	75,800	199	6,690	1.6	1.12	34.8	0.06	<0.01	34.9	0.21	12,800	115	0.1	0.007	0.023	3.97	<0.001		
		27 Dec 2023	157	71,500	115,000	153	5,360	1	1.03	27.9	0.02	<0.01	27.9	0.02	10,100	248	0.07	0.001	0.016	15.9	<0.001		
		28 Jan 2024	383	205,000	168,000	374	13,300	1.2	1.17	44.1	0.03	<0.01	44.1	0.01	25,400	91	<0.10	<0.010	0.011	21.5	<0.010		
		04 Feb 2024	477	250,000	188,000	448	16,700	1.1	3.12	44.8	0.01	<0.01	44.8	0.14	30,400	64	<0.10	<0.010	<0.010	30.1	<0.010		
		13 Feb 2024	445	304,000	218,000	470	15,600	1	2.75	43.8	<0.01	<0.01	43.8	0.06	35,200	64	<0.10	<0.010	<0.010	30	<0.010		
		18 Feb 2024		275,000	225,000		14,100	1		2.7	<0.01	<0.01	2.7	0.1	33,500	34	<0.10	<0.010	<0.010	33.9	<0.010		
		06 Mar 2024	390	216,000	179,000	365	13,700	0.9	3.31	31.7	<0.01	<0.01	31.7	0.16	28,000	50	<0.10	<0.010	<0.010	29.8	<0.010		
		13 Mar 2024		217,000	173,000		14,000	0.7		40.9	<0.01	<0.01	40.9	<0.01	28,600	52	0.15	<0.010	<0.010	15.6	<0.010		
		20 Mar 2024	367	197,000	127,000	406	12,900	0.8	5.02	40.2	<0.01	<0.01	40.2	<0.01	25,500	60	<0.10	<0.010	<0.010	30.9	<0.010		
		27 Mar 2024	288	136,000	124,000	318	10,100	0.6	4.96	34.7	<0.01	<0.01	34.7	<0.01	19,300	54	<0.10	<0.010	<0.010	24	<0.010		
		17 Apr 2024	287	138,000	108,000	310	10,100	0.5	3.71	26.8	<0.01	<0.01	26.8	0.18	20,800	58	0.01	<0.001	<0.001	21.7	<0.001		
		24 Apr 2024	170	73,600	94,400	183	5,960	0.4	3.6	18.6	0.02	<0.01	18.6	<0.01	11,400	34	0.03	<0.001	<0.001	16.5	<0.001		
		2H-StG-02-XLB	BET-PW005	27 Jan 2025		18,600	500		251	<0.200	0.1	16.8	<0.10	<0.10	16.8		4,280	593	0.87	0.001	0.0071	0.078	0.0002
		2H-STG-02-FR	BET-PW005	27 Jan 2025		22,100	300		411	<0.200	0.1	95.5	0.03	0.04	95.6		2,630	161	0.151	0.0014	0.007	0.073	<0.0001
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025		<1,000	500		388	<0.200	0.1	92.8	0.01	0.03	92.8		1,990	146	<0.005	<0.0005	0.005	0.059	<0.0001		
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025		<1,000	600		387	<0.200	0.1	97.9	0.02	0.02	97.9		2,180	96	0.005	<0.0005	0.0051	0.062	<0.0001		
SS2-2H-21-XL	BET-PW005	02 Feb 2025		<1,000	600		188	<0.200	0.1	20.9	0.02	0.02	20.9		4,260	510	1.36	<0.0005	0.005	0.094	0.0004		
SS2-2H-21-XL	BET-PW005	02 Feb 2025		<1,000	600		210	<0.200	0.1	23.2	0.03	0.02	23.2		4,390	592	1.1	<0.0005	0.005	0.084	0.0003		
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025																					
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	554	459,000	236,000	614	19,400	<0.004	0.8	5.16	41.2	<0.020	<0.020	41.2	0.098	32,900	174	0.059	0.002	0.0463	11.2	0.0001	
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025																					
SS2-2H Choke Water	BET-PW005	20 May 2025		238,000	187,000		16,800	<0.004	0.8	57.4	0.007	<0.002	57.4	0.124	29,900	42	0.188	0.0007	0.107	40.4	0.0001		
SS2-2H Choke Water	BET-PW005	20 May 2025																					
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	469	372,000	222,000	538	16,400	<0.004	0.8	6.82	42.4	0.006	<0.002	42.4	0.108	36,400	150	0.134	0.0012	0.0656	42	<0.0001	
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025																					
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025																					
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025		<1,000	700		243	<0.200	0.1	33.4	0.01	0.02	33.4		4,700	970	0.866	0.001	0.0069	0.087	0.0002		
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025		16,200	300		452	<0.200	0.1	88.1	0.1	0.03	88.2		3,100	222	0.105	0.0012	0.0066	0.06	<0.0001		
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025		<1,000	600		402	<0.200	0.1	94.1	0.02	0.02	94.1		2,250	250	0.033	<0.0005	0.0046	0.07	<0.0001		
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025		<1,000	700		175	<0.200	0.1	27.6	<0.01	0.02	27.6		4,150	505	0.838	<0.0005	0.0042	0.072	0.0002		
SS2-2H Water Sample	BET-PW005	10 Jun 2025	537	437,000	265,000	568	18,800	<0.004	0.8	2.77	46.4	<0.020	<0.020	46.4	0.195	30,200	146	0.044	0.0014	0.0451	50.5	<0.0001	
SS2-2H Water Sample	BET-PW005	10 Jun 2025																					
SS2H Water sample	BET-PW005	01 Jul 2025	500	293,000	211,000	578	17,500	<0.004	0.7	7.27	44.2	<0.040	<0.040	44.2	0.068	34,200	265	0.271	0.0024	0.0391	51.2	0.0001	
SS2H Water sample	BET-PW005	01 Jul 2025																					
SS2H Water sample	BET-PW005	08 Jul 2025	603	276,000	229,000	540	21,100	<0.004	0.7	5.5	41.4	<0.040	<0.040	41.4	0.106	38,000	734	0.681	0.003	0.0469	45.4	0.0001	
SS2H Water sample	BET-PW005	08 Jul 2025																					
SS2H Water sample	BET-PW005	15 Jul 2025	554	366,000	274,000	534	19,400	<0.004	0.7	1.85	43.8	<0.040	<0.040	43.8	0.083	37,700	297	0.244	0.0016	0.0211	48.8	<0.0001	
SS2H Water sample	BET-PW005	15 Jul 2025																					
SS2H Water sample	BET-PW005	22 Jul 2025	479	424,000	203,000	532	16,800	<0.004	0.6	5.17	37.5	<0.020	<0.020	37.5	0.072	34,300	215	0.13	0.0018	0.0178	48.2	<0.0001	
SS2H Water sample	BET-PW005	22 Jul 2025																					
SS2H Water sample	BET-PW005	29 Jul 2025	496	240,000	278,000	469	17,400	<0.004	0.7	2.82	36	<0.040	<0.040	36	0.082	34,100	212	0.259	0.0023	0.0198	52	<0.0001	
SS2H Water sample	BET-PW005	29 Jul 2025																					
SS2H Water sample	BET-PW005	05 Aug 2025	472	247,000	239,000	525	16,600	<0.004	0.6	5.3	39.1	<0.040	<0.040	39.1	0.105	36,500	244	0.248	0.0012	0.015	39.3	<0.0001	
SS2H Water sample	BET-PW005	05 Aug 2025																					
SS2H Water sample	BET-PW005	10 Aug 2025	428	456,000	278,000	473	15,000	<0.004	0.6	5.06	31.7	<0.040	<0.040	31.7	0.073	28,900	171	0.079	0.0006	0.0073	46.9	<0.0001	
SS2H Water sample	BET-PW005	10 Aug 2025																					
SS2H Water sample	BET-PW005	10 Aug 2025																					

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
 Beetaloo Flowback Water Assessment  
 Tamboran

	Inorganics															Aluminium	Antimony	Arsenic	Barium	Beryllium
	Anions Total	Bromide	Bromine	Cations Total	Chloride	Cyanide Total	Fluoride	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Reactive Phosphorus as P (Orthophosphate as P)	Total Dissolved Solids (Lab)	Total Suspended Solids (Lab)					
Statistics	meq/L	µg/L	µg/L	meq/L	mg/L	mg/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Number of Results	20	33	33	20	33	21	33	20	33	33	33	33	23	33	33	33	33	33	33	33
Number of Detects	20	26	33	20	33	0	33	20	33	15	9	33	19	33	33	25	17	24	33	9
Minimum Concentration	157	<1000	300	153	175	<0.004	0.1	1.03	2.7	0.006	<0.002	2.7	<0.01	1990	34	<0.005	<0.001	<0.001	0.059	<0
Minimum Detect	157	16200	300	153	175	ND	0.1	1.03	2.7	0.006	0.02	2.7	0.01	1990	34	0.005	0.0006	0.0042	0.059	0.0001
Maximum Concentration	603	459000	278000	614	21100	<0.2	1.6	7.27	97.9	<0.1	<0.1	97.9	0.21	38000	970	1.36	<0.01	0.107	52	<0.01
Maximum Detect	603	459000	278000	614	21100	ND	1.6	7.27	97.9	0.1	0.04	97.9	0.21	38000	970	1.36	0.007	0.107	52	0.0004
Average Concentration *	412.95	182912.121	134018.182	429.85	10206.5758	0.04866667	0.59393939	3.8755	43.7090909	0.01918182	0.01460606	43.7181818	0.08756522	20849.3939	230.878788	0.25386364	0.00222121	0.01737879	22.742697	0.00134242
Geometric Average *	387.506675	49823.6507	30735.612	402.444389	4273.11377	0.01288437	0.41609962	3.37115208	37.227173	0.01362663	0.01017971	37.2328708	0.05292107	14126.4152	152.674652	0.10333596	0.00135509	0.00912226	4.65704314	0.00028003
Median Concentration *	457	205000	168000	469.5	13300	0.002	0.7	3.655	40.2	0.02	0.01	40.2	0.083	25500	161	0.1	0.0014	0.0069	21.7	0.0002
Standard Deviation *	127.621501	151392.434	101076.372	134.180205	7423.90964	0.04894441	0.38842291	1.78584007	23.4943625	0.01902384	0.01136432	23.5056338	0.0608718	13392.9131	222.172436	0.34989109	0.00197714	0.02238507	19.013614	0.00207416
Geometric Standard Deviation *	1.5	12.6	15.1	1.5	6.1	7.1	2.6	1.8	1.9	2.2	2.6	1.9	3.5	2.8	2.5	4.3	2.9	3.2	16.2	6.1
95% UCL (Student's-t) *	462.294324	227552.933	163822.388	481.73022	12395.6505	0.0670876	0.70847295	4.56598765	50.6368309	0.02479134	0.01795704	50.6492453	0.10936033	24798.5379	296.39037	0.35703539	0.00280421	0.02397943	28.3492068	0.00195403
% of Detects	100%	79%	100%	100%	100%	0%	100%	100%	100%	45%	27%	100%	83%	100%	100%	76%	52%	73%	100%	27%
% of Non-Detects	0%	21%	0%	0%	0%	100%	0%	0%	0%	55%	73%	0%	17%	0%	0%	24%	48%	27%	0%	73%

\* A Non Detect Multiplier of 0.5 has been applied.

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
Beetaloo Flowback Water Assessment  
Tamboran

EQL	Metals																		NA	
	Boron	Cadmium	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thorium	Tin	Uranium	Vanadium	Zinc	Formaldehyde
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L
EQ	0.05	0.0001	0.001	0.0001	0.001	0.05	0.001	0.001	0.0001	0.001	0.001	0.01	0.001	0.001	1	0.001	1	0.01	0.005	0.1

Field ID	Location Code	Date	Boron	Cadmium	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thorium	Tin	Uranium	Vanadium	Zinc	Formaldehyde
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	15.6	<0.0001	0.029		0.01	15.2	0.008	0.405	<0.0001	0.019	0.004	<0.01	<0.001	15.2	<1	<0.001	<1	<0.01	0.068	0.4
		27 Dec 2023	16	<0.0001	0.068		0.018	25.9	0.003	0.45	<0.0010	0.021	0.005	<0.01	0.001	27.1	<1	<0.001	<1	<0.01	0.026	1
		28 Jan 2024	21.9	<0.0010	0.034		0.022	26.3	<0.010	0.971	<0.0010	0.011	<0.010	<0.010	<0.010	60.8	<10	<0.010	<10	<0.10	<0.052	1.3
		04 Feb 2024	22.2	<0.0010	0.025		<0.010	21.9	<0.010	1.08	<0.0010	<0.010	<0.010	<0.10	<0.010	84.6	<10	<0.010	<10	<0.10	<0.052	2.3
		13 Feb 2024	18.8	<0.0010	0.023		0.076	18.8	<0.010	0.988	0.0004	<0.010	<0.010	<0.10	<0.010	83.5	<10	<0.010	<10	<0.10	0.065	1.8
		18 Feb 2024	19.4	<0.0010	0.042		<0.010	25.2	<0.010	0.969	0.002	<0.010	<0.010	<0.10	<0.010	97	<10	<0.010	<10	<0.10	<0.052	3
		06 Mar 2024	15	<0.0010	0.038		<0.010	24.6	<0.010	1.09	0.0009	<0.010	<0.010	<0.10	<0.010	92.8	<10	<0.010	<10	<0.10	<0.052	3.1
		13 Mar 2024	15.6	<0.0010	0.042		0.011	22.8	<0.010	1.06	0.0002	0.035	<0.010	<0.10	<0.010	97.6	<10	<0.010	<10	<0.10	<0.052	4.7
		20 Mar 2024	13	<0.0010	0.017		<0.010	19.9	<0.010	0.912	0.0005	0.012	<0.010	<0.10	<0.010	104	<10	<0.010	<10	<0.10	<0.052	8.7
		27 Mar 2024	10.3	<0.0010	0.022		<0.010	26.5	<0.010	0.805	0.0007	0.011	<0.010	<0.10	<0.010	77.3	<10	<0.010	<10	<0.10	<0.052	9.9
		17 Apr 2024	8.92	<0.0001	0.005		0.001	14.4	<0.001	0.659	0.0054	0.005	0.002	<0.01	0.003	58	1	<0.001	<1	<0.01	0.014	4.6
		24 Apr 2024	7.3	<0.0001	0.075		0.004	15.2	0.002	0.493	0.0089	0.007	0.004	<0.01	<0.001	46.1	<1	<0.001	<1	<0.01	0.012	3.7
		2H-StG-02-XLB	BET-PW005	27 Jan 2025	25.9	0.0002	0.0012	0.0028	0.007	0.83	0.0097	0.0483	<0.00040	0.0081	0.0113	<0.002	<0.0001	0.8	2.7	<0.005	7.6	0.0011
2H-STG-02-FR	BET-PW005	27 Jan 2025	1.35	<0.0002	0.0056	0.003	0.008	1.38	0.008	0.045	<0.00040	0.0096	0.0233	<0.002	<0.0001	0.787	6	<0.005	7.1	0.0008	0.105	<0.1
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025	0.829	<0.0002	<0.0005	0.0016	0.002	0.247	0.0174	0.0161	<0.00040	0.0046	0.0063	<0.002	<0.0001	0.73	0.2	<0.005	4.5	<0.0005	0.05	<0.1
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025	0.787	<0.0002	<0.0005	0.0016	0.002	0.232	0.0174	0.0165	<0.00040	0.0049	0.0069	<0.002	<0.0001	0.739	0.1	<0.005	4.5	<0.0005	0.054	0.2
SS2-2H-21-XL	BET-PW005	02 Feb 2025	46.9	<0.0002	0.0009	0.0018	0.006	0.724	0.0219	0.0426	<0.00040	0.0061	0.0084	<0.002	<0.0001	0.758	0.7	<0.005	4.4	0.0007	0.075	<0.5
SS2-2H-21-XL	BET-PW005	02 Feb 2025	45.3	<0.0002	0.0011	0.0017	0.008	0.634	0.0189	0.0434	<0.00040	0.0066	0.0089	<0.002	<0.0001	0.761	1.1	<0.005	3.9	0.0007	0.07	<2.0
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025																				
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	22	<0.0002	0.117	0.0028	0.037	42.1	0.001	8.91	<0.00004	0.178	0.0268	0.008	<0.0001	107	5.6	<0.005	<0.1	0.0066	0.08	3.9
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025																				
SS2-2H Choke Water	BET-PW005	20 May 2025	21.5	<0.0002	0.0157	0.0003	0.004	13.4	0.0007	8.53	<0.00004	0.045	0.0035	0.01	<0.0001	99	0.1	<0.005	<0.1	0.0007	0.054	1.6
SS2-2H Choke Water	BET-PW005	20 May 2025																				
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	34.4	<0.0002	0.0654	0.0008	0.01	24.4	0.0009	9.79	<0.00004	0.0847	0.0078	0.011	<0.0001	117	0.9	<0.005	<0.1	0.0032	0.049	2.2
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025																				
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025																				
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025	35.1	<0.0002	0.0025	0.0028	0.008	0.782	0.0119	0.0564	<0.00040	0.0067	0.0132	<0.002	<0.0001	0.802	2.4	<0.005	6.8	0.0011	0.1	<1.0
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025	2.45	<0.0002	0.0011	0.0025	0.003	0.412	0.0106	0.0258	<0.00040	0.0059	0.0128	<0.002	<0.0001	0.745	<1.0	<0.005	6.9	0.0008	0.075	0.2
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025	<1.05	<0.0002	<0.0005	0.0013	0.001	0.3	0.0156	0.0357	<0.00040	0.005	0.0055	<0.002	<0.0001	0.713	<1.0	<0.005	3.8	0.0008	0.038	<0.1
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025	54	<0.0002	0.0007	0.0015	0.006	0.891	0.0163	0.0387	<0.00040	0.0057	0.0063	<0.002	<0.0001	0.687	1.2	<0.005	4	0.0006	0.057	<0.5
SS2-2H Water Sample	BET-PW005	10 Jun 2025	20.3	<0.0002	0.0944	0.0019	0.026	39.7	0.0008	10	<0.00004	0.161	0.019	0.002	<0.0001	117	<0.1	<0.005	<0.1	0.0056	0.058	5.4
SS2-2H Water Sample	BET-PW005	10 Jun 2025																				
SS2H Water sample	BET-PW005	01 Jul 2025	22	<0.0002	0.355	0.0058	0.078	64.2	0.0016	9.82	<0.00004	0.327	0.0634	0.01	0.0007	129	0.4	<0.005	<0.1	0.0129	0.086	12.4
SS2H Water sample	BET-PW005	01 Jul 2025																				
SS2H Water sample	BET-PW005	08 Jul 2025	17.3	<0.0002	0.631	0.0083	0.117	62.9	0.0036	9.26	0.00006	0.46	0.0852	0.003	0.0024	120	<0.1	<0.005	0.2	0.0246	0.116	7.9
SS2H Water sample	BET-PW005	08 Jul 2025																				
SS2H Water sample	BET-PW005	15 Jul 2025	18.7	<0.0002	0.261	0.0058	0.071	65	0.0012	8.96	<0.00004	0.253	0.056	0.003	0.0005	130	0.2	<0.005	<0.1	0.0099	0.058	13.2
SS2H Water sample	BET-PW005	15 Jul 2025																				
SS2H Water sample	BET-PW005	22 Jul 2025	12.6	<0.0002	0.374	0.0046	0.055	95.4	0.0008	10.1	0.00007	0.299	0.0477	0.003	0.001	114	<0.1	<0.005	<0.1	0.0148	0.055	16
SS2H Water sample	BET-PW005	22 Jul 2025																				
SS2H Water sample	BET-PW005	29 Jul 2025	16.2	<0.0002	0.518	0.0071	0.082	82.3	0.0012	8.47	<0.00004	0.395	0.0713	0.002	0.001	121	0.3	<0.005	<0.1	0.0179	0.058	15.2
SS2H Water sample	BET-PW005	29 Jul 2025																				
SS2H Water sample	BET-PW005	05 Aug 2025	17.7	<0.0002	0.357	0.0058	0.066	72.9	0.0012	7.19	0.00068	0.326	0.0504	0.006	0.0002	103	0.6	<0.005	<0.1	0.0127	0.27	11.4
SS2H Water sample	BET-PW005	05 Aug 2025																				
SS2H Water sample	BET-PW005	10 Aug 2025	13.9	<0.0002	0.117	0.0035	0.019	89.8	0.0004	5.28	<0.00004	0.144	0.0251	0.002	0.0002	119	1	<0.005	<0.1	0.0038	0.03	17.4
SS2H Water sample	BET-PW005	10 Aug 2025																				
SS2H Water sample	BET-PW005	10 Aug 2025																				

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
Beetaloo Flowback Water Assessment  
Tamboran

	Metals																		NA	
	Boron	Cadmium	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thorium	Tin	Uranium	Vanadium	Zinc	Formaldehyde
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	µg/L	mg/L	mg/L	mg/L
<b>Statistics</b>																				
Number of Results	33	33	33	21	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Number of Detects	32	1	30	21	28	33	24	33	11	29	25	11	9	33	17	0	11	19	26	25
Minimum Concentration	0.787	<0	<0.001	0	0.001	0.232	0	0.016	<0	0.005	0.002	<0.002	<0	0.687	<0.1	<0.001	<0.1	<0.001	0.012	<0.1
Minimum Detect	0.787	0.0002	0.0007	0.0003	0.001	0.232	0.0004	0.0161	0.00006	0.0046	0.002	0.002	0.0002	0.687	0.1	ND	0.2	0.0006	0.012	0.2
Maximum Concentration	54	<0.001	0.631	0.008	0.117	95.4	0.022	10.1	0.009	0.46	0.085	<0.1	<0.01	130	<10	<0.01	<10	<0.1	0.27	17.4
Maximum Detect	54	0.0002	0.631	0.0083	0.117	95.4	0.0219	10.1	0.0089	0.46	0.0852	0.011	0.003	130	6	ND	7.6	0.0246	0.27	17.4
Average Concentration *	18.5988182	0.00019394	0.10119242	0.00320476	0.02372727	27.734303	0.00650303	3.22910606	0.00071273	0.08717879	0.01860909	0.01484848	0.00156667	64.4703636	2.03484848	0.00286364	2.91515152	0.01635758	0.06081818	4.67121212
Geometric Average *	12.4150028	0.0001387	0.01820982	0.00249185	0.01068974	9.40705254	0.00367963	0.67318804	0.00017542	0.02295656	0.01053956	0.00513389	0.00037073	20.0580491	0.8637461	0.00243329	0.85797039	0.00532397	0.04923939	1.71103338
Median Concentration *	17.3	0.0001	0.029	0.0028	0.008	21.9	0.005	0.969	0.0002	0.011	0.0069	0.005	0.0005	83.5	0.9	0.0025	3.9	0.005	0.055	2.3
Standard Deviation *	12.7267249	0.00017484	0.16049781	0.00214087	0.03022168	28.0824747	0.00620051	4.00211997	0.0017319	0.13188417	0.02218716	0.02007127	0.00204583	49.3712447	2.14396563	0.00136666	2.62942224	0.01980694	0.04596076	5.23454479
Geometric Standard Deviation *	3.2	2.2	10.4	2.2	3.6	7.2	3.2	9.3	5.0	5.2	2.7	4.4	6.9	9.1	4.6	1.9	8.0	5.6	1.9	5.7
95% UCL (Student's-t) *	22.3515244	0.00024549	0.14851812	0.00401051	0.03263868	36.0149313	0.00833136	4.4092039	0.00122341	0.12606723	0.02515138	0.02076686	0.00216992	79.0283729	2.66703573	0.00326662	3.69048447	0.02219801	0.07437055	6.21471283
% of Detects	97%	3%	91%	100%	85%	100%	73%	100%	33%	88%	76%	33%	27%	100%	52%	0%	33%	58%	79%	76%
% of Non-Detects	3%	97%	9%	0%	15%	0%	27%	0%	67%	12%	24%	67%	73%	0%	48%	100%	67%	42%	21%	24%

\* A Non Detect Multiplier of 0.5 has been applied.

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
Beetaloo Flowback Water Assessment  
Tamboran

EQL	Organic		Organochlorine Pesticides																		
	Dissolved Organic Carbon	Total Organic Carbon	Other organochlorine pesticides EPAVic	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	
	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
	1	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Field ID	Location Code	Date	Dissolved Organic Carbon	Total Organic Carbon	Other organochlorine pesticides EPAVic	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin		
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	254	232	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		
		27 Dec 2023	86	181	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<2.0	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	
		28 Jan 2024	169	194																				
		04 Feb 2024	148	165																				
		13 Feb 2024	155	156																				
		18 Feb 2024	148	154	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		06 Mar 2024	136	138	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		13 Mar 2024	123	124	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		20 Mar 2024	114	119	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		27 Mar 2024	93	98	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		17 Apr 2024	89	85	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		24 Apr 2024	59	65	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		2H-StG-02-XLB	BET-PW005	27 Jan 2025	1,690	2,640																		
2H-STG-02-FR	BET-PW005	27 Jan 2025	1,010	1,240																				
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025	628	717																				
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025	634	833																				
SS2-2H-21-XL	BET-PW005	02 Feb 2025	1,800	2,390																				
SS2-2H-21-XL	BET-PW005	02 Feb 2025	1,750	2,210																				
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025																						
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	175	191	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025																						
SS2-2H Choke Water	BET-PW005	20 May 2025	226	226	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	
SS2-2H Choke Water	BET-PW005	20 May 2025																						
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	205	206	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025																						
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025																						
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025	1,670	2,450																				
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025	796	1,170																				
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025	626	731																				
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025	1,650	2,050																				
SS2-2H Water Sample	BET-PW005	10 Jun 2025	187	188	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
SS2-2H Water Sample	BET-PW005	10 Jun 2025																						
SS2H Water sample	BET-PW005	01 Jul 2025	184	175	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
SS2H Water sample	BET-PW005	01 Jul 2025																						
SS2H Water sample	BET-PW005	08 Jul 2025	174	176	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
SS2H Water sample	BET-PW005	08 Jul 2025																						
SS2H Water sample	BET-PW005	15 Jul 2025	161	158	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
SS2H Water sample	BET-PW005	15 Jul 2025																						
SS2H Water sample	BET-PW005	22 Jul 2025	151	155	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
SS2H Water sample	BET-PW005	22 Jul 2025																						
SS2H Water sample	BET-PW005	29 Jul 2025	161	167	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
SS2H Water sample	BET-PW005	29 Jul 2025																						
SS2H Water sample	BET-PW005	05 Aug 2025	158	160	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
SS2H Water sample	BET-PW005	05 Aug 2025																						
SS2H Water sample	BET-PW005	10 Aug 2025	139	134	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
SS2H Water sample	BET-PW005	10 Aug 2025																						
SS2H Water sample	BET-PW005	10 Aug 2025																						

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
 Beetaloo Flowback Water Assessment  
 Tamboran

	Organic		Organochlorine Pesticides																		
	Dissolved Organic Carbon	Total Organic Carbon	Other organochlorine pesticides EPA/Vic	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	
	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
<b>Statistics</b>																					
Number of Results	33	33	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Number of Detects	33	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	59	65	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Minimum Detect	59	65	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	1800	2640	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Maximum Detect	1800	2640	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	477.242424	608.424242	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	1.0225	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675
Geometric Average *	268.512201	302.272486	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	1.02048015	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673
Median Concentration *	174	181	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Standard Deviation *	566.022113	794.301715	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.06796139	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243
Geometric Standard Deviation *	2.7	3.0	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.1	1.7	1.7	1.7	1.7	1.7	1.7	1.7
95% UCL (Student's-t) *	644.144336	842.638546	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	1.04877699	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392
% of Detects	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
% of Non-Detects	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

\* A Non Detect Multiplier of 0.5 has been applied.

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
Beetaloo Flowback Water Assessment  
Tamboran

EQ/L	Endrin aldehyde	γ-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Benzo(b+j+k)fluoranthene	3-methylcholanthrene	7,12-dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene
	μg/L	μg/L	μg/L	μg/L	μg/L	mg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	mg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L
	0.5	0.5	0.5	0.5	2	0.001	2	2	1	1	1	1	0.5	0.001	1	1	1	1	1	1

Field ID	Location Code	Date	Endrin aldehyde	γ-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Benzo(b+j+k)fluoranthene	3-methylcholanthrene	7,12-dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	<2.5	<2.5	<2.5	<2.5	<2.5	<0.0050			<2.5	<2.5	<2.5	<2.5	<2.5	<0.0556	<2.5	<55.6	<2.5	<2.5	<2.5	<2.5	
		27 Dec 2023	<1.3	<1.3	<1.3	<1.3	<2.0	<0.0026			<1.3	<1.3	<1.3	<1.3	<1.3	<0.0049	<1.3	<4.9	<1.3	<1.3	<1.3	<1.3	
		28 Jan 2024									<4.9	<4.9	<4.9	<4.9	<4.9	<0.0049	<4.9	<4.9	<4.9	<4.9	<4.9	<4.9	
		04 Feb 2024									<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
		13 Feb 2024									<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
		18 Feb 2024	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010			<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
		06 Mar 2024	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010			<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
		13 Mar 2024	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010			<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
		20 Mar 2024	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010			<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
		27 Mar 2024	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010			<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
		17 Apr 2024	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010			<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
		24 Apr 2024	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010			<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2H-StG-02-XLB	BET-PW005	27 Jan 2025						<95	<95	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0476	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	
2H-STG-02-FR	BET-PW005	27 Jan 2025						<10	<10	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0048	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025						<10	<10	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0048	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025						<10	<10	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0048	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	
SS2-2H-21-XL	BET-PW005	02 Feb 2025						<95	<95	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0476	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	
SS2-2H-21-XL	BET-PW005	02 Feb 2025						<95	<95	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0476	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025																					
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<10	<10	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025																					
SS2-2H Choke Water	BET-PW005	20 May 2025	<2.4	<2.4	<2.4	<2.4	<2.4	<0.0047	<10	<10	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2-2H Choke Water	BET-PW005	20 May 2025																					
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<2	<2	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0048	<1.0	<4.8	<1.0	<1.0	<1.0	<1.0	
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025																					
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025																					
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025						<95	<95	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0476	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025						<10	<10	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0048	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025						<2	<2	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0048	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025						<95	<95	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0476	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	
SS2-2H Water Sample	BET-PW005	10 Jun 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<10	<10	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2-2H Water Sample	BET-PW005	10 Jun 2025																					
SS2H Water sample	BET-PW005	01 Jul 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<9	<9	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2H Water sample	BET-PW005	01 Jul 2025																					
SS2H Water sample	BET-PW005	08 Jul 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<10	<10	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2H Water sample	BET-PW005	08 Jul 2025																					
SS2H Water sample	BET-PW005	15 Jul 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<9	<9	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2H Water sample	BET-PW005	15 Jul 2025																					
SS2H Water sample	BET-PW005	22 Jul 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<9	<9	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2H Water sample	BET-PW005	22 Jul 2025																					
SS2H Water sample	BET-PW005	29 Jul 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<9	<9	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2H Water sample	BET-PW005	29 Jul 2025																					
SS2H Water sample	BET-PW005	05 Aug 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<10	<10	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2H Water sample	BET-PW005	05 Aug 2025																					
SS2H Water sample	BET-PW005	10 Aug 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<10	<10	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2H Water sample	BET-PW005	10 Aug 2025																					
SS2H Water sample	BET-PW005	10 Aug 2025																					

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
Beetaloo Flowback Water Assessment  
Tamboran

	Endrin aldehyde µg/L	γ-BHC (Lindane) µg/L	Heptachlor µg/L	Heptachlor epoxide µg/L	Methoxychlor µg/L	PAH															
						Benzo(b+j+k)fluoranthene mg/L	3-methylcholanthrene µg/L	7,12-dimethylbenz(a)anthracene µg/L	Acenaphthene µg/L	Acenaphthylene µg/L	Anthracene µg/L	Benzo(a)anthracene µg/L	Benzo(a)pyrene µg/L	Benzo(b+j)fluoranthene mg/L	Benzo(g,h,i)perylene µg/L	Benzo(k)fluoranthene µg/L	Chrysene µg/L	Dibenz(a,h)anthracene µg/L	Fluoranthene µg/L	Fluorene µg/L	
<b>Statistics</b>																					
Number of Results	20	20	20	20	20	20	21	21	33	33	33	33	33	33	33	33	33	33	33	33	33
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.5	<0.5	<0.5	<2	<0.001	<2	<2	<1	<1	<1	<1	<1	<0.5	<0.001	<1	<1	<1	<1	<1	<1
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<2.5	<2.5	<2.5	<2.5	<2.5	<0.005	<95	<95	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<0.056	<47.6	<55.6	<47.6	<47.6	<47.6	<47.6
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.3675	0.3675	0.3675	0.3675	1.0225	0.0007325	14.6428571	14.6428571	4.40454545	4.40454545	4.40454545	4.40454545	4.40454545	4.2530303	0.00532121	4.40454545	5.32121212	4.40454545	4.40454545	4.40454545	4.40454545
Geometric Average *	0.30739673	0.30739673	0.30739673	0.30739673	1.02048015	0.00061415	7.18583192	7.18583192	1.23822023	1.23822023	1.23822023	1.23822023	1.23822023	0.8134961	0.001485	1.23822023	1.48499858	1.23822023	1.23822023	1.23822023	1.23822023
Median Concentration *	0.25	0.25	0.25	0.25	1	0.0005	5	5	0.5	0.5	0.5	0.5	0.5	0.25	0.0005	0.5	0.5	0.5	0.5	0.5	0.5
Standard Deviation *	0.29886243	0.29886243	0.29886243	0.29886243	0.06796139	0.00059082	18.4023438	18.4023438	8.22742424	8.22742424	8.22742424	8.22742424	8.22742424	8.2999173	0.00908203	8.22742424	9.0820338	8.22742424	8.22742424	8.22742424	8.22742424
Geometric Standard Deviation *	1.7	1.7	1.7	1.7	1.1	1.7	3.2	3.2	4.0	4.0	4.0	4.0	4.0	5.3	4.4	4.0	4.4	4.0	4.0	4.0	4.0
95% UCL (Student's-t) *	0.48305392	0.48305392	0.48305392	0.48305392	1.04877699	0.00096094	21.5688438	21.5688438	6.83055109	6.83055109	6.83055109	6.83055109	6.83055109	6.70041183	0.00799921	6.83055109	7.99921492	6.83055109	6.83055109	6.83055109	6.83055109
% of Detects	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
% of Non-Detects	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

\* A Non Detect Multiplier of 0.5 has been applied.

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
Beetaloo Flowback Water Assessment  
Tamboran

EQ/L	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ Calc (Zero)	PAHs (Sum of total)	Particle Size	3,4-Methylphenol (m&sp-cresol)	2,3,5,6-Tetrachlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,4-Dinitrophenol	2,6-Dichlorophenol	2,3,4,5 & 2,3,4,6-Tetrachlorophenol	2-Chlorophenol	2-Methylphenol	2-Nitrophenol	4,6-Dinitro-2-methylphenol
	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µm	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
EQ/L	1	1	1	1	0.0005	0.5		4	0.002	2	2	2	4	0.1	2	0.002	2	4	4	50

Field ID	Location Code	Date	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ Calc (Zero)	PAHs (Sum of total)	Particle Size	3,4-Methylphenol (m&sp-cresol)	2,3,5,6-Tetrachlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,4-Dinitrophenol	2,6-Dichlorophenol	2,3,4,5 & 2,3,4,6-Tetrachlorophenol	2-Chlorophenol	2-Methylphenol	2-Nitrophenol	4,6-Dinitro-2-methylphenol	
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	<2.5	<2.5	<2.5	<2.5	<0.0012	<1.2		<5	<0.002	<2	<2	<2	<4	<0.1	<2	<0.005	<2	<4	<4	<100	
		27 Dec 2023	<1.3	<1.3	<1.3	<1.3	<0.0006	<0.6		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.003	<2	<4	<4	<50	
		28 Jan 2024	<4.9	<4.9	<4.9	<4.9	<0.0024	<2.4															
		04 Feb 2024	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5															
		13 Feb 2024	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5															
		18 Feb 2024	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
		06 Mar 2024	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
		13 Mar 2024	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
		20 Mar 2024	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
		27 Mar 2024	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
		17 Apr 2024	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
		24 Apr 2024	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
2H-StG-02-XLB	BET-PW005	27 Jan 2025	<47.6	<47.6	<47.6	<47.6	<0.0238	<23.8															
2H-STG-02-FR	BET-PW005	27 Jan 2025	<4.8	<4.8	<4.8	<4.8	<0.0024	<2.4															
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025	<4.8	<4.8	<4.8	<4.8	<0.0024	<2.4															
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025	<4.8	<4.8	<4.8	<4.8	<0.0024	<2.4															
SS2-2H-21-XL	BET-PW005	02 Feb 2025	<47.6	<47.6	<47.6	<47.6	<0.0238	<23.8															
SS2-2H-21-XL	BET-PW005	02 Feb 2025	<47.6	<47.6	<47.6	<47.6	<0.0238	<23.8															
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025							1														
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025																					
SS2-2H Choke Water	BET-PW005	20 May 2025	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<5	<0.002	<2	<2	<2	<4	<0.1	<2	<0.005	<2	<4	<4	<90	
SS2-2H Choke Water	BET-PW005	20 May 2025																					
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025																					
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025							1														
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025	<47.6	<47.6	<47.6	<47.6	<0.0238	<23.8															
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025	<4.8	<4.8	<4.8	<4.8	<0.0024	<2.4															
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025	<4.8	<4.8	<4.8	<4.8	<0.0024	<2.4															
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025	<47.6	<47.6	<47.6	<47.6	<0.0238	<23.8															
SS2-2H Water Sample	BET-PW005	10 Jun 2025	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
SS2-2H Water Sample	BET-PW005	10 Jun 2025																					
SS2H Water sample	BET-PW005	01 Jul 2025	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
SS2H Water sample	BET-PW005	01 Jul 2025																					
SS2H Water sample	BET-PW005	08 Jul 2025	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
SS2H Water sample	BET-PW005	08 Jul 2025																					
SS2H Water sample	BET-PW005	15 Jul 2025	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
SS2H Water sample	BET-PW005	15 Jul 2025																					
SS2H Water sample	BET-PW005	22 Jul 2025	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
SS2H Water sample	BET-PW005	22 Jul 2025																					
SS2H Water sample	BET-PW005	29 Jul 2025	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
SS2H Water sample	BET-PW005	29 Jul 2025																					
SS2H Water sample	BET-PW005	05 Aug 2025	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
SS2H Water sample	BET-PW005	05 Aug 2025																					
SS2H Water sample	BET-PW005	10 Aug 2025	<1.0	4.7	<1.0	<1.0	<0.0005	4.7		6	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50	
SS2H Water sample	BET-PW005	10 Aug 2025																					
SS2H Water sample	BET-PW005	10 Aug 2025		8				8															

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
Beetaloo Flowback Water Assessment  
Tamboran

	Indeno(1,2,3-c,d)pyrene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Benzo(a)pyrene TEQ Calc (Zero) mg/L	PAHs (Sum of total) µg/L	Particle Size	Phenols													
							+75µm	3,4-Methylphenol (m&p-cresol) µg/L	2,3,5,6- Tetrachlorophenol mg/L	2,4,5-Trichlorophenol µg/L	2,4,6-Trichlorophenol µg/L	2,4-Dichlorophenol µg/L	2,4-Dimethylphenol µg/L	2,4-Dinitrophenol mg/L	2,6-Dichlorophenol µg/L	2,3,4,5 & 2,3,4,6- Tetrachlorophenol mg/L	2-Chlorophenol µg/L	2-Methylphenol µg/L	2-Nitrophenol µg/L	4,6-Dinitro-2- methylphenol µg/L	
<b>Statistics</b>																					
Number of Results	33	34	33	33	33	34	2	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Number of Detects	0	2	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<1	<1	<1	<1	<0.001	<0.5	1	<4	<0.002	<2	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<50
Minimum Detect	ND	4.7	ND	ND	ND	4.7	1	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<47.6	<47.6	<47.6	<47.6	<0.024	<23.8	1	6	<0.002	<2	<2	<2	<2	<4	<0.1	<2	<0.005	<2	<4	<4	<100
Maximum Detect	ND	8	ND	ND	ND	8	1	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	4.40454545	4.63382353	4.40454545	4.40454545	0.0022	2.50147059	1	2.25	0.001	1	1	1	1	2	0.05	1	0.001175	1	2	2	27.25
Geometric Average *	1.23822023	1.39717698	1.23822023	1.23822023	0.00061646	0.72463924	1	2.16061337	0.001	1	1	1	1	2	0.05	1	0.0011184	1	2	2	26.6535545
Median Concentration *	0.5	0.5	0.5	0.5	0.00025	0.25	1	2	0.001	1	1	1	1	2	0.05	1	0.001	1	2	2	25
Standard Deviation *	8.22742424	8.0982362	8.22742424	8.22742424	0.00411453	4.17156843	0	0.87321246	4.3368E-19	0	0	0	0	6.9389E-18	0	0.00045484	0	0	0	0	6.79613861
Geometric Standard Deviation *	4.0	4.1	4.0	4.0	4.0	4.3	1.0	1.3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.3	1.0	1.0	1.0	1.2
95% UCL (Student's-t) *	6.83055109	6.98423454	6.83055109	6.83055109	0.00341325	3.71221576	1	2.58762397	0.001	1	1	1	1	2	0.05	1	0.00135086	1	2	2	29.8776988
% of Detects	0%	6%	0%	0%	0%	6%	100%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
% of Non-Detects	100%	94%	100%	100%	100%	94%	0%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

\* A Non Detect Multiplier of 0.5 has been applied.

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
Beetalo Flowback Water Assessment  
Tamboran

EQL	4,6-Dinitro-o-cyclohexyl phenol	4-chloro-3-methylphenol	4-Nitrophenol	Cresol Total	Pentachlorophenol	Phenol	Phenols (halogenated) EPAVic	Phenols (non-halogenated) EPAVic	Phthalates	Radionuclides					SVOCs	TPH				
	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	Bis(2-ethylhexyl) phthalate	Gross Beta Activity - K40	Gross alpha activity	Gross beta activity	Radium-226	Radium-228	Hexachlorophene	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)
	50	4	50	0.004	2	4	2	4	10	0.1	0.05	0.1	0.01	0.08	0.1	20	50	100	50	50

Field ID	Location Code	Date	4,6-Dinitro-o-cyclohexyl phenol	4-chloro-3-methylphenol	4-Nitrophenol	Cresol Total	Pentachlorophenol	Phenol	Phenols (halogenated) EPAVic	Phenols (non-halogenated) EPAVic	Phthalates	Gross Beta Activity - K40	Gross alpha activity	Gross beta activity	Radium-226	Radium-228	SVOCs	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)	
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	<100	<4	<100	<0.025	<5	<4	<10	<10	12							<100	260,000	100,000	1,040	361,000	
		27 Dec 2023	<50	<4	<50	<0.013	<3	<4	<5	<5	<10								50	28,100	21,900	<50	50,000
		28 Jan 2024																	120	16,800	7,080	<50	23,900
		04 Feb 2024											1.86	3.12	5.11				60	1,820	2,570	<50	4,390
		13 Feb 2024											<1.40	6	4.84				80	330	220	<50	550
		18 Feb 2024	<50	<4	<50	<0.004	<2	<4	<2	<4	<4	<10							70	<50	<100	<50	<50
		06 Mar 2024	<50	<4	<50	<0.004	<2	<4	<2	<4	<4	<10							60	210	120	<50	330
		13 Mar 2024	<50	<4	<50	<0.004	<2	<4	<2	<4	<4	<10							70	230	130	<50	360
		20 Mar 2024	<50	<4	<50	<0.004	<2	<4	<2	<4	<4	<10							100	150	260	<50	410
		27 Mar 2024	<50	<4	<50	<0.004	<2	<4	<2	<4	<4	<10							110	250	480	<50	730
		17 Apr 2024	<50	<4	<50	<0.004	<2	<4	<2	<4	<4	<10							50	170	<100	<50	170
		24 Apr 2024	<50	<4	<50	<0.004	<2	<4	<2	<4	<4	<10							50	270	430	<50	700
2H-StG-02-XLB	BET-PW005	27 Jan 2025															<1.0	765,000	372,000	26,600	1,160,000		
2H-STG-02-FR	BET-PW005	27 Jan 2025															<1.0	11,900	6,370	630	18,900		
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025															<1.0	3,080	2,670	520	6,270		
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025															<1.0	6,910	7,040	1,350	15,300		
SS2-2H-21-XL	BET-PW005	02 Feb 2025															<1.0	1,600,000	187,000	40,200	1,830,000		
SS2-2H-21-XL	BET-PW005	02 Feb 2025															<1.0	672,000	70,800	12,300	755,000		
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025																					
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.2	70	660	1,940	<50	2,600	
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025										3.12	8	6.61	2.61	0.86							
SS2-2H Choke Water	BET-PW005	20 May 2025	<90	<4	<90	<0.024	<5	<4	<9	<9	<10						<0.2	60	830	1,720	<50	2,550	
SS2-2H Choke Water	BET-PW005	20 May 2025										5.62	9	9.24	1.28	1.22							
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.1	150	720	1,670	<50	2,390	
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025										5.61	2.97	9.09	3.21	0.84							
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025																					
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025															<1.0	638,000	87,400	4,660	730,000		
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025															<1.0	15,900	7,150	2,120	25,200		
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025															<0.1	470	1,150	640	2,260		
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025															<1.0	1,180,000	247,000	17,000	1,440,000		
SS2-2H Water Sample	BET-PW005	10 Jun 2025	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.2	60	610	1,900	<50	2,510	
SS2-2H Water Sample	BET-PW005	10 Jun 2025										4.18	5.91	7.27	2.68	0.91							
SS2H Water sample	BET-PW005	01 Jul 2025	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.2	40	730	2,590	60	3,380	
SS2H Water sample	BET-PW005	01 Jul 2025										2.98	6.63	6.62	0.65	0.22							
SS2H Water sample	BET-PW005	08 Jul 2025	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.1	50	690	2,170	<50	2,860	
SS2H Water sample	BET-PW005	08 Jul 2025										6.37	21	9.64	2.68	0.89							
SS2H Water sample	BET-PW005	15 Jul 2025	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.2	50	820	3,430	<50	4,250	
SS2H Water sample	BET-PW005	15 Jul 2025										<1.64	2.77	5.55	0.9	0.34							
SS2H Water sample	BET-PW005	22 Jul 2025	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.2	30	400	1,230	<50	1,630	
SS2H Water sample	BET-PW005	22 Jul 2025										1.48	5.6	5.04	1.18	0.48							
SS2H Water sample	BET-PW005	29 Jul 2025	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.2	90	730	1,470	<50	2,200	
SS2H Water sample	BET-PW005	29 Jul 2025										<1.57	4.62	4.83	0.93	0.35							
SS2H Water sample	BET-PW005	05 Aug 2025	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.2	50	980	2,060	50	3,090	
SS2H Water sample	BET-PW005	05 Aug 2025										2.82	8.77	5.87	2.11	0.87							
SS2H Water sample	BET-PW005	10 Aug 2025	<50	<4	<50	0.006	<2	<4	<2	6	<10						<0.2	90	1,250	2,010	<50	3,260	
SS2H Water sample	BET-PW005	10 Aug 2025										1.93	7.03	5.22	2.83	1.14							
SS2H Water sample	BET-PW005	10 Aug 2025																					

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
 Beetaloo Flowback Water Assessment  
 Tamboran

									Phthalates	Radionuclides					SVOCs	TPH				
	4,6-Dinitro-o-cyclohexyl phenol µg/L	4-chloro-3-methylphenol µg/L	4-Nitrophenol µg/L	Cresol Total mg/L	Pentachlorophenol µg/L	Phenol µg/L	Phenols (halogenated) EPAVic µg/L	Phenols (non-halogenated) EPAVic µg/L	Bis(2-ethylhexyl) phthalate µg/L	Gross Beta Activity - K40 Bq/L	Gross alpha activity Bq/L	Gross beta activity Bq/L	Radium-226 Bq/L	Radium-228 Bq/L	Hexachlorophene µg/L	C6-C9 Fraction µg/L	C10-C14 Fraction µg/L	C15-C28 Fraction µg/L	C29-C36 Fraction µg/L	C10-C36 Fraction (Sum) µg/L
<b>Statistics</b>																				
Number of Results	20	20	20	20	20	20	20	20	20	19	19	19	11	11	21	23	33	33	33	33
Number of Detects	0	0	0	1	0	0	0	1	1	15	19	19	11	11	0	22	32	31	13	32
Minimum Concentration	<50	<4	<50	<0.004	<2	<4	<2	<4	<10	<1.3	2.77	4.63	0.65	0.22	<0.1	30	<50	<100	<50	<50
Minimum Detect	ND	ND	ND	0.006	ND	ND	ND	6	12	1.48	2.77	4.63	0.65	0.22	ND	30	150	120	50	170
Maximum Concentration	<100	<4	<100	<0.025	<5	<4	<10	<10	12	6.37	21	9.64	3.21	1.22	<1	150	1600000	372000	40200	1830000
Maximum Detect	ND	ND	ND	0.006	ND	ND	ND	6	12	6.37	21	9.64	3.21	1.22	ND	150	1600000	372000	40200	1830000
Average Concentration *	27.25	2	27.25	0.00345	1.175	2	1.45	2.5	5.35	2.82657895	7.07578947	6.31526316	1.91454545	0.73818182	0.26428571	70	157879.848	34668.4848	3262.72727	195642.879
Geometric Average *	26.6535545	2	26.6535545	0.00268647	1.11840362	2	1.22322437	2.32936575	5.22372814	2.28620004	6.33291655	6.1463119	1.67712326	0.65097453	0.18053204	65.2027147	3012.58949	2942.48569	134.510892	6603.99706
Median Concentration *	25	2	25	0.002	1	2	1	2	5	2.82	6.63	5.87	2.11	0.86	0.1	60	820	2060	25	3090
Standard Deviation *	6.79613861	0	6.79613861	0.00319726	0.45483513	0	1.15	1.15108644	1.52561463	1.67665712	3.84581976	1.53953981	0.8918761	0.32095931	0.20478959	27.9751442	375088.992	81293.6046	8603.7373	452021.96
Geometric Standard Deviation *	1.2	1.0	1.2	1.8	1.3	1.0	1.6	1.4	1.2	2.0	1.6	1.3	1.7	1.7	2.5	1.4	19.8	10.2	11.6	16.0
95% UCL (Student's-t) *	29.8776988	2	29.8776988	0.00468621	1.35086012	2	1.89464273	2.9450628	5.93987257	3.49358915	8.60573916	6.92772516	2.40193576	0.91357889	0.34136122	80.0164823	268481.658	58639.3823	5799.69566	328929.773
% of Detects	0%	0%	0%	5%	0%	0%	0%	5%	5%	79%	100%	100%	100%	100%	0%	96%	97%	94%	39%	97%
% of Non-Detects	100%	100%	100%	95%	100%	100%	100%	95%	95%	21%	0%	0%	0%	0%	100%	4%	3%	6%	61%	3%

\* A Non Detect Multiplier of 0.5 has been applied.

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
Beetaloo Flowback Water Assessment  
Tamboran

	TRH						
	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)
EQL	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
	20	20	100	100	100	100	100

Field ID	Location Code	Date									
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	<100	<100	328,000	328,000	32,700	330	361,000		
		27 Dec 2023	50	50	41,200	41,200	8,900	<100	50,100		
		28 Jan 2024	120	120	20,200	20,200	3,950	<100	24,200		
		04 Feb 2024	60	60	3,160	3,160	1,220	<100	4,380		
		13 Feb 2024	70	70	380	380	<100	<100	380		
		18 Feb 2024	70	70	<100	<100	<100	<100	<100		
		06 Mar 2024	50	50	180	180	<100	<100	180		
		13 Mar 2024	70	70	260	260	<100	<100	260		
		20 Mar 2024	100	100	260	260	150	<100	410		
		27 Mar 2024	100	100	400	400	340	<100	740		
		17 Apr 2024	50	50	160	160	<100	<100	160		
		24 Apr 2024	50	50	350	350	360	<100	710		
		2H-StG-02-XLB	BET-PW005	27 Jan 2025			1,140,000	1,140,000	37,200	27,000	1,200,000
		2H-STG-02-FR	BET-PW005	27 Jan 2025			15,800	15,800	2,560	310	18,700
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025			4,520	4,520	1,550	360	6,430		
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025			11,600	11,600	3,300	860	15,800		
SS2-2H-21-XL	BET-PW005	02 Feb 2025			1,760,000	1,760,000	41,000	40,200	1,840,000		
SS2-2H-21-XL	BET-PW005	02 Feb 2025			726,000	726,000	15,000	10,300	751,000		
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025									
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	80	80	1,750	1,750	780	<100	2,530		
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025									
SS2-2H Choke Water	BET-PW005	20 May 2025	70	70	1,700	1,700	780	<100	2,480		
SS2-2H Choke Water	BET-PW005	20 May 2025									
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	100	100	1,480	1,480	760	<100	2,240		
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025									
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025									
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025			715,000	715,000	8,960	4,050	728,000		
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025			20,600	20,600	3,680	2,010	26,300		
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025			770	770	1,250	480	2,500		
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025			1,410,000	1,410,000	22,500	14,700	1,450,000		
SS2-2H Water Sample	BET-PW005	10 Jun 2025	70	60	1,660	1,660	760	<100	2,420		
SS2-2H Water Sample	BET-PW005	10 Jun 2025									
SS2H Water sample	BET-PW005	01 Jul 2025	40	40	2,290	2,290	1,030	<100	3,320		
SS2H Water sample	BET-PW005	01 Jul 2025									
SS2H Water sample	BET-PW005	08 Jul 2025	50	50	2,040	2,040	780	<100	2,820		
SS2H Water sample	BET-PW005	08 Jul 2025									
SS2H Water sample	BET-PW005	15 Jul 2025	50	40	2,680	2,680	1,890	<100	4,570		
SS2H Water sample	BET-PW005	15 Jul 2025									
SS2H Water sample	BET-PW005	22 Jul 2025	30	30	1,100	1,100	460	<100	1,560		
SS2H Water sample	BET-PW005	22 Jul 2025									
SS2H Water sample	BET-PW005	29 Jul 2025	60	60	1,520	1,520	550	<100	2,070		
SS2H Water sample	BET-PW005	29 Jul 2025									
SS2H Water sample	BET-PW005	05 Aug 2025	50	50	2,020	2,020	1,010	<100	3,030		
SS2H Water sample	BET-PW005	05 Aug 2025									
SS2H Water sample	BET-PW005	10 Aug 2025	90	70	2,330	2,320	680	<100	3,010		
SS2H Water sample	BET-PW005	10 Aug 2025									
SS2H Water sample	BET-PW005	10 Aug 2025									

Table B-1 Shenandoah S-1H S-2H Flowback Water Analytical Data  
Beetaloo Flowback Water Assessment  
Tamboran

	TRH						
	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
<b>Statistics</b>							
Number of Results	23	23	33	33	33	33	33
Number of Detects	22	22	32	32	28	11	32
Minimum Concentration	30	30	<100	<100	<100	<100	<100
Minimum Detect	30	30	160	160	150	310	160
Maximum Concentration	120	120	1760000	1760000	41000	40200	1840000
Maximum Detect	120	120	1760000	1760000	41000	40200	1840000
Average Concentration *	66.5217391	64.7826087	188468.485	188468.182	5889.39394	3081.81818	197313.636
Geometric Average *	63.0278525	61.3285772	4905.62789	4904.98855	1175.43302	183.316526	6461.41619
Median Concentration *	60	60	2040	2040	1010	50	3010
Standard Deviation *	22.1866971	22.0413771	439076.13	439076.259	10929.8036	8484.5694	456341.547
Geometric Standard Deviation *	1.4	1.4	17.5	17.5	6.9	8.2	16.2
95% UCL (Student's-t) *	74.4656717	72.6745095	317938.065	317937.8	9112.24525	5583.64774	331874.239
% of Detects	96%	96%	97%	97%	85%	33%	97%
% of Non-Detects	4%	4%	3%	3%	15%	67%	3%

\* A Non Detect Multiplier of 0.5 has been applied.



## Appendix C Human Health Risk Assessment

Table C-1  
Human Health Tier 1 Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

	BTEX								Explosives		Halogenated Benzenes	Herbicides	Other Parameters						
	Naphthalene (VOC)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	2,4-Dinitrotoluene	Nitrobenzene	Hexachlorobenzene	Dinoseb	Total Phosphorus as P (Organic Phosphate as P)	Silicon as SiO2	Nitrite + Nitrate as N	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3
	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL	0.005	1	2	2	2	2	2	1	4	2	0.5	50	0.01	0.1	0.01	1	1	1	1
ADWG 2025 Aesthetic			25	3			20												
ADWG 2025 Health		1	800	300	600	600	600												
WHO (2022) Drinking Water Guidelines <sup>1</sup>																			
USEPA RSLs	0.00012								0.24	0.14	0.0098	15							

Field ID	Location Code	Date	Naphthalene (VOC)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	2,4-Dinitrotoluene	Nitrobenzene	Hexachlorobenzene	Dinoseb	Total Phosphorus as P (Organic Phosphate as P)	Silicon as SiO2	Nitrite + Nitrate as N	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	0.007	<5	<5	<5	<10	<5	<2	<2	<4	<2	<2.5	<100	2.52	141	0.06	554	<1	<1	554	
		27 Dec 2023	<0.005	<1	<2	<2	<2	<2	<2	<1	<1	<4	<2	<1.3	<50	1.28	164	0.02	243	<1	<1	243
		28 Jan 2024	<0.005	<1	<2	<2	00.	<2	<2	<1	<1					1.36	173	0.03	332	<1	<1	332
		04 Feb 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1					1.05	170	0.01	269	<1	<1	269
		13 Feb 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1					0.77	161	<0.01	223	<1	<1	223
		18 Feb 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.38	148	<0.01	201	<1	<1	201
		06 Mar 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.42	130	<0.01	162	<1	<1	162
		13 Mar 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	<0.10	131	<0.01	156	<1	<1	156
		20 Mar 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.41	115	<0.01	156	<1	<1	156
		27 Mar 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.3	88.2	<0.01	148	<1	<1	148
		17 Apr 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.2	53.4	<0.01	116	<1	<1	116
		24 Apr 2024	<0.005	<1	<2	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.15	45.4	0.02	102	<1	<1	102
2H-StG-02-XLB	BET-PW005	27 Jan 2025												1.84	23.4	<0.10	420	<1	<1	420		
2H-STG-02-FR	BET-PW005	27 Jan 2025												10.3	22.5	0.07	280	<1	<1	280		
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025												11.4	21.3	0.04	200	<1	<1	200		
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025												11.9	21.4	0.04	220	<1	<1	220		
SS2-2H-21-XL	BET-PW005	02 Feb 2025												1.32	26	0.04	540	<1	<1	540		
SS2-2H-21-XL	BET-PW005	02 Feb 2025												1.68	26.8	0.05	530	<1	<1	530		
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025																				
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	<0.005	<1	3	<2	<2	<2	<2	3	<4	<2	<0.5	<50	1.2	192	<0.020	303	<1	<1	303	
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025																				
SS2-2H Choke Water	BET-PW005	20 May 2025	<0.005	<1	4	<2	<2	<2	<2	4	<4	<2	<2.4	<90	1.11	220	0.007	364	<1	<1	364	
SS2-2H Choke Water	BET-PW005	20 May 2025																				
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	<0.005	<1	2	<2	<2	<2	<2	2	<4	<2	<0.5	<50	1.05	209	0.006	296	<1	<1	296	
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025																				
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025																				
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025													2.6	25	0.03	380	<1	<1	380	
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025													8.65	21.3	0.13	290	<1	<1	290	
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025													8.87	21.9	0.04	320	<1	<1	320	
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025													1.42	24.4	0.02	530	<1	<1	530	
SS2-2H Water Sample	BET-PW005	10 Jun 2025	<0.005	<1	5	<2	<2	<2	<2	5	<4	<2	<0.5	<50	0.992	183	<0.020	320	<1	<1	320	
SS2-2H Water Sample	BET-PW005	10 Jun 2025																				
SS2H Water sample	BET-PW005	01 Jul 2025	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	1.25	182	<0.040	285	<1	<1	285	
SS2H Water sample	BET-PW005	01 Jul 2025																				
SS2H Water sample	BET-PW005	08 Jul 2025	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	1.02	169	<0.040	352	<1	<1	352	
SS2H Water sample	BET-PW005	08 Jul 2025																				
SS2H Water sample	BET-PW005	15 Jul 2025	<0.005	<1	9	<2	<2	<2	<2	9	<4	<2	<0.5	<50	0.605	168	<0.040	332	<1	<1	332	
SS2H Water sample	BET-PW005	15 Jul 2025																				
SS2H Water sample	BET-PW005	22 Jul 2025	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.606	157	<0.020	250	<1	<1	250	
SS2H Water sample	BET-PW005	22 Jul 2025																				
SS2H Water sample	BET-PW005	29 Jul 2025	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	0.482	162	<0.040	258	<1	<1	258	
SS2H Water sample	BET-PW005	29 Jul 2025																				
SS2H Water sample	BET-PW005	05 Aug 2025	<0.005	<1	2	<2	<2	<2	<2	2	<4	<2	<0.5	<50	0.587	140	<0.040	201	<1	<1	201	
SS2H Water sample	BET-PW005	05 Aug 2025																				

**Table C-1**  
**Human Health Tier 1 Screening Assessment**  
**Beetaloo Flowback Water Assessment**  
**Tamboran**

			BTEX						Explosives		Halogenated Benzenes	Herbicides									
			Naphthalene (VOC)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Total BTEX	2,4-Dinitrotoluene	Nitrobenzene	Hexachlorobenzene	Dinoseb	Total Phosphorus as P (Organic Phosphate as P)	Silicon as SiO2	Nitrite + Nitrate as N	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Carbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3
			mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
SS2H Water sample	BET-PW005	10 Aug 2025	0.008	2	14	<2	<2	<2	<2	16	<4	<2	<0.5	<50	0.506	140	<0.040	222	<1	<1	222
SS2H Water sample	BET-PW005	10 Aug 2025																			
SS2H Water sample	BET-PW005	10 Aug 2025																			

**Statistics**

Number of Results	23	23	23	23	23	23	23	23	23	20	20	20	20	33	33	33	33	33	33	33
Number of Detects	2	1	7	0	0	0	0	7	0	0	0	0	0	32	33	16	33	0	0	33
Minimum Concentration	<0.005	<1	<2	<2	<2	<2	<2	<1	<4	<2	<0.5	<50	<0.1	21.3	0.006	102	<1	<1	102	
Minimum Detect	0.007	2	2	ND	ND	ND	ND	2	ND	ND	ND	ND	0.15	21.3	0.006	102	ND	ND	102	
Maximum Concentration	0.008	<5	14	<5	<10	<5	<2	16	<4	<2	<2.5	<100	11.9	220	0.13	554	<1	<1	554	
Maximum Detect	0.008	2	14	ND	ND	ND	ND	16	ND	ND	ND	ND	11.9	220	0.13	554	ND	ND	554	
Average Concentration *	0.00293478	0.65217391	2.45652174	1.06521739	1.13043478	1.06521739	1	2.15217391	2	1	0.3675	27.25	2.37206061	111.393939	0.02569697	289.545455	0.5	0.5	289.545455	
Geometric Average *	0.00275008	0.56955612	1.62970742	1.04064293	#NUM!	1.04064293	1	1.00231766	2	1	0.307396726	26.6535545	1.08694344	81.8426903	0.01714068	265.856281	0.5	0.5	265.856281	
Median Concentration *	0.0025	0.5	1	1	1	1	1	0.5	2	1	0.25	25	1.05	140	0.02	280	0.5	0.5	280	
Standard Deviation *	0.00141655	0.49858021	3.07483843	0.30589668	0.8497748	0.30589668	0	3.57051568	0	0	0.298862427	6.79613861	3.40815196	67.8398736	0.02526764	119.173439	0	0	119.173439	
Geometric Standard Deviation *	1.4	1.5	2.2	1.2	#NUM!	1.2	1.0	2.9	1.0	1.0	1.7	1.2	3.4	2.4	2.5	1.5	1.0	1.0	1.5	
95% UCL (Student's-t) *	0.00344198	0.83069024	3.55746565	1.1747435	1.4346961	1.1747435	1	3.43059474	2	1	0.483053917	29.8776988	3.37701618	131.39776	0.03314759	324.68591	0.5	0.5	324.68591	
% of Detects	9%	4%	30%	0%	0%	0%	0%	30%	0%	0%	0%	0%	97%	100%	48%	100%	0%	0%	100%	
% of Non-Detects	91%	96%	70%	100%	100%	100%	100%	70%	100%	100%	100%	100%	3%	0%	52%	0%	100%	100%	0%	

\* A Non Detect Multiplier of 0.5 has been applied.

Table C-1  
Human Health Tier 1 Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

	Inorganics																	Aluminium	Antimony	Arsenic	Barium
	Ammonia as N	Anions Total	Bromide	Bromine	Cations Total	Chloride	Cyanide Total	Fluoride	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Reactive Phosphorus as P (Orthophosphate as P)	Total Dissolved Solids (Lab)	Total Suspended Solids (Lab)					
	mg/L	meq/L	µg/L	µg/L	meq/L	mg/L	mg/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L					
EQI	0.01	0.01	10	100	0.01	1	0.004	0.1	0.01	0.1	0.01	0.01	0.1	0.01	10	5	0.01	0.001	0.001	0.001	
ADWG 2025 Aesthetic						250									600						
ADWG 2025 Health						0.08		1.5										0.003	0.01	2	
WHO (2022) Drinking Water Guidelines <sup>1</sup>										50	3										
USEPA RSLs																	20				

Field ID	Location Code	Date	Ammonia as N	Anions Total	Bromide	Bromine	Cations Total	Chloride	Cyanide Total	Fluoride	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Reactive Phosphorus as P (Orthophosphate as P)	Total Dissolved Solids (Lab)	Total Suspended Solids (Lab)	Aluminium	Antimony	Arsenic	Barium	
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	14.8	203	84,600	75,800	199	6,690		1.6	1.12	34.8	0.06	<0.01	34.9	0.21	12,800	115	0.1	0.007	0.023	3.97	
		27 Dec 2023	13	157	71,500	115,000	153	5,360		1	1.03	27.9	0.02	<0.01	27.9	0.02	10,100	248	0.07	0.001	0.016	15.9	
		28 Jan 2024	19.8	383	205,000	168,000	374	13,300			1.2	1.17	44.1	0.03	<0.01	44.1	0.01	25,400	91	<0.10	<0.010	0.011	21.5
		04 Feb 2024	21.8	477	250,000	188,000	448	16,700			1.1	3.12	44.8	0.01	<0.01	44.8	0.14	30,400	64	<0.10	<0.010	<0.010	30.1
		13 Feb 2024	18.8	445	304,000	218,000	470	15,600			1	2.75	43.8	<0.01	<0.01	43.8	0.06	35,200	64	<0.10	<0.010	<0.010	30
		18 Feb 2024	0.04		275,000	225,000		14,100			1		2.7	<0.01	<0.01	2.7	0.1	33,500	34	<0.10	<0.010	<0.010	33.9
		06 Mar 2024	20.9	390	216,000	179,000	365	13,700			0.9	3.31	31.7	<0.01	<0.01	31.7	0.16	28,000	50	<0.10	<0.010	<0.010	29.8
		13 Mar 2024	23.3		217,000	173,000		14,000			0.7		40.9	<0.01	<0.01	40.9	<0.01	28,600	52	0.15	<0.010	<0.010	15.6
		20 Mar 2024	19.4	367	197,000	127,000	406	12,900			0.8	5.02	40.2	<0.01	<0.01	40.2	<0.01	25,500	60	<0.10	<0.010	<0.010	30.9
		27 Mar 2024	17.6	288	136,000	124,000	318	10,100			0.6	4.96	34.7	<0.01	<0.01	34.7	<0.01	19,300	54	<0.10	<0.010	<0.010	24
		17 Apr 2024	15.4	287	138,000	108,000	310	10,100			0.5	3.71	26.8	<0.01	<0.01	26.8	0.18	20,800	58	0.01	<0.001	<0.001	21.7
		24 Apr 2024	14.4	170	73,600	94,400	183	5,960			0.4	3.6	18.6	0.02	<0.01	18.6	<0.01	11,400	34	0.03	<0.001	<0.001	16.5
2H-StG-02-XLB	BET-PW005	27 Jan 2025	<0.10		18,600	500		251	<0.200	0.1		16.8	<0.10	<0.10	16.8		4,280	593	0.87	0.001	0.0071	0.078	
2H-STG-02-FR	BET-PW005	27 Jan 2025	4.75		22,100	300		411	<0.200	0.1		95.5	0.03	0.04	95.6		2,630	161	0.151	0.0014	0.007	0.073	
SS2-2H-21-FR-Stg7/8	BET-PW005	30 Jan 2025	22.2		<1,000	500		388	<0.200	0.1		92.8	0.01	0.03	92.8		1,990	146	<0.005	<0.0005	0.005	0.059	
SS2-2H-21-FR-Stg7/8	BET-PW005	30 Jan 2025	9.8		<1,000	600		387	<0.200	0.1		97.9	0.02	0.02	97.9		2,180	96	0.005	<0.0005	0.0051	0.062	
SS2-2H-21-XL	BET-PW005	02 Feb 2025	<0.10		<1,000	600		188	<0.200	0.1		20.9	0.02	0.02	20.9		4,260	510	1.36	<0.0005	0.005	0.094	
SS2-2H-21-XL	BET-PW005	02 Feb 2025	0.09		<1,000	600		210	<0.200	0.1		23.2	0.03	0.02	23.2		4,390	592	1.1	<0.0005	0.005	0.084	
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025																					
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	23.9	554	459,000	236,000	614	19,400	<0.004	0.8	5.16	41.2	<0.020	<0.020	41.2	0.098	32,900	174	0.059	0.002	0.0463	11.2	
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025																					
SS2-2H Choke Water	BET-PW005	20 May 2025	21.9		238,000	187,000		16,800	<0.004	0.8		57.4	0.007	<0.002	57.4	0.124	29,900	42	0.188	0.0007	0.107	40.4	
SS2-2H Choke Water	BET-PW005	20 May 2025																					
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	22.8	469	372,000	222,000	538	16,400	<0.004	0.8	6.82	42.4	0.006	<0.002	42.4	0.108	36,400	150	0.134	0.0012	0.0656	42	
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025																					
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025																					
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025	<0.10		<1,000	700		243	<0.200	0.1		33.4	0.01	0.02	33.4		4,700	970	0.866	0.001	0.0069	0.087	
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025	1.26		16,200	300		452	<0.200	0.1		88.1	0.1	0.03	88.2		3,100	222	0.105	0.0012	0.0066	0.06	
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025	2.05		<1,000	600		402	<0.200	0.1		94.1	0.02	0.02	94.1		2,250	250	0.033	<0.0005	0.0046	0.07	
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025	0.41		<1,000	700		175	<0.200	0.1		27.6	<0.01	0.02	27.6		4,150	505	0.838	<0.0005	0.0042	0.072	
SS2-2H Water Sample	BET-PW005	10 Jun 2025	23.7	537	437,000	265,000	568	18,800	<0.004	0.8	2.77	46.4	<0.020	<0.020	46.4	0.195	30,200	146	0.044	0.0014	0.0451	50.5	
SS2-2H Water Sample	BET-PW005	10 Jun 2025																					
SS2H Water sample	BET-PW005	01 Jul 2025	24	500	293,000	211,000	578	17,500	<0.004	0.7	7.27	44.2	<0.040	<0.040	44.2	0.068	34,200	265	0.271	0.0024	0.0391	51.2	
SS2H Water sample	BET-PW005	01 Jul 2025																					
SS2H Water sample	BET-PW005	08 Jul 2025	24.2	603	276,000	229,000	540	21,100	<0.004	0.7	5.5	41.4	<0.040	<0.040	41.4	0.106	38,000	734	0.681	0.003	0.0469	45.4	
SS2H Water sample	BET-PW005	08 Jul 2025																					
SS2H Water sample	BET-PW005	15 Jul 2025	24	554	366,000	274,000	534	19,400	<0.004	0.7	1.85	43.8	<0.040	<0.040	43.8	0.083	37,700	297	0.244	0.0016	0.0211	48.8	
SS2H Water sample	BET-PW005	15 Jul 2025																					
SS2H Water sample	BET-PW005	22 Jul 2025	23.2	479	424,000	203,000	532	16,800	<0.004	0.6	5.17	37.5	<0.020	<0.020	37.5	0.072	34,300	215	0.13	0.0018	0.0178	48.2	
SS2H Water sample	BET-PW005	22 Jul 2025																					
SS2H Water sample	BET-PW005	29 Jul 2025	23.5	496	240,000	278,000	469	17,400	<0.004	0.7	2.82	36	<0.040	<0.040	36	0.082	34,100	212	0.259	0.0023	0.0198	52	
SS2H Water sample	BET-PW005	29 Jul 2025																					
SS2H Water sample	BET-PW005	05 Aug 2025	23.1	472	247,000	239,000	525	16,600	<0.004	0.6	5.3	39.1	<0.040	<0.040	39.1	0.105	36,500	244	0.248	0.0012	0.015	39.3	
SS2H Water sample	BET-PW005	05 Aug 2025																					

Table C-1  
Human Health Tier 1 Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

			Inorganics																			
			Ammonia as N	Anions Total	Bromide	Bromine	Cations Total	Chloride	Cyanide Total	Fluoride	Ionic Balance	Kjeldahl Nitrogen Total	Nitrate (as N)	Nitrite (as N)	Nitrogen (Total)	Reactive Phosphorus as P (Orthophosphate as P)	Total Dissolved Solids (Lab)	Total Suspended Solids (Lab)	Aluminium	Antimony	Arsenic	Barium
			mg/L	meq/L	µg/L	µg/L	meq/L	mg/L	mg/L	mg/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
SS2H Water sample	BET-PW005	10 Aug 2025	24.7	428	456,000	278,000	473	15,000	<0.004	0.6	5.06	31.7	<0.040	<0.040	31.7	0.073	28,900	171	0.079	0.0006	0.0073	46.9
SS2H Water sample	BET-PW005	10 Aug 2025																				
SS2H Water sample	BET-PW005	10 Aug 2025																				

Statistics

Number of Results	33	20	33	33	20	33	21	33	20	33	33	33	33	33	23	33	33	33	33	33	33	33
Number of Detects	30	20	26	33	20	33	0	33	20	33	15	9	33	19	33	33	33	25	17	24	33	33
Minimum Concentration	0.04	157	<1000	300	153	175	<0.004	0.1	1.03	2.7	0.006	<0.002	2.7	<0.01	1990	34	<0.005	<0.001	<0.001	0.059	0.059	0.059
Minimum Detect	0.04	157	16200	300	153	175	ND	0.1	1.03	2.7	0.006	0.02	2.7	0.01	1990	34	0.005	0.0006	0.0042	0.059	0.059	0.059
Maximum Concentration	24.7	603	459000	278000	614	21100	<0.2	1.6	7.27	97.9	<0.1	<0.1	97.9	0.21	38000	970	1.36	<0.01	0.107	52	52	52
Maximum Detect	24.7	603	459000	278000	614	21100	ND	1.6	7.27	97.9	0.1	0.04	97.9	0.21	38000	970	1.36	0.007	0.107	52	52	52
Average Concentration *	15.119697	412.95	182912.121	134018.182	429.85	10206.5758	0.04866667	0.59393939	3.8755	43.7090909	0.01918182	0.01460606	43.7181818	0.08756522	20849.3939	230.878788	0.25386364	0.00222121	0.01737879	22.742697	22.742697	22.742697
Geometric Average *	5.94259222	387.506675	49823.6507	30735.612	402.444389	4273.11377	0.01288437	0.41609962	3.37115208	37.227173	0.01362663	0.01017971	37.2328708	0.05292107	14126.4152	152.674652	0.10333596	0.00135509	0.00912226	4.65704314	4.65704314	4.65704314
Median Concentration *	19.4	457	205000	168000	469.5	13300	0.002	0.7	3.655	40.2	0.02	0.01	40.2	0.083	25500	161	0.1	0.0014	0.0069	21.7	21.7	21.7
Standard Deviation *	9.36907404	127.621501	151392.434	101076.372	134.180205	7423.90964	0.04894441	0.38842291	1.78584007	23.4943625	0.01902384	0.01136432	23.5056338	0.0608718	13392.9131	222.172436	0.34989109	0.00197714	0.02238507	19.013614	19.013614	19.013614
Geometric Standard Deviation *	8.9	1.5	12.6	15.1	1.5	6.1	7.1	2.6	1.8	1.9	2.2	2.6	1.9	3.5	2.8	2.5	4.3	2.9	3.2	16.2	16.2	16.2
95% UCL (Student's-t) *	17.8823388	462.294324	227552.933	163822.388	481.73022	12395.6505	0.0670876	0.70847295	4.56598765	50.6368309	0.02479134	0.01795704	50.6492453	0.10936033	24798.5379	296.39037	0.35703539	0.00280421	0.02397943	28.3492068	28.3492068	28.3492068
% of Detects	91%	100%	79%	100%	100%	100%	0%	100%	100%	100%	45%	27%	100%	83%	100%	100%	76%	52%	73%	100%	100%	100%
% of Non-Detects	9%	0%	21%	0%	0%	0%	100%	0%	0%	0%	55%	73%	0%	17%	0%	0%	24%	48%	27%	0%	0%	0%

\* A Non Detect Multiplier of 0.5 has been applied.

Table C-1  
Human Health Tier 1 Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

Metals																				
	Beryllium	Boron	Cadmium	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thorium	Tin	Uranium	Vanadium	Zinc
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	µg/L	mg/L	mg/L
EQI	0.001	0.05	0.0001	0.001	0.0001	0.001	0.05	0.001	0.001	0.0001	0.001	0.001	0.01	0.001	0.001	1	0.001	1	0.01	0.005
ADWG 2025 Aesthetic						1	0.3		0.1											3
ADWG 2025 Health	0.06	4	0.002	0.05		2		0.005	0.5	0.001	0.05	0.02	0.004	0.1				20		
WHO (2022) Drinking Water Guidelines <sup>1</sup>																				
USEPA RSLs							14								12		12		0.086	6

Field ID	Location Code	Date	Beryllium	Boron	Cadmium	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thorium	Tin	Uranium	Vanadium	Zinc
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	<0.001	15.6	<0.0001	0.029		0.01	15.2	0.008	0.405	<0.0001	0.019	0.004	<0.01	<0.001	15.2	<1	<0.001	<1	<0.01	0.068
		27 Dec 2023	<0.001	16	<0.0001	0.068		0.018	25.9	0.003	0.45	<0.0010	0.021	0.005	<0.01	0.001	27.1	<1	<0.001	<1	<0.01	0.026
		28 Jan 2024	<0.010	21.9	<0.0010	0.034		0.022	26.3	<0.010	0.971	<0.0010	0.011	<0.010	<0.010	<0.010	60.8	<10	<0.010	<10	<0.10	<0.052
		04 Feb 2024	<0.010	22.2	<0.0010	0.025		<0.010	21.9	<0.010	1.08	<0.0010	<0.010	<0.010	<0.010	<0.010	84.6	<10	<0.010	<10	<0.10	<0.052
		13 Feb 2024	<0.010	18.8	<0.0010	0.023		0.076	18.8	<0.010	0.988	0.0004	<0.010	<0.010	<0.010	<0.010	83.5	<10	<0.010	<10	<0.10	0.065
		18 Feb 2024	<0.010	19.4	<0.0010	0.042		<0.010	25.2	<0.010	0.969	0.002	<0.010	<0.010	<0.010	<0.010	97	<10	<0.010	<10	<0.10	<0.052
		06 Mar 2024	<0.010	15	<0.0010	0.038		<0.010	24.6	<0.010	1.09	0.0009	<0.010	<0.010	<0.010	<0.010	92.8	<10	<0.010	<10	<0.10	<0.052
		13 Mar 2024	<0.010	15.6	<0.0010	0.042		0.011	22.8	<0.010	1.06	0.0002	0.035	<0.010	<0.010	<0.010	97.6	<10	<0.010	<10	<0.10	<0.052
		20 Mar 2024	<0.010	13	<0.0010	0.017		<0.010	19.9	<0.010	0.912	0.0005	0.012	<0.010	<0.010	<0.010	104	<10	<0.010	<10	<0.10	<0.052
		27 Mar 2024	<0.010	10.3	<0.0010	0.022		<0.010	26.5	<0.010	0.805	0.0007	0.011	<0.010	<0.010	<0.010	77.3	<10	<0.010	<10	<0.10	<0.052
		17 Apr 2024	<0.001	8.92	<0.0001	0.005		0.001	14.4	<0.001	0.659	0.0054	0.005	0.002	<0.01	0.003	58	1	<0.001	<1	<0.01	0.014
		24 Apr 2024	<0.001	7.3	<0.0001	0.075		0.004	15.2	0.002	0.493	0.0089	0.007	0.004	<0.01	<0.001	46.1	<1	<0.001	<1	<0.01	0.012
2H-StG-02-XLB	BET-PW005	27 Jan 2025	0.0002	25.9	0.0002	0.0012	0.0028	0.007	0.83	0.0097	0.0483	<0.00040	0.0081	0.0113	<0.002	<0.0001	0.8	2.7	<0.005	7.6	0.0011	0.102
2H-STG-02-FR	BET-PW005	27 Jan 2025	<0.0001	1.35	<0.0002	0.0056	0.003	0.008	1.38	0.008	0.045	<0.00040	0.0096	0.0233	<0.002	<0.0001	0.787	6	<0.005	7.1	0.0008	0.105
SS2-2H-21-FR-Stg7/8	BET-PW005	30 Jan 2025	<0.0001	0.829	<0.0002	<0.0005	0.0016	0.002	0.247	0.0174	0.0161	<0.00040	0.0046	0.0063	<0.002	<0.0001	0.73	0.2	<0.005	4.5	<0.0005	0.05
SS2-2H-21-FR-Stg7/8	BET-PW005	30 Jan 2025	<0.0001	0.787	<0.0002	<0.0005	0.0016	0.002	0.232	0.0174	0.0165	<0.00040	0.0049	0.0069	<0.002	<0.0001	0.739	0.1	<0.005	4.5	<0.0005	0.054
SS2-2H-21-XL	BET-PW005	02 Feb 2025	0.0004	46.9	<0.0002	0.0009	0.0018	0.006	0.724	0.0219	0.0426	<0.00040	0.0061	0.0084	<0.002	<0.0001	0.758	0.7	<0.005	4.4	0.0007	0.075
SS2-2H-21-XL	BET-PW005	02 Feb 2025	0.0003	45.3	<0.0002	0.0011	0.0017	0.008	0.634	0.0189	0.0434	<0.00040	0.0066	0.0089	<0.002	<0.0001	0.761	1.1	<0.005	3.9	0.0007	0.07
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025																				
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	0.0001	22	<0.0002	0.117	0.0028	0.037	42.1	0.001	8.91	<0.00004	0.178	0.0268	0.008	<0.0001	107	5.6	<0.005	<0.1	0.0066	0.08
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025																				
SS2-2H Choke Water	BET-PW005	20 May 2025	0.0001	21.5	<0.0002	0.0157	0.0003	0.004	13.4	0.0007	8.53	<0.00004	0.045	0.0035	0.01	<0.0001	99	0.1	<0.005	<0.1	0.0007	0.054
SS2-2H Choke Water	BET-PW005	20 May 2025																				
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	<0.0001	34.4	<0.0002	0.0654	0.0008	0.01	24.4	0.0009	9.79	<0.00004	0.0847	0.0078	0.011	<0.0001	117	0.9	<0.005	<0.1	0.0032	0.049
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025																				
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025																				
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025	0.0002	35.1	<0.0002	0.0025	0.0028	0.008	0.782	0.0119	0.0564	<0.00040	0.0067	0.0132	<0.002	<0.0001	0.802	2.4	<0.005	6.8	0.0011	0.1
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025	<0.0001	2.45	<0.0002	0.0011	0.0025	0.003	0.412	0.0106	0.0258	<0.00040	0.0059	0.0128	<0.002	<0.0001	0.745	<1.0	<0.005	6.9	0.0008	0.075
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025	<0.0001	<1.05	<0.0002	<0.0005	0.0013	0.001	0.3	0.0156	0.0357	<0.00040	0.005	0.0055	<0.002	<0.0001	0.713	<1.0	<0.005	3.8	0.0008	0.038
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025	0.0002	54	<0.0002	0.0007	0.0015	0.006	0.891	0.0163	0.0387	<0.00040	0.0057	0.0063	<0.002	<0.0001	0.687	1.2	<0.005	4	0.0006	0.057
SS2-2H Water Sample	BET-PW005	10 Jun 2025	<0.0001	20.3	<0.0002	0.0944	0.0019	0.026	39.7	0.0008	10	<0.00004	0.161	0.019	0.002	<0.0001	117	<0.1	<0.005	<0.1	0.0056	0.058
SS2-2H Water Sample	BET-PW005	10 Jun 2025																				
SS2H Water sample	BET-PW005	01 Jul 2025	0.0001	22	<0.0002	0.355	0.0058	0.078	64.2	0.0016	9.82	<0.00004	0.327	0.0634	0.01	0.0007	129	0.4	<0.005	<0.1	0.0129	0.086
SS2H Water sample	BET-PW005	01 Jul 2025																				
SS2H Water sample	BET-PW005	08 Jul 2025	0.0001	17.3	<0.0002	0.631	0.0083	0.117	62.9	0.0036	9.26	0.00006	0.46	0.0852	0.003	0.0024	120	<0.1	<0.005	0.2	0.0246	0.116
SS2H Water sample	BET-PW005	08 Jul 2025																				
SS2H Water sample	BET-PW005	15 Jul 2025	<0.0001	18.7	<0.0002	0.261	0.0058	0.071	65	0.0012	8.96	<0.00004	0.253	0.056	0.003	0.0005	130	0.2	<0.005	<0.1	0.0099	0.058
SS2H Water sample	BET-PW005	15 Jul 2025																				
SS2H Water sample	BET-PW005	22 Jul 2025	<0.0001	12.6	<0.0002	0.374	0.0046	0.055	95.4	0.0008	10.1	0.00007	0.299	0.0477	0.003	0.001	114	<0.1	<0.005	<0.1	0.0148	0.055
SS2H Water sample	BET-PW005	22 Jul 2025																				
SS2H Water sample	BET-PW005	29 Jul 2025	<0.0001	16.2	<0.0002	0.518	0.0071	0.082	82.3	0.0012	8.47	<0.00004	0.395	0.0713	0.002	0.001	121	0.3	<0.005	<0.1	0.0179	0.058
SS2H Water sample	BET-PW005	29 Jul 2025																				
SS2H Water sample	BET-PW005	05 Aug 2025	<0.0001	17.7	<0.0002	0.357	0.0058	0.066	72.9	0.0012	7.19	0.00068	0.326	0.0504	0.006	0.0002	103	0.6	<0.005	<0.1	0.0127	0.27
SS2H Water sample	BET-PW005	05 Aug 2025																				

Table C-1  
Human Health Tier 1 Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

			Metals																			
			Beryllium	Boron	Cadmium	Chromium (III+VI)	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Strontium	Thorium	Tin	Uranium	Vanadium	Zinc
			mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	mg/L	µg/L	mg/L	mg/L
SS2H Water sample	BET-PW005	10 Aug 2025	<0.0001	13.9	<0.0002	0.117	0.0035	0.019	89.8	0.0004	5.28	<0.00004	0.144	0.0251	0.002	0.0002	119	1	<0.005	<0.1	0.0038	0.03
SS2H Water sample	BET-PW005	10 Aug 2025																				
SS2H Water sample	BET-PW005	10 Aug 2025																				

Statistics																						
Number of Results	33	33	33	33	21	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Number of Detects	9	32	1	30	21	28	33	24	33	11	29	25	11	9	33	17	0	11	19	26		
Minimum Concentration	<0	0.787	<0	<0.001	0	0.001	0.232	0	0.016	<0	0.005	0.002	<0.002	<0	0.687	<0.1	<0.001	<0.1	<0.001	0.012		
Minimum Detect	0.0001	0.787	0.0002	0.0007	0.0003	0.001	0.232	0.0004	0.0161	0.00006	0.0046	0.002	0.002	0.0002	0.687	0.1	ND	0.2	0.0006	0.012		
Maximum Concentration	<0.01	54	<0.001	0.631	0.008	0.117	95.4	0.022	10.1	0.009	0.46	0.085	<0.1	<0.01	130	<10	<0.01	<10	<0.1	0.27		
Maximum Detect	0.0004	54	0.0002	0.631	0.0083	0.117	95.4	0.0219	10.1	0.0089	0.46	0.0852	0.011	0.003	130	6	ND	7.6	0.0246	0.27		
Average Concentration *	0.00134242	18.5988182	0.00019394	0.10119242	0.00320476	0.02372727	27.734303	0.00650303	3.22910606	0.00071273	0.08717879	0.01860909	0.01484848	0.00156667	64.4703636	2.03484848	0.00286364	2.91515152	0.01635758	0.06081818		
Geometric Average *	0.00028003	12.4150028	0.0001387	0.01820982	0.00249185	0.01068974	9.40705254	0.00367963	0.67318804	0.00017542	0.02295656	0.01053956	0.00513389	0.00037073	20.0580491	0.8637461	0.00243329	0.85797039	0.00532397	0.04923939		
Median Concentration *	0.0002	17.3	0.0001	0.029	0.0028	0.008	21.9	0.005	0.969	0.0002	0.011	0.0069	0.005	0.0005	83.5	0.9	0.0025	3.9	0.005	0.055		
Standard Deviation *	0.00207416	12.7267249	0.00017484	0.16049781	0.00214087	0.03022168	28.0824747	0.00620051	4.00211997	0.0017319	0.13188417	0.02218716	0.02007127	0.00204583	49.3712447	2.14396563	0.00136666	2.62942224	0.01980694	0.04596076		
Geometric Standard Deviation *	6.1	3.2	2.2	10.4	2.2	3.6	7.2	3.2	9.3	5.0	5.2	2.7	4.4	6.9	9.1	4.6	1.9	8.0	5.6	1.9		
95% UCL (Student's-t) *	0.00195403	22.3515244	0.00024549	0.14851812	0.00401051	0.03263868	36.0149313	0.00833136	4.4092039	0.00122341	0.12606723	0.02515138	0.02076686	0.00216992	79.0283729	2.66703573	0.00326662	3.69048447	0.02219801	0.07437055		
% of Detects	27%	97%	3%	91%	100%	85%	100%	73%	100%	33%	88%	76%	33%	27%	100%	52%	0%	33%	58%	79%		
% of Non-Detects	73%	3%	97%	9%	0%	15%	0%	27%	0%	67%	12%	24%	67%	73%	0%	48%	100%	67%	42%	21%		

\* A Non Detect Multiplier of 0.5 has been applied.

Table C-1  
Human Health Tier 1 Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

	NA	Organic		Organochlorine Pesticides																	
	Formaldehyde	Dissolved Organic Carbon	Total Organic Carbon	Other organochlorine pesticides EPAVic	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	
	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	0.1	1	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	0.5	0.5	0.5
ADWG 2025 Aesthetic																					
ADWG 2025 Health	0.5						0.3			2					9						
WHO (2022) Drinking Water Guidelines <sup>1</sup>							0.03										0.03				
USEPA RSLs														0.032				100			110

Field ID	Location Code	Date	Formaldehyde	Dissolved Organic Carbon	Total Organic Carbon	Other organochlorine pesticides EPAVic	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate		
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	0.4	254	232	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		
		27 Dec 2023	1	86	181	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<1.3	<2.0	<1.3	<1.3	<1.3	<1.3	<1.3	
		28 Jan 2024	1.3	169	194																			
		04 Feb 2024	2.3	148	165																			
		13 Feb 2024	1.8	155	156																			
		18 Feb 2024	3	148	154	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		06 Mar 2024	3.1	136	138	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		13 Mar 2024	4.7	123	124	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		20 Mar 2024	8.7	114	119	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		27 Mar 2024	9.9	93	98	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		17 Apr 2024	4.6	89	85	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		24 Apr 2024	3.7	59	65	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
		2H-StG-02-XLB	BET-PW005	27 Jan 2025	<1.0	1,690	2,640																	
2H-STG-02-FR	BET-PW005	27 Jan 2025	<0.1	1,010	1,240																			
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025	<0.1	628	717																			
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025	0.2	634	833																			
SS2-2H-21-XL	BET-PW005	02 Feb 2025	<0.5	1,800	2,390																			
SS2-2H-21-XL	BET-PW005	02 Feb 2025	<2.0	1,750	2,210																			
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025																						
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	3.9	175	191	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025																						
SS2-2H Choke Water	BET-PW005	20 May 2025	1.6	226	226	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	<2.4	
SS2-2H Choke Water	BET-PW005	20 May 2025																						
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	2.2	205	206	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025																						
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025																						
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025	<1.0	1,670	2,450																			
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025	0.2	796	1,170																			
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025	<0.1	626	731																			
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025	<0.5	1,650	2,050																			
SS2-2H Water Sample	BET-PW005	10 Jun 2025	5.4	187	188	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
SS2-2H Water Sample	BET-PW005	10 Jun 2025																						
SS2H Water sample	BET-PW005	01 Jul 2025	12.4	184	175	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
SS2H Water sample	BET-PW005	01 Jul 2025																						
SS2H Water sample	BET-PW005	08 Jul 2025	7.9	174	176	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
SS2H Water sample	BET-PW005	08 Jul 2025																						
SS2H Water sample	BET-PW005	15 Jul 2025	13.2	161	158	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
SS2H Water sample	BET-PW005	15 Jul 2025																						
SS2H Water sample	BET-PW005	22 Jul 2025	16	151	155	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
SS2H Water sample	BET-PW005	22 Jul 2025																						
SS2H Water sample	BET-PW005	29 Jul 2025	15.2	161	167	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
SS2H Water sample	BET-PW005	29 Jul 2025																						
SS2H Water sample	BET-PW005	05 Aug 2025	11.4	158	160	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		
SS2H Water sample	BET-PW005	05 Aug 2025																						

Table C-1  
Human Health Tier 1 Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

	NA	Organic		Organochlorine Pesticides																		
		Formaldehyde	Dissolved Organic Carbon	Total Organic Carbon	Other organochlorine pesticides EPAVIC	4,4-DDE	α-BHC	Aldrin	Aldrin + Dieldrin	β-BHC	Chlordane	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	
	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
SS2H Water sample	BET-PW005	10 Aug 2025	17.4	139	134	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.5	<0.5	<0.5	<0.5	<0.5
SS2H Water sample	BET-PW005	10 Aug 2025																				
SS2H Water sample	BET-PW005	10 Aug 2025																				

Statistics

Number of Results	33	33	33	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	
Number of Detects	25	33	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.1	59	65	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Minimum Detect	0.2	59	65	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	17.4	1800	2640	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Maximum Detect	17.4	1800	2640	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	4.67121212	477.242424	608.424242	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	1.0225	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675	0.3675
Geometric Average *	1.71103338	268.512201	302.272486	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	1.02048015	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673
Median Concentration *	2.3	174	181	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Standard Deviation *	5.23454479	566.022113	794.301715	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.06796139	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243
Geometric Standard Deviation *	5.7	2.7	3.0	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.1	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
95% UCL (Student's-t) *	6.21471283	644.144336	842.638546	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	1.04877699	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392
% of Detects	76%	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
% of Non-Detects	24%	0%	0%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

\* A Non Detect Multiplier of 0.5 has been applied.

Table C-1  
Human Health Tier 1 Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

	Endrin µg/L	Endrin aldehyde µg/L	γ-BHC (Lindane) µg/L	Heptachlor µg/L	Heptachlor epoxide µg/L	Methoxychlor µg/L	PAH														
							Benzo(b+j+k)fluoranthene mg/L	3-methylcholanthrene µg/L	7,12-dimethylbenz(a)anthracene µg/L	Acenaphthene µg/L	Acenaphthylene µg/L	Anthracene µg/L	Benzo(a)anthracene µg/L	Benzo(a)pyrene µg/L	Benzo(b+j)fluoranthene mg/L	Benzo(g,h,i)perylene µg/L	Benzo(k)fluoranthene µg/L	Chrysene µg/L	Dibenz(a,h)anthracene µg/L	Fluoranthene µg/L	
							0.001	2	2	1	1	1	1	0.5	0.001	1	1	1	1	1	1
EQL	0.5	0.5	0.5	0.5	0.5	2															
ADWG 2025 Aesthetic																					
ADWG 2025 Health			10	0.3										0.01							
WHO (2022) Drinking Water Guidelines <sup>1</sup>	0.6					20															
USEPA RSLs				0.0014	0.0014					530			1800	0.03				2.5	25	0.025	800

Field ID	Location Code	Date	Endrin	Endrin aldehyde	γ-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Benzo(b+j+k)fluoranthene	3-methylcholanthrene	7,12-dimethylbenz(a)anthracene	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<0.0050			<2.5	<2.5	<2.5	<2.5	<2.5	<0.0556	<2.5	<55.6	<2.5	<2.5	<2.5	
		27 Dec 2023	<1.3	<1.3	<1.3	<1.3	<1.3	<2.0	<0.0026			<1.3	<1.3	<1.3	<1.3	<1.3	<0.0049	<1.3	<4.9	<1.3	<1.3	<1.3	
		28 Jan 2024										<4.9	<4.9	<4.9	<4.9	<4.9	<0.0049	<4.9	<4.9	<4.9	<4.9	<4.9	
		04 Feb 2024										<1.0	<1.0	<1.0	<1.0	<1.0	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	
		13 Feb 2024										<1.0	<1.0	<1.0	<1.0	<1.0	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	
		18 Feb 2024	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010			<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0
		06 Mar 2024	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010			<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0
		13 Mar 2024	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010			<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0
		20 Mar 2024	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010			<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0
		27 Mar 2024	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010			<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0
		17 Apr 2024	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010			<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0
		24 Apr 2024	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010			<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0
2H-StG-02-XLB	BET-PW005	27 Jan 2025							<95	<95	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0476	<47.6	<47.6	<47.6	<47.6	<47.6	
2H-STG-02-FR	BET-PW005	27 Jan 2025							<10	<10	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0048	<4.8	<4.8	<4.8	<4.8	<4.8	
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025							<10	<10	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0048	<4.8	<4.8	<4.8	<4.8	<4.8	
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025							<10	<10	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0048	<4.8	<4.8	<4.8	<4.8	<4.8	
SS2-2H-21-XL	BET-PW005	02 Feb 2025							<95	<95	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0476	<47.6	<47.6	<47.6	<47.6	<47.6	
SS2-2H-21-XL	BET-PW005	02 Feb 2025							<95	<95	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0476	<47.6	<47.6	<47.6	<47.6	<47.6	
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025																					
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025																					
SS2-2H Choke Water	BET-PW005	20 May 2025	<2.4	<2.4	<2.4	<2.4	<2.4	<0.0047	<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2-2H Choke Water	BET-PW005	20 May 2025																					
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<2	<2	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0048	<1.0	<4.8	<1.0	<1.0	<1.0	
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025																					
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025																					
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025							<95	<95	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0476	<47.6	<47.6	<47.6	<47.6	<47.6	
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025							<10	<10	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0048	<4.8	<4.8	<4.8	<4.8	<4.8	
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025							<2	<2	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0048	<4.8	<4.8	<4.8	<4.8	<4.8	
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025							<95	<95	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0476	<47.6	<47.6	<47.6	<47.6	<47.6	
SS2-2H Water Sample	BET-PW005	10 Jun 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2-2H Water Sample	BET-PW005	10 Jun 2025																					
SS2H Water sample	BET-PW005	01 Jul 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<9	<9	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2H Water sample	BET-PW005	01 Jul 2025																					
SS2H Water sample	BET-PW005	08 Jul 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2H Water sample	BET-PW005	08 Jul 2025																					
SS2H Water sample	BET-PW005	15 Jul 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<9	<9	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2H Water sample	BET-PW005	15 Jul 2025																					
SS2H Water sample	BET-PW005	22 Jul 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<9	<9	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2H Water sample	BET-PW005	22 Jul 2025																					
SS2H Water sample	BET-PW005	29 Jul 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<9	<9	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2H Water sample	BET-PW005	29 Jul 2025																					
SS2H Water sample	BET-PW005	05 Aug 2025	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<10	<10	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	
SS2H Water sample	BET-PW005	05 Aug 2025																					

Table C-1  
Human Health Tier 1 Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

			PAH																				
			Endrin µg/L	Endrin aldehyde µg/L	g-BHC (Lindane) µg/L	Heptachlor µg/L	Heptachlor epoxide µg/L	Methoxychlor µg/L	Benzo(b+j+k)fluoranthene mg/L	3-methylcholanthrene µg/L	7,12-dimethylbenz(a)anthracene µg/L	Acenaphthene µg/L	Acenaphthylene µg/L	Anthracene µg/L	Benzo(a)anthracene µg/L	Benzo(a)pyrene µg/L	Benzo(b+j)fluoranthene mg/L	Benzo(g,h,i)perylene µg/L	Benzo(k)fluoranthene µg/L	Chrysene µg/L	Dibenz(a,h)anthracene µg/L	Fluoranthene µg/L	
SS2H Water sample	BET-PW005	10 Aug 2025	<0.5	<0.5	<0.5	<0.5	<0.5	<2.0	<0.0010	<10	<10	<1.0	<1.0	<1.0	<1.0	<0.5	<0.0010	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
SS2H Water sample	BET-PW005	10 Aug 2025																					
SS2H Water sample	BET-PW005	10 Aug 2025																					

Statistics

Number of Results	20	20	20	20	20	20	20	21	21	33	33	33	33	33	33	33	33	33	33	33	33	33	
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.001	<2	<2	<1	<1	<1	<1	<1	<0.5	<0.001	<1	<1	<1	<1	<1	<1	<1
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<0.005	<95	<95	<47.6	<47.6	<47.6	<47.6	<47.6	<47.6	<0.056	<47.6	<55.6	<47.6	<47.6	<47.6	<47.6	
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration *	0.3675	0.3675	0.3675	0.3675	0.3675	1.0225	0.0007325	14.6428571	14.6428571	4.40454545	4.40454545	4.40454545	4.40454545	4.40454545	4.2530303	0.00532121	4.40454545	5.32121212	4.40454545	4.40454545	4.40454545	4.40454545	
Geometric Average *	0.30739673	0.30739673	0.30739673	0.30739673	0.30739673	1.02048015	0.00061415	7.18583192	7.18583192	1.23822023	1.23822023	1.23822023	1.23822023	1.23822023	0.8134961	0.001485	1.23822023	1.48499858	1.23822023	1.23822023	1.23822023	1.23822023	
Median Concentration *	0.25	0.25	0.25	0.25	0.25	1	0.0005	5	5	0.5	0.5	0.5	0.5	0.5	0.25	0.0005	0.5	0.5	0.5	0.5	0.5	0.5	
Standard Deviation *	0.29886243	0.29886243	0.29886243	0.29886243	0.29886243	0.06796139	0.00059082	18.4023438	18.4023438	8.22742424	8.22742424	8.22742424	8.22742424	8.22742424	8.2999173	0.00908203	8.22742424	9.0820338	8.22742424	8.22742424	8.22742424	8.22742424	
Geometric Standard Deviation *	1.7	1.7	1.7	1.7	1.7	1.1	1.7	3.2	3.2	4.0	4.0	4.0	4.0	4.0	5.3	4.4	4.0	4.4	4.0	4.0	4.0	4.0	
95% UCL (Student's-t) *	0.48305392	0.48305392	0.48305392	0.48305392	0.48305392	1.04877699	0.00096094	21.5688438	21.5688438	6.83055109	6.83055109	6.83055109	6.83055109	6.83055109	6.70041183	0.00799921	6.83055109	7.99921492	6.83055109	6.83055109	6.83055109	6.83055109	
% of Detects	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
% of Non-Detects	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

\* A Non Detect Multiplier of 0.5 has been applied.

Table C-1  
Human Health Tier 1 Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ calc (Zero)	PAHs (Sum of total)	Particle Size	3&4-Methylphenol (m&p-cresol)	2,3,5,6-Tetrachlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,4-Dinitrophenol	2,6-Dichlorophenol	2,3,4,5 & 2,3,4,6-Tetrachlorophenol	2-Chlorophenol	2-Methylphenol	2-Nitrophenol	
	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µm	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L	
	1	1	1	1	1	0.0005	0.5		4	0.002	2	2	2	4	0.1	2	0.002	2	4	4	
EQI																					
ADWG 2025 Aesthetic												2	0.3					0.1			
ADWG 2025 Health												20	200					300			
WHO (2022) Drinking Water Guidelines <sup>1</sup>																					
USEPA RSLs	290	0.25		0.12	120				1400		1200			360	0.039		0.24	91			

Field ID	Location Code	Date	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ	PAHs (Sum of total)	Particle Size	3&4-Methylphenol (m&p-cresol)	2,3,5,6-Tetrachlorophenol	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4-Dichlorophenol	2,4-Dimethylphenol	2,4-Dinitrophenol	2,6-Dichlorophenol	2,3,4,5 & 2,3,4,6-Tetrachlorophenol	2-Chlorophenol	2-Methylphenol	2-Nitrophenol		
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	<2.5	<2.5	<2.5	<2.5	<2.5	<0.0012	<1.2		<5	<0.002	<2	<2	<2	<4	<0.1	<2	<0.005	<2	<4	<4		
		27 Dec 2023	<1.3	<1.3	<1.3	<1.3	<1.3	<0.0006	<0.6		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.003	<2	<4	<4		
		28 Jan 2024	<4.9	<4.9	<4.9	<4.9	<4.9	<0.0024	<2.4															
		04 Feb 2024	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5															
		13 Feb 2024	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5															
		18 Feb 2024	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<4	
		06 Mar 2024	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<4	
		13 Mar 2024	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<4	
		20 Mar 2024	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<4	
		27 Mar 2024	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<4	
		17 Apr 2024	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<4	
		24 Apr 2024	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	<4	
2H-StG-02-XLB	BET-PW005	27 Jan 2025	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0238	<23.8															
2H-STG-02-FR	BET-PW005	27 Jan 2025	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0024	<2.4															
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0024	<2.4															
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0024	<2.4															
SS2-2H-21-XL	BET-PW005	02 Feb 2025	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0238	<23.8															
SS2-2H-21-XL	BET-PW005	02 Feb 2025	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0238	<23.8															
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025								1														
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4		
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025																						
SS2-2H Choke Water	BET-PW005	20 May 2025	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<5	<0.002	<2	<2	<2	<4	<0.1	<2	<0.005	<2	<4	<4		
SS2-2H Choke Water	BET-PW005	20 May 2025																						
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4		
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025																						
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025								1														
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0238	<23.8															
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0024	<2.4															
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025	<4.8	<4.8	<4.8	<4.8	<4.8	<0.0024	<2.4															
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025	<47.6	<47.6	<47.6	<47.6	<47.6	<0.0238	<23.8															
SS2-2H Water Sample	BET-PW005	10 Jun 2025	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4		
SS2-2H Water Sample	BET-PW005	10 Jun 2025																						
SS2H Water sample	BET-PW005	01 Jul 2025	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4		
SS2H Water sample	BET-PW005	01 Jul 2025																						
SS2H Water sample	BET-PW005	08 Jul 2025	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4		
SS2H Water sample	BET-PW005	08 Jul 2025																						
SS2H Water sample	BET-PW005	15 Jul 2025	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4		
SS2H Water sample	BET-PW005	15 Jul 2025																						
SS2H Water sample	BET-PW005	22 Jul 2025	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4		
SS2H Water sample	BET-PW005	22 Jul 2025																						
SS2H Water sample	BET-PW005	29 Jul 2025	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4		
SS2H Water sample	BET-PW005	29 Jul 2025																						
SS2H Water sample	BET-PW005	05 Aug 2025	<1.0	<1.0	<1.0	<1.0	<1.0	<0.0005	<0.5		<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4		
SS2H Water sample	BET-PW005	05 Aug 2025																						

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Beetaloo Flowback Water Assessment  
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										Particle Size	Phenols											
			Fluorene µg/L	Indeno(1,2,3-c,d)pyrene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Benzo(a)pyrene TEQ calc (Zero) mg/L	PAHs (Sum of total) µg/L	>75µm	3&4-Methylphenol (m&p-cresol) µg/L	2,3,5,6-Tetrachlorophenol mg/L	2,4,5-Trichlorophenol µg/L	2,4,6-Trichlorophenol µg/L	2,4-Dichlorophenol µg/L	2,4-Dimethylphenol µg/L	2,4-Dinitrophenol mg/L	2,6-Dichlorophenol µg/L	2,3,4,5 & 2,3,4,6-Tetrachlorophenol mg/L	2-Chlorophenol µg/L	2-Methylphenol µg/L	2-Nitrophenol µg/L
SS2H Water sample	BET-PW005	10 Aug 2025	<1.0	<1.0	4.7	<1.0	<1.0	<0.0005	4.7		6	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4
SS2H Water sample	BET-PW005	10 Aug 2025																				
SS2H Water sample	BET-PW005	10 Aug 2025			8				8													

Statistics

Number of Results	33	33	34	33	33	33	34	2	20	20	20	20	20	20	20	20	20	20	20	20	20
Number of Detects	0	0	2	0	0	0	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<1	<1	<1	<1	<1	<0.001	<0.5	1	<4	<0.002	<2	<2	<2	<4	<0.1	<2	<0.002	<2	<4	<4	
Minimum Detect	ND	ND	4.7	ND	ND	ND	4.7	1	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Maximum Concentration	<47.6	<47.6	<47.6	<47.6	<47.6	<0.024	<23.8	1	6	<0.002	<2	<2	<2	<4	<0.1	<2	<0.005	<2	<4	<4	
Maximum Detect	ND	ND	8	ND	ND	ND	8	1	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Average Concentration *	4.40454545	4.40454545	4.63382353	4.40454545	4.40454545	0.0022	2.50147059	1	2.25	0.001	1	1	1	2	0.05	1	0.001175	1	2	2	
Geometric Average *	1.23822023	1.23822023	1.39717698	1.23822023	1.23822023	0.00061646	0.72463924	1	2.16061337	0.001	1	1	1	2	0.05	1	0.0011184	1	2	2	
Median Concentration *	0.5	0.5	0.5	0.5	0.5	0.00025	0.25	1	2	0.001	1	1	1	2	0.05	1	0.001	1	2	2	
Standard Deviation *	8.22742424	8.22742424	8.0982362	8.22742424	8.22742424	0.00411453	4.17156843	0	0.87321246	4.3368E-19	0	0	0	0	6.9389E-18	0	0.00045484	0	0	0	
Geometric Standard Deviation *	4.0	4.0	4.1	4.0	4.0	4.0	4.3	1.0	1.3	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.3	1.0	1.0	1.0	
95% UCL (Student's-t) *	6.83055109	6.83055109	6.98423454	6.83055109	6.83055109	0.00341325	3.71221576	1	2.58762397	0.001	1	1	1	2	0.05	1	0.00135086	1	2	2	
% of Detects	0%	0%	6%	0%	0%	0%	6%	100%	5%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
% of Non-Detects	100%	100%	94%	100%	100%	100%	94%	0%	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

\* A Non Detect Multiplier of 0.5 has been applied.

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	4,6-Dinitro-2-methylphenol	4,6-Dinitro-o-cyclohexyl phenol	4-chloro-3-methylphenol	4-Nitrophenol	Cresol Total	Pentachlorophenol	Phenol	Phenols (halogenated) EPAVIC	Phenols (non-halogenated) EPAVIC	Phthalates	Radionuclides					SVOCs	TPH			
	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L	Bis(2-ethylhexyl) phthalate	Gross Beta Activity - K40	Gross alpha activity	Gross beta activity	Radium-226	Radium-228	Hexachlorophene	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction
EQL	50	50	4	50	0.004	2	4	2	4	10	0.1	0.05	0.1	0.01	0.08	0.1	20	50	100	50
ADWG 2025 Aesthetic											0.5	0.5								
ADWG 2025 Health						10				10										
WHO (2022) Drinking Water Guidelines <sup>1</sup>																				
USEPA RSLs					1.5	0.041	5800													

Field ID	Location Code	Date	4,6-Dinitro-2-methylphenol	4,6-Dinitro-o-cyclohexyl phenol	4-chloro-3-methylphenol	4-Nitrophenol	Cresol Total	Pentachlorophenol	Phenol	Phenols (halogenated) EPAVIC	Phenols (non-halogenated) EPAVIC	Phthalates	Gross Beta Activity - K40	Gross alpha activity	Gross beta activity	Radium-226	Radium-228	Hexachlorophene	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	<100	<100	<4	<100	<0.025	<5	<4	<10	<10	12							<100	260,000	100,000	1,040	
		27 Dec 2023	<50	<50	<4	<50	<0.013	<3	<4	<5	<5	<10								50	28,100	21,900	<50
		28 Jan 2024																		120	16,800	7,080	<50
		04 Feb 2024												1.86	3.12	5.11				60	1,820	2,570	<50
		13 Feb 2024												<1.40	6	4.84				80	330	220	<50
		18 Feb 2024	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<4	<10	2.79	6.91	6.19				70	<50	<100	<50
		06 Mar 2024	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<4	<10	1.81	6.73	4.66				60	210	120	<50
		13 Mar 2024	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<4	<10	<1.30	7.46	4.63				70	230	130	<50
		20 Mar 2024	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<4	<10	3.86	10.7	7.49				100	150	260	<50
		27 Mar 2024	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<4	<10	3.03	5.55	6.23				110	250	480	<50
		17 Apr 2024	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<4	<10	3.29	5.67	5.86				50	170	<100	<50
		24 Apr 2024	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<4	<10							50	270	430	<50
2H-StG-02-XLB	BET-PW005	27 Jan 2025																<1.0	765,000	372,000	26,600		
2H-STG-02-FR	BET-PW005	27 Jan 2025																<1.0	11,900	6,370	630		
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025																<1.0	3,080	2,670	520		
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025																<1.0	6,910	7,040	1,350		
SS2-2H-21-XL	BET-PW005	02 Feb 2025																<1.0	1,600,000	187,000	40,200		
SS2-2H-21-XL	BET-PW005	02 Feb 2025																<1.0	672,000	70,800	12,300		
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025																					
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.2	70	660	1,940	<50	
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025											3.12	8	6.61	2.61	0.86						
SS2-2H Choke Water	BET-PW005	20 May 2025	<90	<90	<4	<90	<0.024	<5	<4	<9	<9	<10						<0.2	60	830	1,720	<50	
SS2-2H Choke Water	BET-PW005	20 May 2025											5.62	9	9.24	1.28	1.22						
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.1	150	720	1,670	<50	
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025											5.61	2.97	9.09	3.21	0.84						
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025																					
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025																<1.0	638,000	87,400	4,660		
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025																<1.0	15,900	7,150	2,120		
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025																<0.1	470	1,150	640		
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025																<1.0	1,180,000	247,000	17,000		
SS2-2H Water Sample	BET-PW005	10 Jun 2025	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.2	60	610	1,900	<50	
SS2-2H Water Sample	BET-PW005	10 Jun 2025											4.18	5.91	7.27	2.68	0.91						
SS2H Water sample	BET-PW005	01 Jul 2025	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.2	40	730	2,590	60	
SS2H Water sample	BET-PW005	01 Jul 2025											2.98	6.63	6.62	0.65	0.22						
SS2H Water sample	BET-PW005	08 Jul 2025	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.1	50	690	2,170	<50	
SS2H Water sample	BET-PW005	08 Jul 2025											6.37	21	9.64	2.68	0.89						
SS2H Water sample	BET-PW005	15 Jul 2025	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.2	50	820	3,430	<50	
SS2H Water sample	BET-PW005	15 Jul 2025											<1.64	2.77	5.55	0.9	0.34						
SS2H Water sample	BET-PW005	22 Jul 2025	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.2	30	400	1,230	<50	
SS2H Water sample	BET-PW005	22 Jul 2025											1.48	5.6	5.04	1.18	0.48						
SS2H Water sample	BET-PW005	29 Jul 2025	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.2	90	730	1,470	<50	
SS2H Water sample	BET-PW005	29 Jul 2025											<1.57	4.62	4.83	0.93	0.35						
SS2H Water sample	BET-PW005	05 Aug 2025	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<10						<0.2	50	980	2,060	50	
SS2H Water sample	BET-PW005	05 Aug 2025											2.82	8.77	5.87	2.11	0.87						

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										Phthalates	Radionuclides					SVOCs	TPH					
			4,6-Dinitro-2-methylphenol µg/L	4,6-Dinitro-o-cyclohexyl phenol µg/L	4-chloro-3-methylphenol µg/L	4-Nitrophenol µg/L	Cresol Total mg/L	Pentachlorophenol µg/L	Phenol µg/L	Phenols (halogenated) EPAVic µg/L	Phenols (non-halogenated) EPAVic µg/L	Bis(2-ethylhexyl) phthalate µg/L	Gross Beta Activity - K40 Bq/L	Gross alpha activity Bq/L	Gross beta activity Bq/L	Radium-226 Bq/L	Radium-228 Bq/L	Hexachlorophene µg/L	C6-C9 Fraction µg/L	C10-C14 Fraction µg/L	C15-C28 Fraction µg/L	C29-C36 Fraction µg/L
SS2H Water sample	BET-PW005	10 Aug 2025	<50	<50	<4	<50	0.006	<2	<4	<2	6	<10						<0.2	90	1,250	2,010	<50
SS2H Water sample	BET-PW005	10 Aug 2025										1.93	7.03	5.22	2.83	1.14						
SS2H Water sample	BET-PW005	10 Aug 2025																				

Statistics

Number of Results	20	20	20	20	20	20	20	20	20	20	19	19	19	11	11	21	23	33	33	33
Number of Detects	0	0	0	0	1	0	0	0	1	1	15	19	19	11	11	0	22	32	31	13
Minimum Concentration	<50	<50	<4	<50	<0.004	<2	<4	<2	<4	<10	<1.3	2.77	4.63	0.65	0.22	<0.1	30	<50	<100	<50
Minimum Detect	ND	ND	ND	ND	0.006	ND	ND	ND	6	12	1.48	2.77	4.63	0.65	0.22	ND	30	150	120	50
Maximum Concentration	<100	<100	<4	<100	<0.025	<5	<4	<10	<10	12	6.37	21	9.64	3.21	1.22	<1	150	1600000	372000	40200
Maximum Detect	ND	ND	ND	ND	0.006	ND	ND	ND	6	12	6.37	21	9.64	3.21	1.22	ND	150	1600000	372000	40200
Average Concentration *	27.25	27.25	2	27.25	0.00345	1.175	2	1.45	2.5	5.35	2.82657895	7.07578947	6.31526316	1.91454545	0.73818182	0.26428571	70	157879.848	34668.4848	3262.72727
Geometric Average *	26.6535545	26.6535545	2	26.6535545	0.00268647	1.11840362	2	1.22322437	2.32936575	5.22372814	2.28620004	6.33291655	6.1463119	1.67712326	0.65097453	0.18053204	65.2027147	3012.58949	2942.48569	134.510892
Median Concentration *	25	25	2	25	0.002	1	2	1	2	5	2.82	6.63	5.87	2.11	0.86	0.1	60	820	2060	25
Standard Deviation *	6.79613861	6.79613861	0	6.79613861	0.00319726	0.45483513	0	1.15	1.15108644	1.52561463	1.67665712	3.84581976	1.53953981	0.8918761	0.32095931	0.20478959	27.9751442	375088.992	81293.6046	8603.7373
Geometric Standard Deviation *	1.2	1.2	1.0	1.2	1.8	1.3	1.0	1.6	1.4	1.2	2.0	1.6	1.3	1.7	1.7	2.5	1.4	19.8	10.2	11.6
95% UCL (Student's-t) *	29.8776988	29.8776988	2	29.8776988	0.00468621	1.35086012	2	1.89464273	2.9450628	5.93987257	3.49358915	8.60573916	6.92772516	2.40193576	0.91357889	0.34136122	80.0164823	268481.658	58639.3823	5799.69566
% of Detects	0%	0%	0%	0%	5%	0%	0%	0%	5%	5%	79%	100%	100%	100%	100%	0%	96%	97%	94%	39%
% of Non-Detects	100%	100%	100%	100%	95%	100%	100%	100%	95%	95%	21%	0%	0%	0%	0%	100%	4%	3%	6%	61%

\* A Non Detect Multiplier of 0.5 has been applied.

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	C10-C36 Fraction (Sum)	TRH						
		C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	50	20	20	100	100	100	100	100
ADWG 2025 Aesthetic								
ADWG 2025 Health								0.2
WHO (2022) Drinking Water Guidelines <sup>1</sup>		15,000 aliphatic	15,000 aliphatic	90 aromatic 300 aliphatic	90 aromatic 300 aliphatic	90 aromatic 300 aliphatic		
USEPA RSLs								0.05

Field ID	Location Code	Date	C10-C36 Fraction (Sum)	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)
SS-1H Flowback ALS Sample	BET-PW004	20 Dec 2023	361,000	<100	<100	328,000	328,000	32,700	330	361,000
		27 Dec 2023	50,000	50	50	41,200	41,200	8,900	<100	50,100
		28 Jan 2024	23,900	120	120	20,200	20,200	3,950	<100	24,200
		04 Feb 2024	4,390	60	60	3,160	3,160	1,220	<100	4,380
		13 Feb 2024	550	70	70	380	380	<100	<100	380
		18 Feb 2024	<50	70	70	<100	<100	<100	<100	<100
		06 Mar 2024	330	50	50	180	180	<100	<100	180
		13 Mar 2024	360	70	70	260	260	<100	<100	260
		20 Mar 2024	410	100	100	260	260	150	<100	410
		27 Mar 2024	730	100	100	400	400	340	<100	740
		17 Apr 2024	170	50	50	160	160	<100	<100	160
		24 Apr 2024	700	50	50	350	350	360	<100	710
2H-StG-02-XLB	BET-PW005	27 Jan 2025	1,160,000			1,140,000	1,140,000	37,200	27,000	1,200,000
2H-STG-02-FR	BET-PW005	27 Jan 2025	18,900			15,800	15,800	2,560	310	18,700
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025	6,270			4,520	4,520	1,550	360	6,430
SS2-2H-21-FR-Stge7/8	BET-PW005	30 Jan 2025	15,300			11,600	11,600	3,300	860	15,800
SS2-2H-21-XL	BET-PW005	02 Feb 2025	1,830,000			1,760,000	1,760,000	41,000	40,200	1,840,000
SS2-2H-21-XL	BET-PW005	02 Feb 2025	755,000			726,000	726,000	15,000	10,300	751,000
SS2-2H Choke Manifold	BET-PW005	07 Jun 2025								
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025	2,600	80	80	1,750	1,750	780	<100	2,530
SS2-2H Choke Manifold	BET-PW005	17 Jun 2025								
SS2-2H Choke Water	BET-PW005	20 May 2025	2,550	70	70	1,700	1,700	780	<100	2,480
SS2-2H Choke Water	BET-PW005	20 May 2025								
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025	2,390	100	100	1,480	1,480	760	<100	2,240
SS2-2H CHOKE - WATER	BET-PW005	27 May 2025								
SS2-2H D/S Open Top Tank	BET-PW005	07 Jun 2025								
SS2-2H-Stg03-Liberty30thJustice	BET-PW005	27 Jan 2025	730,000			715,000	715,000	8,960	4,050	728,000
SS2-2H-Stg03-LibertyFR	BET-PW005	27 Jan 2025	25,200			20,600	20,600	3,680	2,010	26,300
SS2-2H-Stg35-LibertyFR	BET-PW005	06 Feb 2025	2,260			770	770	1,250	480	2,500
SS2-2H-Stg35-XL	BET-PW005	06 Feb 2025	1,440,000			1,410,000	1,410,000	22,500	14,700	1,450,000
SS2-2H Water Sample	BET-PW005	10 Jun 2025	2,510	70	60	1,660	1,660	760	<100	2,420
SS2-2H Water Sample	BET-PW005	10 Jun 2025								
SS2H Water sample	BET-PW005	01 Jul 2025	3,380	40	40	2,290	2,290	1,030	<100	3,320
SS2H Water sample	BET-PW005	01 Jul 2025								
SS2H Water sample	BET-PW005	08 Jul 2025	2,860	50	50	2,040	2,040	780	<100	2,820
SS2H Water sample	BET-PW005	08 Jul 2025								
SS2H Water sample	BET-PW005	15 Jul 2025	4,250	50	40	2,680	2,680	1,890	<100	4,570
SS2H Water sample	BET-PW005	15 Jul 2025								
SS2H Water sample	BET-PW005	22 Jul 2025	1,630	30	30	1,100	1,100	460	<100	1,560
SS2H Water sample	BET-PW005	22 Jul 2025								
SS2H Water sample	BET-PW005	29 Jul 2025	2,200	60	60	1,520	1,520	550	<100	2,070
SS2H Water sample	BET-PW005	29 Jul 2025								
SS2H Water sample	BET-PW005	05 Aug 2025	3,090	50	50	2,020	2,020	1,010	<100	3,030
SS2H Water sample	BET-PW005	05 Aug 2025								

Table C-1  
Human Health Tier 1 Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

			TRH							
			C10-C36 Fraction (Sum)	C6-C10 Fraction (F1)	C6-C10 (F1 minus BTEX)	>C10-C16 Fraction (F2)	>C10-C16 Fraction (F2 minus Naphthalene)	>C16-C34 Fraction (F3)	>C34-C40 Fraction (F4)	>C10-C40 Fraction (Sum)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
SS2H Water sample	BET-PW005	10 Aug 2025	3,260	90	70	2,330	2,320	680	<100	3,010
SS2H Water sample	BET-PW005	10 Aug 2025								
SS2H Water sample	BET-PW005	10 Aug 2025								

Statistics

Number of Results	33	23	23	33	33	33	33	33
Number of Detects	32	22	22	32	32	28	11	32
Minimum Concentration	<50	30	30	<100	<100	<100	<100	<100
Minimum Detect	170	30	30	160	160	150	310	160
Maximum Concentration	1830000	120	120	1760000	1760000	41000	40200	1840000
Maximum Detect	1830000	120	120	1760000	1760000	41000	40200	1840000
Average Concentration *	195642.879	66.5217391	64.7826087	188468.4848	188468.1818	5889.393939	3081.81818	197313.636
Geometric Average *	6603.99706	63.0278525	61.3285772	4905.627886	4904.988549	1175.433018	183.316526	6461.41619
Median Concentration *	3090	60	60	2040	2040	1010	50	3010
Standard Deviation *	452021.96	22.1866971	22.0413771	439076.1301	439076.2586	10929.80355	8484.5694	456341.547
Geometric Standard Deviation *	16.0	1.4	1.4	17.5	17.5	6.9	8.2	16.2
95% UCL (Student's-t) *	328929.773	74.4656717	72.6745095	317938.0654	317937.8003	9112.245251	5583.64774	331874.239
% of Detects	97%	96%	96%	97%	97%	85%	33%	97%
% of Non-Detects	3%	4%	4%	3%	3%	15%	67%	3%

\* A Non Detect Multiplier of 0.5 has been applied.

**Table B-1**  
**Human Health Tier 1 Screening Assessment**  
**Shenandoah S-1H Flowback Water**  
**Tamboran**

**Environmental Standards**

NHMRC, June 2025, ADWG 2025 Aesthetic

NHMRC, June 2025, ADWG 2025 Health

USEPA. 2024. Regional Screening Levels. November

WHO. 2022. Guidelines for Drinking Water Quality. Fourth edition incorporating the first and second addenda.

1/ WHO Guidelines for TPH fractions are not established because taste and odor thresholds are lower than health-based values.

However, WHO developed health-based group values providing guidance as to tolerable levels of aromatic and aliphatic hydrocarbon fractions in drinking water (WHO, 2008).

Analysis of aliphatic and aromatic fractions for petroleum hydrocarbon was not performed. Therefore, the following application of levels was followed:

- TPH C6-C10 (F1) aromatic - assumed to be total BTEX concentration

- TPH C6-C10 (F1) minus BTEX - assumed to be aliphatic portion of TPH fraction

-Consistent with NEPM guidance, concentrations of higher TPH fractions were assumed to be 80 percent aliphatic and 20 percent aromatic fractions.

**Table C-2**  
**Radionuclide Annual Dose Calculations**  
**Beetaloo Flowback Water Assessment**  
**Tamboran**

Radionuclide	Dose/unit (mSv/Bq)	Max Conc <sup>1</sup> (Bq/L)	Drinking Water Exposure Scenario		Worker Exposure Scenario	
			Ing/year	Dose/year	Ing/year	Dose/year
			(L/year)	(mSv/year)	(L/year)	(mSv/year)
Radium 226	2.8E-04	3.21	750	6.7E-01	0.00208	1.9E-06
Radium-228	6.9E-04	1.22	750	6.3E-01	0.00208	1.7E-06
<b>Total dose/year</b>				6.7E-01	<b>Total dose/year</b>	1.9E-06

**Notes:**

Bq/L = becquerel per litre

L = litre

L/year = litre per year

mSv/Bq = millisievert per becquerel

mSv/year = millisievert per year

1/ Radium-226 & Radium-228 assumed to be source of gross beta and gross alpha activity in assessed flowback water.

**Table C-3  
Human Receptor Exposure Assumptions  
Beetaloo Flowback Water Assessment  
Tamboran**

Media	Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value - Agricultural Worker	Source (b)
Water	Ingestion	IR	Ingestion rate	mL/day	0.005	Origin, 2022
		EF	Exposure frequency	day/yr	20	Origin, 2022
		ED	Exposure duration	yr	0.083	Origin, 2022
		RBA	Relative bioavailability factor	unitless	chemical-specific	(f) enHealth, 2012
		BW	Body weight	kg	78	enHealth, 2012
		LT	Lifetime	yr	79	(f) enHealth, 2012
		AT-NC	Averaging time - noncancer	days	30	enHealth, 2012
		AT-C	Averaging time - cancer	days	25,550	enHealth, 2012
	Dermal	CF	Conversion factor	kg/mg	1.0E-06	enHealth, 2012
		SA	Surface area for contact (exposed)	cm <sup>2</sup> /day	2,300	Origin, 2022
		EF	Exposure frequency	day/yr	20	Origin, 2022
		ED	Exposure duration	yr	0.083	Origin, 2022
		BW	Body weight	kg	78	(f) enHealth, 2012
		LT	Lifetime	yr	79	enHealth, 2012
		AT-NC	Averaging time - noncancer	days	30	enHealth, 2012
		AT-C	Averaging time - cancer	days	25,550	enHealth, 2012
	Inhalation	ET	Exposure Time	hr/day	1	Origin, 2022
		CF	Conversion factor	kg/mg	1.0E-06	enHealth, 2012
		EF	Exposure frequency	day/yr	120	Origin, 2022
		ED	Exposure duration	yr	1	Origin, 2022
		AT-NC	Averaging time - noncancer	days	365	enHealth, 2012
		AT-C	Averaging time - cancer	days	25550	enHealth, 2012
		ET	Exposure Time	hr/day	1	Origin, 2022
		EMF	Driftable aerosol emission factor	L/m <sup>3</sup>	2.5E-03	Origin, 2022
AAF	Aerosol Inhalation bioavailability	unitless	1.0E+00	Origin, 2022		

Notes:

a/ Units:

l/hr = litres per hour	cm/h = centimetre per hour
hr/day = hours per day	l/cm <sup>3</sup> = litre per cubic centimetre
day/yr = days per year	cm <sup>2</sup> /day = square centimetre per day
yr = year	mg soil/cm <sup>2</sup> skin = milligrams soil per square centimetre skin
kg = kilogram	kg/mg = kilogram per milligram
cm <sup>2</sup> = square centimetre	

b/ References:

enHealth. (2012). Australian Exposure Factor Guidance. enHealth Subcommittee of the Australian Health Protection Principal Committee, Canberra, Australia.

Origin 2021. ORI6-3:Beetaloo Sub-basin Kyalla 117 N2 Multi-Well Drilling, Stimulation and Well Testing Program Environment Management Plan, EP117. 11 February 2021.

d/ Exposed body surface area is the time weighted average of head, forearms, hands, lower legs, and feet.

Forearms are considered 45% of arm surface area; lower leg is considered 40% of leg surface area (USEPA, 2016).

e/ Adherence factor calculated for exposed body part surface area is the time weighted average of head, forearms, hands, lower legs, and feet.

f/ Male exposure factor used based on enHealth recommendation.

**Table C-4  
Risk Estimates for Flowback Worker During Re-Use  
Beetaloo Flowback Water Assessment  
Tamboran**

Exposure to Flowback Water																
Constituent Name	CAS No.	EPC <sup>1</sup> Flowback Water CW (mg/L)	Toxicity <sup>2</sup>				ABS <sup>3</sup>	Oral Intake		DAevent (ug/cm2-event)	Dermal Intake		Excess Cancer Lifetime Risk		Hazard Quotient	
			CSFo 1/(mg/kg-day)	RfDo mg/kg-day	LADDoral	CADDoral		LADDderm	CADDderm		Incidental Ingestion	Dermal	Incidental Ingestion	Dermal		
										I					P	I
Chromium	18540-29-9	0.10	1.6E-01	9.0E-04	I	1	4.0E-10	3.3E-07	1.9E-04	3.6E-10	3.1E-07	6.3E-11	5.8E-11	3.7E-04	3.4E-04	
Iron	7439-89-6	27.7	NA	7.0E-01	P	1	1.2E-07	9.7E-05	2.8E-02	5.3E-08	4.5E-05	NA	NA	1.4E-04	6.4E-05	
Lead	7439-92-1	0.0065	NA	NA	0.0E+00	1	2.7E-11	2.3E-08	6.5E-07	1.2E-12	1.1E-09	NA	NA	NA	NA	
Manganese	7439-96-5	3.23	NA	1.4E-01	I	1	1.3E-08	1.1E-05	3.2E-03	6.2E-09	5.2E-06	NA	NA	8.1E-05	3.7E-05	
Naphthalene (VOC)	91-20-3	0.003	1.2E-01	2.0E-02	I	1	1.2E-11	1.1E-08	2.9E-04	5.5E-10	4.6E-07	1.5E-12	6.6E-11	5.3E-07	2.3E-05	
Selenium	7782-49-2	0.02	NA	5.0E-03	I	1	6.2E-11	5.3E-08	1.5E-05	2.9E-11	2.4E-08	NA	NA	1.1E-05	4.8E-06	
Strontium	7440-24-6	64.50	NA	1.0E-01	I	1	2.7E-07	2.3E-04	1.0E-01	1.9E-07	1.6E-04	NA	NA	2.3E-03	1.6E-03	
<b>Total Risk</b>													<b>2E-10</b>	<b>Total HI</b>		<b>5E-03</b>

**Notes:**

1/ EPC is average concentration in flowback samples. For petroleum hydrocarbon fractions, concentrations were assumed to be 80-percent aliphatic and 20 percent aromatic fractions.

2/ Sources of toxicity values:

Friebel, E & Nadebaum, P 2011, Health screening levels for petroleum hydrocarbons in soil and groundwater. Part 1: Technical development document, CRC CARE Technical Report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.

NHMRC, NRMCC. (2011). Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy. National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra. Updated December 2023

USEPA. 2024. Regional Screening Levels. May. Toxicity sources. Available online at: <https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables>

Including IRIS, ATSDR, PPRTV toxicological profiles and databases.

WHO. 2022. Guidelines for drinking-water quality. Fourth edition incorporating the first and second addenda

Toxicity data for chromium VI used to calculate potential cancer risk and noncancer hazard for total chromium.

3/ Consistent with enHealth guidance a default value of 1 used for the ABS values.

CAS = Chemical Abstracts Service  
CW = concentration in water  
CADD = chronic average daily dose

EPC = exposure point concentration  
mg/l = milligrams per litre  
mg/kg/day = milligrams per kilograms per day

NA = not applicable  
RfDo = oral reference dose

$$Oral\ Intake = \frac{EPC \times IR \times EF \times ED \times CF_{water}}{BW \times AT}$$

$$Dermal\ Intake = \frac{DA_{event} \times EV \times EF \times ED \times SA_{exp} \times Kp \times ET \times CF_{water}}{BW \times AT}$$

**Table B-5  
Risk Estimates for Worker During Mechanical Evaporation  
Beetaloo Flowback Water Assessment  
Tamboran**

Exposure to Flowback Water								
Constituent Name	CAS No.	EPC <sup>1</sup> Flowback Water	Toxicity <sup>2</sup>		Inhalation Intake		Excess Cancer Lifetime Risk	Hazard Quotient
		CW (mg/L)	IUR 1/(ug/m3)	RfCi (mg/m3)	LADDinh	CADDinh	Inhalation	Inhalation
Chromium	18540-29-9	0.10	1.1E-02	3.0E-05	4.6E-05	3.3E-06	5.1E-07	1.1E-01
Iron	7439-89-6	27.7	NA	NA	1.4E-02	9.5E-04	NA	NA
Lead	7439-92-1	0.0065	NA	1.2E+00	3.2E-06	2.2E-07	NA	1.9E-07
Manganese	7439-96-5	3.23	NA	1.5E-04	1.6E-03	1.1E-04	NA	7.4E-01
Naphthalene (VOC)	91-20-3	0.003	3.4E-05	3.0E-03	1.5E-06	1.0E-07	5.0E-11	3.4E-05
Selenium	7782-49-2	0.02	NA	2.0E-01	7.3E-06	5.1E-07	NA	2.6E-06
Strontium	7440-24-6	64.50	NA	NA	3.2E-02	2.2E-03	NA	NA
<b>Total Risk/Hi</b>							<b>5E-07</b>	<b>8E-01</b>

**Notes:**

CADD = chronic average daily dose

CAS = Chemical Abstracts Service

CW = concentration in water

EPC = exposure point concentration

IUR = inhalation unit risk

LADD = lifetime average daily dose

mg/L = milligrams per litre

mg/m3 = milligram per cubic metre

NA = not applicable

RfCi = inhalation reference concentration

1/ EPC is average concentration in flowback samples. For petroleum hydrocarbon fractions, concentrations were assumed to be 80-percent aliphatic and 20 percent aromatic fractions.

2/ Sources of toxicity values:

Friebel, E & Nadebaum, P 2011, Health screening levels for petroleum hydrocarbons n soil and groundwater. Part 1: Technical development document, CRC CARE Technical Report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.

NHMRC, NRMCC. (2011). Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy. National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra. Updated January 2022

USEPA. 2023. Regional Screening Levels. May. Toxicity sources.

Available online at:<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables>.

Including IRIS, ATSDR, PPRTV toxicological profiles and databases.

WHO. 2022. Guidelines for drinking-water quality. Fourth edition incorporating the first and second addenda

Toxicity data for chromium VI used to calculate potential cancer risk and noncancer hazard.

$$\text{Inhalation Intake} = \frac{\text{EPC} \times \text{EF} \times \text{ED} \times \text{ET} \times \text{EMF} \times \text{AAF}}{\text{AT} \times 24}$$



## Appendix D Avian Risk Assessment

Table D-1  
Tier 1 Avian Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

Field ID		Number of Results	Number of Detects	Minimum Concentration	Minimum Detect	Maximum Concentration	Maximum Detect	Average Concentration *	Geometric Average *	Median Concentration *	Standard Deviation *
Location Code											
Date											
Chemical	Unit										
Naphthalene (VOC)	mg/L	23	2	<0.005	0.007	0.008	0.008	0.002934783	0.002750076	0.0025	0.001416551
Benzene	µg/L	23	1	<1	2	<5	2	0.652173913	0.569556124	0.5	0.498580215
Toluene	µg/L	23	7	<2	2	14	14	2.456521739	1.629707422	1	3.074838432
Total Phosphorus as P (Organic Phosphate as P)	mg/L	33	32	<0.1	0.15	11.9	11.9	2.372060606	1.086943441	1.05	3.408151965
Sulfate as SO4 - Turbidimetric (filtered)	mg/L	33	32	<1.	6	164	164	58.89393939	31.86136746	31	56.33742466
Silicon as SiO2	mg/L	33	33	21.3	21.3	220	220	111.3939394	81.84269035	140	67.83987359
Nitrite + Nitrate as N	mg/L	33	16	0.006	0.006	0.13	0.13	0.02569697	0.017140679	0.02	0.02526764
Alkalinity (Bicarbonate as CaCO3)	mg/L	33	33	102	102	554	554	289.5454545	265.8562811	280	119.1734389
Alkalinity (total) as CaCO3	mg/L	33	33	102	102	554	554	289.5454545	265.8562811	280	119.1734389
Ammonia as N	mg/L	33	30	0.04	0.04	24.7	24.7	15.11969697	5.942592221	19.4	9.369074041
Anions Total	meq/L	20	20	157	157	603	603	412.95	387.5066753	457	127.6215009
Bromide	µg/L	33	26	<1000	16200	459000	459000	182912.1212	49823.65074	205000	151392.4336
Bromine	µg/L	33	33	300	300	278000	278000	134018.1818	30735.61204	168000	101076.3721
Cations Total	meq/L	20	20	153	153	614	614	429.85	402.4443893	469.5	134.1802053
Chloride	mg/L	33	33	175	175	21100	21100	10206.57576	4273.113774	13300	7423.909642
Fluoride	mg/L	33	33	0.1	0.1	1.6	1.6	0.593939394	0.416099621	0.7	0.388422914
Nitrate (as N)	mg/L	33	15	0.006	0.006	<0.1	0.1	0.019181818	0.013626635	0.02	0.019023836
Nitrite (as N)	mg/L	33	9	<0.002	0.02	<0.1	0.04	0.014606061	0.010179713	0.01	0.011364323
Nitrogen (Total)	mg/L	33	33	2.7	2.7	97.9	97.9	43.71818182	37.2328708	40.2	23.50563381
Reactive Phosphorus as P (Orthophosphate as P)	mg/L	23	19	<0.01	0.01	0.21	0.21	0.087565217	0.052921072	0.083	0.060871801
Reactive Phosphorus as P (Orthophosphate as P) (filtered)	mg/L	10	9	0.03	0.03	0.24	0.24	0.087	0.066474463	0.05	0.066790718
Total Dissolved Solids (Lab)	mg/L	33	33	1990	1990	38000	38000	20849.39394	14126.4152	25500	13392.91308
Total Suspended Solids (Lab)	mg/L	33	33	34	34	970	970	230.8787879	152.674652	161	222.1724361
Aluminium	mg/L	33	25	<0.005	0.005	1.36	1.36	0.253863636	0.103335961	0.1	0.349891093
Antimony	mg/L	33	17	<0.001	0.0006	<0.01	0.007	0.002221212	0.001355092	0.0014	0.001977143
Arsenic	mg/L	33	24	<0.001	0.0042	0.107	0.107	0.017378788	0.009122262	0.0069	0.02238507
Barium	mg/L	33	33	0.059	0.059	52	52	22.74269697	4.65704314	21.7	19.01361396
Beryllium	mg/L	33	9	<0	0.0001	<0.01	0.0004	0.001342424	0.000280026	0.0002	0.00207416
Boron	mg/L	33	32	0.787	0.787	54	54	18.59881818	12.41500282	17.3	12.72672491
Cadmium	mg/L	33	1	<0	0.0002	<0.001	0.0002	0.000193939	0.000138701	0.0001	0.000174841
Chromium (III+VI)	mg/L	33	30	<0.001	0.0007	0.631	0.631	0.101192424	0.018209815	0.029	0.160497809
Cobalt	mg/L	21	21	0	0.0003	0.008	0.0083	0.003204762	0.002491845	0.0028	0.002140867
Copper	mg/L	33	28	0.001	0.001	0.117	0.117	0.023727273	0.010689737	0.008	0.030221679
Iron	mg/L	33	33	0.232	0.232	95.4	95.4	27.73430303	9.407052535	21.9	28.08247474
Lead	mg/L	33	24	0	0.0004	0.022	0.0219	0.00650303	0.003679633	0.005	0.006200512
Manganese	mg/L	33	33	0.016	0.0161	10.1	10.1	3.229106061	0.673188041	0.969	4.002119969
Mercury	mg/L	33	11	<0	0.00006	0.009	0.0089	0.000712727	0.000175417	0.0002	0.001731904
Molybdenum	mg/L	33	29	0.005	0.0046	0.46	0.46	0.087178788	0.022956564	0.011	0.13188417
Nickel	mg/L	33	25	0.002	0.002	0.085	0.0852	0.018609091	0.010539559	0.0069	0.022187157
Selenium	mg/L	33	11	<0.002	0.002	<0.1	0.011	0.014848485	0.005133887	0.005	0.020071269
Silver	mg/L	33	9	<0	0.0002	<0.01	0.003	0.001566667	0.000370726	0.0005	0.002045826
Strontium	mg/L	33	33	0.687	0.687	130	130	64.47036364	20.05804911	83.5	49.37124475
Thorium	µg/L	33	17	<0.1	0.1	<10	6	2.034848485	0.863746102	0.9	2.143965628
Uranium	µg/L	33	11	<0.1	0.2	<10	7.6	2.915151515	0.857970392	3.9	2.629422245
Vanadium	mg/L	33	19	<0.001	0.0006	<0.1	0.0246	0.016357576	0.005323966	0.005	0.019806944
Zinc	mg/L	33	26	0.012	0.012	0.27	0.27	0.060818182	0.049239392	0.055	0.045960757
Formaldehyde	mg/L	33	25	<0.1	0.2	17.4	17.4	4.671212121	1.711033383	2.3	5.234544788
Total Organic Carbon	mg/L	33	33	65	65	2640	2640	608.4242424	302.2724863	181	794.3017147
Naphthalene	µg/L	34	2	<1	4.7	<47.6	8	4.633823529	1.397176984	0.5	8.098236197
PAHs (Sum of total)	µg/L	34	2	<0.5	4.7	<23.8	8	2.501470588	0.724639239	0.25	4.171568426
3&4-Methylphenol (m&p-cresol)	µg/L	20	1	<4	6	6	6	2.25	2.160613372	2	0.87321246

Table D-1  
Tier 1 Avian Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

Field ID		Number of Results	Number of Detects	Minimum Concentration	Minimum Detect	Maximum Concentration	Maximum Detect	Average Concentration *	Geometric Average *	Median Concentration *	Standard Deviation *
Location Code											
Date											
Chemical	Unit										
Phenols (non-halogenated) EPAVic	µg/L	20	1	<4	6	<10	6	2.5	2.329365749	2	1.151086443
Bis(2-ethylhexyl) phthalate	µg/L	20	1	<10	12	12	12	5.35	5.223728136	5	1.52561463
Gross Beta Activity -K40	Bq/L	19	15	<1.3	1.48	6.37	6.37	2.826578947	2.286200042	2.82	1.676657116
Gross alpha activity	Bq/L	19	19	2.77	2.77	21	21	7.075789474	6.332916552	6.63	3.845819762
Radium-226	Bq/L	11	11	0.65	0.65	3.21	3.21	1.914545455	1.677123262	2.11	0.891876099
Radium-228	Bq/L	11	11	0.22	0.22	1.22	1.22	0.738181818	0.650974528	0.86	0.320959306
C6-C9 Fraction	µg/L	23	22	30	30	150	150	70	65.20271472	60	27.97514425
C10-C14 Fraction	µg/L	33	32	<50	150	1600000	1600000	157879.8485	3012.589488	820	375088.9917
C15-C28 Fraction	µg/L	33	31	<100	120	372000	372000	34668.48485	2942.485686	2060	81293.60458
C29-C36 Fraction	µg/L	33	13	<50	50	40200	40200	3262.727273	134.5108917	25	8603.737304
C6-C10 (F1 minus BTEX)	µg/L	23	22	30	30	120	120	64.7826087	61.32857718	60	22.04137714
>C10-C16 Fraction (F2)	µg/L	33	32	<100	160	1760000	1760000	188468.4848	4905.627886	2040	439076.1301
>C10-C16 Fraction (F2 minus Naphthalene)	µg/L	33	32	<100	160	1760000	1760000	188468.1818	4904.988549	2040	439076.2586
>C16-C34 Fraction (F3)	µg/L	33	28	<100	150	41000	41000	5889.393939	1175.433018	1010	10929.80355
>C34-C40 Fraction (F4)	µg/L	33	11	<100	310	40200	40200	3081.818182	183.3165256	50	8484.5694

Table D-1  
Tier 1 Avian Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

Field ID		Geometric Standard Deviation *	95% UCL (Student's-t) *	% of Detects	% of Non-Detects	Freshwater Trigger Value				Alternative SW Screening Criteria	Reference
Location Code						by Protection Level (% Species)					
Date						99%	95%	90%	80%		
Chemical	Unit										
Naphthalene (VOC)	mg/L	1.4	0.003441978	9%	91%	2.5	16	37	85		
Benzene	µg/L	1.5	0.830690236	4%	96%	600	950	1300	2000		
Toluene	µg/L	2.2	3.55746565	30%	70%	110	180	230	330		
Total Phosphorus as P (Organic Phosphate as P)	mg/L	3.4	3.377016182	97%	3%	NC	NC	NC	NC	0.01	b
Sulfate as SO4 - Turbidimetric (filtered)	mg/L	3.6	75.50605343	97%	3%	NC	NC	NC	NC	2000	a
Silicon as SiO2	mg/L	2.4	131.3977596	100%	0%	NC	NC	NC	NC		
Nitrite + Nitrate as N	mg/L	2.5	0.033147593	48%	52%	NC	NC	NC	NC		
Alkalinity (Bicarbonate as CaCO3)	mg/L	1.5	324.6859099	100%	0%	NC	NC	NC	NC		
Alkalinity (total) as CaCO3	mg/L	1.5	324.6859099	100%	0%	NC	NC	NC	NC		
Ammonia as N	mg/L	8.9	17.88233881	91%	9%	0.32	0.9	1.43	2.3	0.01	b
Anions Total	meq/L	1.5	462.2943238	100%	0%	NC	NC	NC	NC	NC	
Bromide	µg/L	12.6	227552.933	79%	21%	NC	NC	NC	NC	NC	
Bromine	µg/L	15.1	163822.388	100%	0%	NC	NC	NC	NC		
Cations Total	meq/L	1.5	481.7302197	100%	0%	NC	NC	NC	NC	NC	
Chloride	mg/L	6.1	12395.6505	100%	0%	NC	NC	NC	NC	NC	
Fluoride	mg/L	2.6	0.708472953	100%	0%	1300	3100	4800	8200		
Nitrate (as N)	mg/L	2.2	0.024791342	45%	55%	NC	NC	NC	NC	NC	
Nitrite (as N)	mg/L	2.6	0.017957038	27%	73%	NC	NC	NC	NC	0.02	j
Nitrogen (Total)	mg/L	1.9	50.64924535	100%	0%	NC	NC	NC	NC	0.35	b
Reactive Phosphorus as P (Orthophosphate as P)	mg/L	3.5	0.109360326	83%	17%	NC	NC	NC	NC	NC	
Reactive Phosphorus as P (Orthophosphate as P) (filtered)	mg/L	2.1	0.125717324	90%	10%	NC	NC	NC	NC	NC	
Total Dissolved Solids (Lab)	mg/L	2.8	24798.53788	100%	0%	NC	NC	NC	NC		
Total Suspended Solids (Lab)	mg/L	2.5	296.3903704	100%	0%	NC	NC	NC	NC	NC	
Aluminium	mg/L	4.3	0.357035387	76%	24%	0.027	0.055	0.08	0.15		
Antimony	mg/L	2.9	0.002804209	52%	48%	NC	NC	NC	NC	0.009	h
Arsenic	mg/L	3.2	0.023979433	73%	27%	0.0008	0.013	0.042	0.14		
Barium	mg/L	16.2	28.34920677	100%	0%	4	4	4	4		
Beryllium	mg/L	6.1	0.001954028	27%	73%	0.66	0.66	0.66	0.66	0.11	k
Boron	mg/L	3.2	22.35152443	97%	3%	0.09	0.37	0.68	1.3		
Cadmium	mg/L	2.2	0.000245494	3%	97%	0.00006	0.0002	0.0004	0.0008		
Chromium (III+VI)	mg/L	10.4	0.148518122	91%	9%	0.00001	0.001	0.006	0.04		
Cobalt	mg/L	2.2	0.004010508	100%	0%	0.0014	0.0014	0.0014	0.0014		
Copper	mg/L	3.6	0.032638684	85%	15%	0.001	0.0014	0.0018	0.0025		
Iron	mg/L	7.2	36.01493132	100%	0%	300	300	300	300		
Lead	mg/L	3.2	0.008331364	73%	27%	1	3.4	5.6	9.4		
Manganese	mg/L	9.3	4.409203903	100%	0%	1200	1900	2500	3600		
Mercury	mg/L	5.0	0.001223411	33%	67%	0.00006	0.0006	0.0019	0.0054		
Molybdenum	mg/L	5.2	0.126067234	88%	12%	0.034	0.034	0.034	0.034		h
Nickel	mg/L	2.7	0.025151377	76%	24%	0.008	0.011	0.013	0.017		
Selenium	mg/L	4.4	0.020766863	33%	67%	5	11	18	34		
Silver	mg/L	6.9	0.002169916	27%	73%	0.00002	0.00005	0.0001	0.0002		
Strontium	mg/L	9.1	79.02837286	100%	0%	NC	NC	NC	NC	1500	d
Thorium	µg/L	4.6	2.667035733	52%	48%	NC	NC	NC	NC	NC	
Uranium	µg/L	8.0	3.690484474	33%	67%	0.5	0.5	0.5	0.5		h
Vanadium	mg/L	5.6	0.022198013	58%	42%	NC	NC	NC	NC	0.006	h
Zinc	mg/L	1.9	0.074370547	79%	21%	0.0024	0.008	0.015	0.031		
Formaldehyde	mg/L	5.7	6.21471283	76%	24%	NC	NC	NC	NC	1610	c
Total Organic Carbon	mg/L	3.0	842.6385456	100%	0%	NC	NC	NC	NC		
Naphthalene	µg/L	4.1	6.949287249	6%	94%	2.5	16	37	85		e
PAHs (Sum of total)	µg/L	4.3	3.550098128	6%	94%	NC	NC	NC	NC		
3&4-Methylphenol (m&p-cresol)	µg/L	1.3	2.587623975	5%	95%	NC	NC	NC	NC	100	g

Table D-1  
Tier 1 Avian Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran

Field ID		Geometric Standard Deviation *	95% UCL (Student's-t) *	% of Detects	% of Non-Detects	Freshwater Trigger Value by Protection Level (% Species)				Alternative SW Screening Criteria	Reference
Location Code											
Date											
Chemical	Unit					99%	95%	90%	80%		
Phenols (non-halogenated) EPAVic	µg/L	1.4	2.945062797	5%	95%	NC	NC	NC	NC		
Bis(2-ethylhexyl) phthalate	µg/L	1.2	5.939872567	5%	95%	NC	NC	NC	NC		
Gross Beta Activity -K40	Bq/L	2.0	3.577073087	79%	21%	NC	NC	NC	NC	0.5	
Gross alpha activity	Bq/L	1.6	8.698436199	100%	0%	NC	NC	NC	NC	0.5	d
Radium-226	Bq/L	1.7	2.335878988	100%	0%	NC	NC	NC	NC	5	a
Radium-228	Bq/L	1.7	0.877191829	100%	0%	NC	NC	NC	NC	2	a
C6-C9 Fraction	µg/L	1.4	80.0164823	96%	4%	NC	NC	NC	NC		
C10-C14 Fraction	µg/L	19.8	268481.6579	97%	3%	NC	NC	NC	NC		
C15-C28 Fraction	µg/L	10.2	58639.3823	94%	6%	NC	NC	NC	NC		
C29-C36 Fraction	µg/L	11.6	5799.695657	39%	61%	NC	NC	NC	NC		
C6-C10 (F1 minus BTEX)	µg/L	1.4	72.67450952	96%	4%	NC	NC	NC	NC	500	f
>C10-C16 Fraction (F2)	µg/L	17.5	317938.0654	97%	3%	NC	NC	NC	NC		
>C10-C16 Fraction (F2 minus Naphthalene)	µg/L	17.5	317937.8003	97%	3%	NC	NC	NC	NC	500	f
>C16-C34 Fraction (F3)	µg/L	6.9	9112.245251	85%	15%	NC	NC	NC	NC	640	f
>C34-C40 Fraction (F4)	µg/L	8.2	5583.647742	33%	67%	NC	NC	NC	NC	NC	

**Table D-1  
Tier 1 Avian Screening Assessment  
Beetaloo Flowback Water Assessment  
Tamboran**

<b>Notes</b>	
BLANK CELL	Information not available
FRACTION	T - Total
	D - Dissolved
	N - Null
SAMPLE TYPE	N - Normal Grab Sample
	TB - Trip Blank
	NST - No Sample Taken
	FD - Field Duplicate
WORKORDER (Empty)	Field measurement only

< less than limit of reporting  
 °C = degrees Celsius  
 µg/L = micrograms per liter  
 µS/cm = microsiemen per centimetre  
 Bq/L = becquerel per litre  
 BTEX = benzene, toluene, ethylbenzene, xylene  
 CaCO3 = calcium carbonate  
 LOR = limit of reporting  
 meq/L = milliequivalents per litre  
 mg/L = milligrams per litre

NC = no criteria  
 PAH = polycyclic aromatic hydrocarbons  
 SO4 2- = sulfate  
 TEQ = toxic equivalence quotient  
 USEPA = United States Environmental Protection Agency

<b>WATER QUALITY SCREENING CRITERIA EXCEEDANCE KEY</b>
Results underlined exceeds Freshwater Trigger Value 80%
Results in <i>italic</i> exceeds Freshwater Trigger Value 90%
Results shaded exceeds Freshwater Trigger Value 95%
Results in <b>bold red</b> exceeds Freshwater Trigger Value 99%
<b>Bold Green</b> exceeds alternative screening criterion

<b>ALTERNATIVE WATER SCREENING CRITERIA NOTES</b>
NC - No appropriate screening criterion
1 - API Publication 4709 September 2001. Frequently Asked Questions About TPH Analytical Methods for Crude Oil
a - Major ions of concern for livestock drinking water quality - <a href="https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf">https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf</a>
b - Default trigger values for physical and chemical stressors for Tropical Australia for slightly disturbed ecosystems (Table 3.3.4). FW Lakes and Reservoirs. <a href="https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf">https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf</a>
c - Chronic aquatic life water quality criterion from Hohreiter DW1, Rigg DK. Derivation of ambient water quality criteria for formaldehyde. Chemosphere. 2001. Chemosphere. Nov;45(4-5):471-86. <a href="https://www.ncbi.nlm.nih.gov/pubmed/11680743">https://www.ncbi.nlm.nih.gov/pubmed/11680743</a>
d - Trigger values for radioactive contaminants for irrigation water. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. <a href="https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf">https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf</a>
e - Australian and New Zealand Guidelines for Fresh and Marine Water Quality Screening Benchmarks (October 2000) from (From Oak Ridge National Laboratory - Risk Assessment Information System) <a href="https://rais.ornl.gov/tools/eco_search.php">https://rais.ornl.gov/tools/eco_search.php</a>
with Contaminated Soil and Groundwater. California Regional Water Quality Control Board. INTERIM FINAL - November 2007. Table F4-b, Freshwater Criterion Region 2 Basin Plan
g - Guidelines for chemical compounds in water found to cause tainting of fish flesh and other aquatic organisms - <a href="https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf">https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf</a>
h - Freshwater trigger value with unknown level of species protection.
i - Default short-term trigger value for irrigation (Table 4.2.10). <a href="https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf">https://www.waterquality.gov.au/sites/default/files/documents/anzecc-armcanz-2000-guidelines-vol1.pdf</a>
j - USEPA Region 4 Chronic Freshwater Value (March 2018) (From Oak Ridge National Laboratory - Risk Assessment Information System) <a href="https://rais.ornl.gov/tools/eco_search.php">https://rais.ornl.gov/tools/eco_search.php</a>
k - USEPA Region 6 Chronic Freshwater Value (August 2020) (From Oak Ridge National Laboratory - Risk Assessment Information System) <a href="https://rais.ornl.gov/tools/eco_search.php">https://rais.ornl.gov/tools/eco_search.php</a>
l - USEPA Region 3 Freshwater BTAG (2015) (From Oak Ridge National Laboratory - Risk Assessment Information System)
m - USEPA Region 5 RCRA Surface Water (2003) (From Oak Ridge National Laboratory - Risk Assessment Information System)
n - USEPA ESBs Final Chronic Value (2003) (From Oak Ridge National Laboratory - Risk Assessment Information System)

**Table D-2**  
**Avian Receptor Summary**  
**Beetaloo Flowback Water - Avian Risk Assessment**  
**Tamboran**

Common Name	Scientific Name	Body Mass								Drinking WIR (L/day) <sup>3,4</sup>
		Sex <sup>1</sup>	N	Mean (kg)	Standard Deviation (kg)	Min (kg)	Max (kg)	Location	Source ID <sup>2</sup>	Mean
Crested Pigeon	<i>Ocyphaps lophotes</i>	B	21	0.204	---	0.142	0.26	Australia	515a	0.020
Willie Wagtail	<i>Rhipidura leucophrys picata</i>	B	13	0.0201	---	0.0145	0.0255	Australia	518a	0.004
Peaceful Dove	<i>Geopelia placida</i>	B	38	0.0478	---	0.035	0.065	Australia	515a	0.008
Cattle Egret	<i>Bubulcus ibis</i>	M	27	0.372	---	0.296	0.46	FL, USA	1207	0.0304
Cattle Egret	<i>Bubulcus ibis</i>	F	59	0.36	---	0.27	0.512	FL, USA	1207	0.0298
Brown Honeyeater	<i>Lichmera indistincta</i>	M	37	0.0118	0.0015	0.009	0.015	Australia	517	0.0030
Brown Honeyeater	<i>Lichmera indistincta</i>	F	15	0.0106	0.0021	0.008	0.014	Australia	517	0.0028

**Notes:**

<sup>1</sup> Sex: M, Male; F, Female; B, Both

<sup>2</sup> Body mass statistics compiled in Dunning (2008); Original source documents based on Source ID in Dunning (2008) include: Dunning, J. 2008. CRC Handbook of Avian Body Masses 2nd Edition. CRC Press; 2 edition Boca Raton : CRC Press, [2008].

515a. Higgins, P.J. and S.J.J.F. Davies. 1996. *Handbook of Australian, New Zealand and Antarctic birds*. Oxford University Press, Melbourne, Australia. Volume 3.

518a. Higgins, P.J. , J.M. Peter, and S.J. Cowling. 2006. *Handbook of Australian, New Zealand and Antarctic birds*. Oxford University Press, Melbourne, Australia. Volume 7.

1207. Telfair, R.C. 1994. *Cattle Egret (Bubulcus ibis) In The Birds of North America*. A. Poole and F. Gill (editors). The Birds of North America, Inc , Philadelphia, PA, and The American Ornithologists' Union, Washington, DC. Number 113.

517. Higgins, P.J., J.M. Peter, and W.K. Steele. 2001. *Handbook of Australian, New Zealand and Antarctic birds*. Oxford University Press, Melbourne, Australia. Volume 5.

<sup>3</sup> Drinking WIR based on the allometric relationship developed by Calder and Braun (1983). *Scaling of osmotic regulation in mammals and birds*. Am J Physiol. 1983 May;244(5): R601-6., where WIR (L/day) = 0.059 x BW (Kg)<sup>0.67</sup>

<sup>4</sup> Proposed WIR shown in bold, estimated based on the arithmetic mean of female or combined body mass; WIR may be estimated based on other body mass statistics depending on the appropriate exposure scenario.

--- = no data

BW = body weight

N = number

kg = kilogram

L = litre

WIR = water ingestion rate

**Table D-3  
Crested Pigeon  
Beetaloo Flowback Water - Avian Risk Assessment  
Tamboran**

Constituent Name	CAS No.	Mammal NOAEL (mg/kg-day)	Mammal NOAEL		Avian NOAEL <sup>1</sup> (mg/kg-day)	Avian NOAEL		Avian Receptor		
			Test Animal			Test Animal		Crested Pigeon		
			Animal	Body Weight (kg)		Animal	Body Weight (kg)	Body Weight (kg)	Derived TRV	
Mercury (ECHA)	7439-97-6	0.312	Rat	0.35	0.18	Mallard Duck	1.58	0.204	3.0E-01	
Molybdenum (ECHA)	7439-98-7	4	Rat	0.35	0.35	Chicken	1.5	0.204	5.8E-01	
Aluminium (ECHA - as aluminium citrate)	7429-90-5	200	Rat	0.35	NA	NA	NA	0.204	2.3E+02	
Arsenic (ECHA)	7440-38-2	NA	NA	NA	2.24	Mallard Duck	1.58	a	0.204	3.74E+00
Barium	7440-39-3	45	Rat	0.35	NA	NA	NA	0.204	5.2E+01	
Boron	7440-42-8	10.3	Rat	0.35	29	Mallard Duck	1.58	0.204	4.8E+01	
Cobalt	7440-48-4	3	Rat	0.35	7.61	Chicken	0.770	b	0.204	1.1E+01
Chromium (ECHA - as chromium III)	7440-47-3	1368.0	Rat	0.35	NA	NA	NA	0.204	1.6E+03	
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	4.2	Mouse	0.012	NA	NA	NA	0.204	2.1E+00	
Silver	7440-22-4	30	Rat	0.35	NA	NA	NA	0.204	3.4E+01	
Ammonia (ECHA - Ammonia anhydrous)	7664-41-7	250	Rat	0.35	NA	NA	NA	0.204	2.9E+02	
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	1000	Rat	0.35	NA	NA	NA	0.204	1.1E+03	
Nickel	7440-02-0	5	Rat	0.35	NA	NA	NA	0.204	5.7E+00	
Nitrogen (Total)	7727-37-9	6.7	Rat	0.35	NA	NA	NA	0.204	7.7E+00	
Vanadium	7440-62-2	0.21	Rat	0.35	11.38	Mallard Duck	1.58	0.204	1.9E+01	
Zinc	7440-66-6	13	Rat	0.35	15	White Leghorn Hen	1.766	0.204	2.6E+01	
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized)	93763-35-0	750	Rat	0.35	NA	NA	NA	0.204	8.6E+02	
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	50	Rat	0.35	NA	NA	NA	0.204	5.7E+01	

**Notes:**

<sup>1</sup> - If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.

a -Oak Ridge National Laboratory. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Risk Assessment Program Health Sciences Research Division Oak Ridge, Tennessee 37831

b- USEPA Ecological Screening Levels for Cobalt. Interim Final OSWER Directive 9285.7-67 [https://www.epa.gov/sites/default/files/2015-09/documents/eco-ssl\\_cobalt\\_.pdf](https://www.epa.gov/sites/default/files/2015-09/documents/eco-ssl_cobalt_.pdf)

ADWG = Australian Drinking Water Guidelines

CAS = Chemical Abstracts Service

ECHA = European Chemical Agency

kg = kilogram

mg = milligram

NA = not applicable

ND = no data available

NOAEL = No observed adverse effect level

NOAELtest = No observed adverse effect level test animal - mg/kg/day

TRV = toxicity reference value

$$Derived\ TRV = NOAEL_{test} * \left( \frac{Body\ Weight_{test}}{Body\ Weight_{Avian}} \right)^{1/4}$$

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	L/day	0.020	Table B-1
	EF <sub>shortterm</sub>	Exposure frequency	day/yr	21	BPJ
	EF <sub>longterm</sub>	Exposure frequency	day/yr	365	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.204	Table B-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

**Notes:**

a/ Units:

L/day = litres per day

day/yr = days per year

yr = year

kg = kilogram

b/ Source:

BPJ = Best Professional Judgement

**Table D-3  
Crested Pigeon  
Beetaloo Flowback Water - Avian Risk Assessment  
Tamboran**

Constituent Name	CAS No.	EPC <sup>1</sup> Average CW (mg/L)	Toxicity TRVs	Short-Term Storage (21 days)		Long-Term Storage (1 year)	
				Total Intake (mg/kg/day)	Hazard Quotient	Total Intake (mg/kg/day)	Hazard Quotient
				Ingestion		Ingestion	
Mercury (ECHA)	7439-97-6	0.00070	3.00E-01	4.0E-06	1.3E-05	6.98E-05	2.3E-04
Molybdenum (ECHA)	7439-98-7	0.087	5.76E-01	5.0E-04	8.7E-04	8.67E-03	1.5E-02
Aluminium (ECHA - as aluminium citrate)	7429-90-5	0.2540	2.29E+02	1.5E-03	6.4E-06	2.53E-02	1.1E-04
Arsenic (ECHA)	7440-38-2	0.0174	3.74E+00	1.0E-04	2.7E-05	1.73E-03	4.6E-04
Barium	7440-39-3	22.74	5.15E+01	1.3E-01	2.5E-03	2.27E+00	4.4E-02
Boron	7440-42-8	18.6000	4.80E+01	1.1E-01	2.2E-03	1.85E+00	3.9E-02
Cobalt	7440-48-4	0.00320	1.06E+01	1.8E-05	1.7E-06	3.19E-04	3.0E-05
Chromium (ECHA - as chromium III)	7440-47-3	0.10	1.57E+03	5.8E-04	3.7E-07	1.01E-02	6.4E-06
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	0.02	2.07E+00	1.3E-04	6.4E-05	2.29E-03	1.1E-03
Silver	7440-22-4	0.002	3.43E+01	9.2E-06	2.7E-07	1.60E-04	4.6E-06
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	15.120	2.86E+02	8.7E-02	3.0E-04	1.51E+00	5.3E-03
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	2.370	1.14E+03	1.4E-02	1.2E-05	2.36E-01	2.1E-04
Nickel	7440-02-0	0.019	5.72E+00	1.1E-04	1.9E-05	1.89E-03	3.3E-04
Nitrogen (Total)	7727-37-9	43.720	7.67E+00	2.5E-01	3.3E-02	4.36E+00	5.7E-01
Vanadium	7440-62-2	0.016	1.90E+01	9.2E-05	4.8E-06	1.60E-03	8.4E-05
Zinc	7440-66-6	0.061	2.57E+01	3.5E-04	1.4E-05	6.08E-03	2.4E-04
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized)	93763-35-0	188.468	8.58E+02	1.1E+00	1.3E-03	1.88E+01	2.2E-02
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	5.890	5.72E+01	3.4E-02	5.9E-04	5.87E-01	1.0E-02
				<b>Cumulative:</b>	<b>4E-02</b>	<b>Cumulative:</b>	<b>7E-01</b>

**Notes:**

ADWG = Australian Drinking Water Guidelines  
 BW = body weight  
 CAS = Chemical Abstracts Service  
 CW = concentration in water  
 ECHA = European Chemical Agency  
 ED = exposure duration  
 EF = exposure frequency  
 EPC = exposure point concentration  
 IR = ingestion rate  
 mg/kg/day = milligrams per kilograms per day  
 mg/L = milligrams per litre  
 NA = not available/applicable  
 TRV = toxicity reference value  
 1 - EPC is average concentration presented in Attachment A. If constituent was not detected, 1/2 the detection limit was used to calculate the average.

$$Total\ Intake = \frac{EPC \times IR \times EF \times ED}{BW \times ED \times 365 \frac{days}{year}}$$

$$Hazard\ Quotient = \frac{Total\ Intake \left( \frac{mg}{kg \cdot day} \right)}{TRV \left( \frac{mg}{kg \cdot day} \right)}$$

**Table D-4**  
**Willie Wagtail**  
**Beetaloo Flowback Water - Avian Risk Assessment**  
**Tamboran**

Constituent Name	CAS No.	Mammal NOAEL (mg/kg-day)	Mammal NOAEL		Avian NOAEL <sup>1</sup> (mg/kg-day)	Avian NOAEL		Avian Receptor	
			Test Animal			Test Animal		Willie Wagtail	
			Animal	Body Weight (kg)		Animal	Body Weight (kg)	Body Weight (kg)	Derived TRV
Mercury (ECHA)	7439-97-6	0.312	Rat	0.35	0.18	Mallard Duck	2	0.0201	5.36E-01
Molybdenum (ECHA)	7439-98-7	4.246	Rat	0.35	0.35	Chicken	2	0.0201	1.03E+00
Aluminium (ECHA - as aluminium citrate)	7429-90-5	200	Rat	0.35	NA	NA	NA	0.0201	4.09E+02
Arsenic (ECHA)	7440-38-2	NA	NA	NA	2.24	Mallard Duck	2	0.0201	6.67E+00
Barium	7440-39-3	45	Rat	0.35	NA	NA	NA	0.0201	9.19E+01
Boron	7440-42-8	10.3	Rat	0.35	29	Mallard Duck	2	0.0201	8.58E+01
Cobalt	7440-48-4	3	Rat	0.35	7.61	Chicken	1	0.0201	1.89E+01
Chromium (ECHA - as chromium III)	7440-47-3	1368	Rat	0.35	NA	NA	NA	0.0201	2.79E+03
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	4.2	Mouse	0.012	NA	NA	NA	0.0201	3.69E+00
Silver	7440-22-4	30	Rat	0.35	NA	NA	NA	0.0201	6.13E+01
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	250	Rat	0.35	NA	NA	NA	0.0201	5.11E+02
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	1000	Rat	0.35	NA	NA	NA	0.0201	2.04E+03
Nickel	7440-02-0	5.00	Rat	0.35	NA	NA	NA	0.0201	1.02E+01
Nitrogen (Total)	7727-37-9	6.7	Rat	0.35	NA	NA	NA	0.0201	1.37E+01
Vanadium	7440-62-2	0.21	Rat	0.35	11.38	Mallard Duck	1.58	0.0201	3.39E+01
Zinc	7440-66-6	13	Rat	0.35	15	White Leghorn Hen	2	0.0201	4.59E+01
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized)	93763-35-0	750	Rat	0.35	NA	NA	NA	0.0201	1.53E+03
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	50	Rat	0.35	NA	NA	NA	0.0201	1.02E+02

**Notes:**

ADWG = Australian Drinking Water Guidelines

CAS = Chemical Abstracts Service

ECHA = European Chemical Agency

kg = kilogram

mg = milligram

NA = not applicable

NOAEL = No observed adverse effect level

NOAEL<sub>test</sub> = No observed adverse effect level test animal

TRV = toxicity reference value

1/ If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.

$$Derived\ TRV = NOAEL_{test} * \left( \frac{Body\ Weight_{test}}{Body\ Weight_{Avian}} \right)^{(1/4)}$$

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	L/day	0.004	Table B-1
	EF <sub>shortterm</sub>	Exposure frequency	day/yr	21	BPJ
	EF <sub>longterm</sub>	Exposure frequency	day/yr	365	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.0201	Table B-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

**Notes:**

a/ Units:

L/day = litres per day

day/yr = days per year

yr = year

kg = kilogram

b/ Source:

BPJ = Best Professional Judgement

**Table D-4**  
**Willie Wagtail**  
**Beetaloo Flowback Water - Avian Risk Assessment**  
**Tamboran**

Constituent Name	CAS No.	EPC <sup>1</sup>	Toxicity	Short-Term Storage (21 days)		Long-Term Storage (1 year)	
				Total Intake (mg/kg/day)	Hazard Quotient	Total Intake (mg/kg/day)	Hazard Quotient
					Ingestion		Ingestion
Mercury (ECHA)	7439-97-6	0.00070	5.36E-01	8.6E-06	1.6E-05	1.5E-04	2.8E-04
Molybdenum (ECHA)	7439-98-7	0.087	1.03E+00	1.1E-03	1.0E-03	1.9E-02	1.8E-02
Aluminium (ECHA - as aluminium citrate)	7429-90-5	0.2540	4.09E+02	3.1E-03	7.7E-06	5.4E-02	1.3E-04
Arsenic (ECHA)	7440-38-2	0.0174	6.67E+00	2.1E-04	3.2E-05	3.7E-03	5.6E-04
Barium	7440-39-3	22.74	9.19E+01	2.8E-01	3.0E-03	4.9E+00	5.3E-02
Boron	7440-42-8	18.6000	8.58E+01	2.3E-01	2.7E-03	4.0E+00	4.6E-02
Cobalt	7440-48-4	0.00320	1.89E+01	3.9E-05	2.1E-06	6.9E-04	3.6E-05
Chromium (ECHA - as chromium III)	7440-47-3	0.10	2.79E+03	1.2E-03	4.5E-07	2.2E-02	7.7E-06
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	0.02	3.69E+00	2.8E-04	7.7E-05	4.9E-03	1.3E-03
Silver	7440-22-4	0.002	6.13E+01	2.0E-05	3.2E-07	3.4E-04	5.6E-06
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	15.120	5.11E+02	1.9E-01	3.6E-04	3.2E+00	6.3E-03
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	2.370	2.04E+03	2.9E-02	1.4E-05	5.1E-01	2.5E-04
Nickel	7440-02-0	0.019	1.02E+01	2.3E-04	2.3E-05	4.1E-03	4.0E-04
Nitrogen (Total)	7727-37-9	43.720	1.37E+01	5.4E-01	3.9E-02	9.4E+00	6.8E-01
Vanadium	7440-62-2	0.016	3.39E+01	2.0E-04	5.8E-06	3.4E-03	1.0E-04
Zinc	7440-66-6	0.061	4.59E+01	7.5E-04	1.6E-05	1.3E-02	2.8E-04
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized)	93763-35-0	188.468	1.53E+03	2.3E+00	1.5E-03	4.0E+01	2.6E-02
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	5.890	1.02E+02	7.3E-02	7.1E-04	1.3E+00	1.2E-02
<b>Cumulative:</b>				<b>5E-02</b>	<b>Cumulative:</b>	<b>9E-01</b>	

**Notes:**

- ADWG = Australian Drinking Water Guidelines
- BW = body weight
- CAS = Chemical Abstracts Service
- CW = concentration in water
- ECHA = European Chemical Agency
- ED = exposure duration
- EF = exposure frequency
- EPC = exposure point concentration
- IR = ingestion rate
- mg/kg/day = milligrams per kilograms per day
- mg/L = milligrams per litre
- TRV = toxicity reference value
- 1 - EPC is average concentration presented in Attachment A. If constituent was not detected, 1/2 the detection limit was used to calculate the average.

$$Total\ Intake = \frac{EPC \times IR \times EF \times ED}{BW \times ED \times 365 \frac{days}{year}}$$

$$Hazard\ Quotient = \frac{Total\ Intake \left( \frac{mg}{kg - day} \right)}{TRV \left( \frac{mg}{kg - day} \right)}$$

**Table D-5**  
**Peaceful Dove**  
**Beetaloo Flowback Water - Avian Risk Assessment**  
**Tamboran**

Constituent Name	CAS No.	Mammal NOAEL (mg/kg-day)	Mammal NOAEL		Avian NOAEL <sup>1</sup> (mg/kg-day)	Avian NOAEL		Avian Receptor	
			Test Animal			Test Animal		Peaceful Dove	
			Animal	Body Weight (kg)		Animal	Body Weight (kg)	Body Weight (kg)	Derived TRV
Mercury (ECHA)	7439-97-6	0.312	Rat	0.35	0.18	Mallard Duck	1.58	0.0478	4.32E-01
Molybdenum (ECHA)	7439-98-7	4	Rat	0.35	0.35	Chicken	1.5	0.0478	8.28E-01
Aluminium (ECHA - as aluminium citrate)	7429-90-5	200	Rat	0.35	NA	NA	NA	0.0478	3.29E+02
Arsenic (ECHA)	7440-38-2	NA	NA	NA	2.24	Mallard Duck	1.58	0.0478	5.37E+00
Barium	7440-39-3	45	Rat	0.35	NA	NA	NA	0.0478	7.40E+01
Boron	7440-42-8	10.3	Rat	0.35	29	Mallard Duck	1.580	0.0478	6.91E+01
Cobalt	7440-48-4	3	Rat	0.35	8	Chicken	1	0.0478	1.52E+01
Chromium (ECHA - as chromium III)	7440-47-3	1368	Rat	0.35	NA	NA	NA	0.0478	2.25E+03
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	4	Mouse	0.012	NA	NA	NA	0.0478	2.97E+00
Silver	7440-22-4	30	Rat	0.35	NA	NA	NA	0.0478	4.93E+01
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	250	Rat	0.35	NA	NA	NA	0.0478	4.11E+02
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	1000	Rat	0.35	NA	NA	NA	0.0478	1.64E+03
Nickel	7440-02-0	5	Rat	0.35	NA	NA	NA	0.0478	8.22E+00
Nitrogen (Total)	7727-37-9	7	Rat	0.35	NA	NA	NA	0.0478	1.10E+01
Vanadium	7440-62-2	0.21	Rat	0.35	11.38	Mallard Duck	1.58	0.0478	2.73E+01
Zinc	7440-66-6	13	Rat	0.35	15	White Leghorn Hen	2	0.0478	3.70E+01
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized)	93763-35-0	750	Rat	0.35	NA	NA	NA	0.0478	1.23E+03
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	50	Rat	0.35	NA	NA	NA	0.0478	8.22E+01

**Notes:**

ADWG = Australian Drinking Water Guidelines

CAS = Chemical Abstracts Service

ECHA = European Chemical Agency

kg = kilogram

mg = milligram

NA = not applicable

NOAEL = No observed adverse effect level

NOAELt = No observed adverse effect level test animal

TRV = toxicity reference value

1/ If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.

$$Derived\ TRV = NOAEL_{test} * \left( \frac{Body\ Weight_{test}}{Body\ Weight_{Avian}} \right)^{1/4}$$

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	L/day	0.008	Table B-1
	EF <sub>shortterm</sub>	Exposure frequency	day/yr	21	BPJ
	EF <sub>longterm</sub>	Exposure frequency	day/yr	365	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.0478	Table B-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

**Notes:**

a/ Units:

L/day = litres per day

day/yr = days per year

yr = year

kg = kilogram

b/ Source:

BPJ = Best Professional Judgement

**Table D-5**  
**Peaceful Dove**  
**Beetaloo Flowback Water - Avian Risk Assessment**  
**Tamboran**

Constituent Name	CAS No.	EPC <sup>1</sup>	Toxicity	Short-Term Storage (21 days)		Long-Term Storage (1 year)	
				Total Intake (mg/kg/day)	Hazard Quotient	Total Intake (mg/kg/day)	Hazard Quotient
					Ingestion		Ingestion
		CW (mg/L)	TRVs				
Mercury (ECHA)	7439-97-6	0.00070	4.32E-01	6.5E-06	1.5E-05	1.1E-04	2.6E-04
Molybdenum (ECHA)	7439-98-7	0.087	8.28E-01	8.1E-04	9.7E-04	1.4E-02	1.7E-02
Aluminium (ECHA - as aluminium citrate)	7429-90-5	0.2540	3.29E+02	2.4E-03	7.1E-06	4.1E-02	1.2E-04
Arsenic (ECHA)	7440-38-2	0.0174	5.37E+00	1.6E-04	3.0E-05	2.8E-03	5.2E-04
Barium	7440-39-3	22.74	7.40E+01	2.1E-01	2.8E-03	3.7E+00	4.9E-02
Boron	7440-42-8	18.6000	6.91E+01	1.7E-01	2.5E-03	3.0E+00	4.3E-02
Cobalt	7440-48-4	0.00320	1.52E+01	3.0E-05	1.9E-06	5.1E-04	3.4E-05
Chromium (ECHA - as chromium III)	7440-47-3	0.10	2.25E+03	9.4E-04	4.2E-07	1.6E-02	7.2E-06
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	0.02	2.97E+00	2.1E-04	7.2E-05	3.7E-03	1.2E-03
Silver	7440-22-4	0.002	4.93E+01	1.5E-05	3.0E-07	2.6E-04	5.2E-06
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	15.120	4.11E+02	1.4E-01	3.4E-04	2.4E+00	5.9E-03
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	2.370	1.64E+03	2.2E-02	1.3E-05	3.8E-01	2.3E-04
Nickel	7440-02-0	0.019	8.22E+00	1.8E-04	2.1E-05	3.1E-03	3.7E-04
Nitrogen (Total)	7727-37-9	43.720	1.10E+01	4.0E-01	3.7E-02	7.0E+00	6.4E-01
Vanadium	7440-62-2	0.016	2.73E+01	1.5E-04	5.4E-06	2.6E-03	9.4E-05
Zinc	7440-66-6	0.061	3.70E+01	5.6E-04	1.5E-05	9.8E-03	2.7E-04
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized)	93763-35-0	188.468	1.23E+03	1.7E+00	1.4E-03	3.0E+01	2.5E-02
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	5.890	8.22E+01	5.5E-02	6.6E-04	9.5E-01	1.2E-02
				<b>Cumulative:</b>	<b>5E-02</b>	<b>Cumulative:</b>	<b>8E-01</b>

**Notes:**

- ADWG = Australian Drinking Water Guidelines
- BW = body weight
- CAS = Chemical Abstracts Service
- CW = concentration in water
- ECHA = European Chemical Agency
- ED = exposure duration
- EF = exposure frequency
- EPC = exposure point concentration
- IR = ingestion rate
- mg/kg/day = milligrams per kilograms per day
- mg/L = milligrams per litre
- NA = not available/applicable
- TRV = toxicity reference value
- 1 - EPC is average concentration presented in Attachment A. If constituent was not detected, 1/2 the detection limit was used to calculate the average.

$$Total\ Intake = \frac{EPC \times IR \times EF \times ED}{BW \times ED \times 365\ days/year}$$

$$Hazard\ Quotient = \frac{Total\ Intake \left(\frac{mg}{kg - day}\right)}{TRV \left(\frac{mg}{kg - day}\right)}$$

**Table D-6  
Cattle Egret  
Beetaloo Flowback Water - Avian Risk Assessment  
Tamboran**

Constituent Name	CAS No.	Mammal NOAEL (mg/kg-day)	Mammal NOAEL		Avian NOAEL <sup>1</sup> (mg/kg-day)	Avian NOAEL		Avian Receptor	
			Test Animal			Test Animal		Cattle Egret	
			Animal	Body Weight (kg)		Animal	Body Weight (kg)	Body Weight (kg)	Derived TRV
Mercury (ECHA)	7439-97-6	0.312	Rat	0.35	0.18	Mallard Duck	1.58	0.36	2.61E-01
Molybdenum (ECHA)	7439-98-7	4	Rat	0.35	0.35	Chicken	1.5	0.36	5.00E-01
Aluminium (ECHA - as aluminium citrate)	7429-90-5	200	Rat	0.35	NA	NA	NA	0.36	1.99E+02
Arsenic (ECHA)	7440-38-2	NA	NA	NA	2.2	Mallard Duck	1.58	0.36	3.24E+00
Barium	7440-39-3	45	Rat	0.35	NA	NA	NA	0.36	4.47E+01
Boron	7440-42-8	10.3	Rat	0.35	28.8	Mallard Duck	1.58	0.36	4.17E+01
Cobalt	7440-48-4	3	Rat	0.35	7.6	Chicken	0.77	0.36	9.20E+00
Chromium (ECHA - as chromium III)	7440-47-3	1368	Rat	0.35	NA	NA	NA	0.36	1.36E+03
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	4	Mouse	0.012	NA	NA	NA	0.36	1.79E+00
Silver	7440-22-4	30	Rat	0.35	NA	NA	NA	0.36	2.98E+01
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	250	Rat	0.35	NA	NA	NA	0.36	2.48E+02
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	1000	Rat	0.35	NA	NA	NA	0.36	9.93E+02
Nickel	7440-02-0	5	Rat	0.35	NA	NA	NA	0.36	4.96E+00
Nitrogen (Total)	7727-37-9	7	Rat	0.35	NA	NA	NA	0.36	6.65E+00
Vanadium	7440-62-2	0.21	Rat	0.35	11.38	Mallard Duck	1.58	0.36	1.65E+01
Zinc	7440-66-6	13	Rat	0.35	15	White Leghorn Her	1.766	0.36	2.23E+01
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized)	93763-35-0	750	Rat	0.35	NA	NA	NA	0.36	7.45E+02
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	50	Rat	0.35	NA	NA	NA	0.36	4.96E+01

**Notes:**

ADWG = Australian Drinking Water Guidelines

CAS = Chemical Abstracts Service

ECHA = European Chemical Agency

kg = kilogram

mg = milligram

NA = not applicable

NOAEL = No observed adverse effect level

NOAEL<sub>test</sub> = No observed adverse effect level test animal

TRV = toxicity reference value

1/ If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.

$$Derived\ TRV = NOAEL_{test} * \left( \frac{Body\ Weight_{test}}{Body\ Weight_{Avian}} \right)^{(1/4)}$$

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	L/day	0.0298	Table B-1
	EF <sub>shortterm</sub>	Exposure frequency	day/yr	21	BPJ
	EF <sub>longterm</sub>	Exposure frequency	day/yr	365	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.36	Table B-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

**Notes:**

a/ Units:

L/day = litres per day

day/yr = days per year

yr = year

kg = kilogram

b/ Source:

BPJ = Best Professional Judgement

**Table D-6  
Cattle Egret  
Beetaloo Flowback Water - Avian Risk Assessment  
Tamboran**

Constituent Name	CAS No.	EPC <sup>1</sup>	Toxicity	Short-Term Storage (21 days)		Long-Term Storage (1 year)	
				Total Intake (mg/kg/day)	Hazard Quotient	Total Intake (mg/kg/day)	Hazard Quotient
					Ingestion		Ingestion
		CW (mg/L)	TRVs				
Mercury (ECHA)	7439-97-6	0.00070	2.61E-01	3.3E-06	1.3E-05	5.8E-05	2.2E-04
Molybdenum (ECHA)	7439-98-7	0.087	5.00E-01	4.1E-04	8.3E-04	7.2E-03	1.4E-02
Aluminium (ECHA - as aluminium citrate)	7429-90-5	0.2540	1.99E+02	1.2E-03	6.1E-06	2.1E-02	1.1E-04
Arsenic (ECHA)	7440-38-2	0.0174	3.24E+00	8.3E-05	2.6E-05	1.4E-03	4.4E-04
Barium	7440-39-3	22.74	4.47E+01	1.1E-01	2.4E-03	1.9E+00	4.2E-02
Boron	7440-42-8	18.6000	4.17E+01	8.8E-02	2.1E-03	1.5E+00	3.7E-02
Cobalt	7440-48-4	0.00320	9.20E+00	1.5E-05	1.7E-06	2.6E-04	2.9E-05
Chromium (ECHA - as chromium III)	7440-47-3	0.10	1.36E+03	4.8E-04	3.5E-07	8.3E-03	6.1E-06
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	0.02	1.79E+00	1.1E-04	6.1E-05	1.9E-03	1.1E-03
Silver	7440-22-4	0.002	2.98E+01	7.6E-06	2.6E-07	1.3E-04	4.4E-06
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	15.120	2.48E+02	7.2E-02	2.9E-04	1.2E+00	5.0E-03
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	2.370	9.93E+02	1.1E-02	1.1E-05	2.0E-01	2.0E-04
Nickel	7440-02-0	0.019	4.96E+00	9.0E-05	1.8E-05	1.6E-03	3.2E-04
Nitrogen (Total)	7727-37-9	43.720	6.65E+00	2.1E-01	3.1E-02	3.6E+00	5.4E-01
Vanadium	7440-62-2	0.016	1.65E+01	7.6E-05	4.6E-06	1.3E-03	8.0E-05
Zinc	7440-66-6	0.061	2.23E+01	2.9E-04	1.3E-05	5.0E-03	2.3E-04
>C10 - C16 Fraction minus Naphthalene (ECHA: Surrogate as hydrocarbons, C9-16, hydrotreated, dearomatized)	93763-35-0	188.468	7.45E+02	9.0E-01	1.2E-03	1.6E+01	2.1E-02
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocarbons, C18-C24, iso-alkanes <2% aromatics)	EC 940-734-7	5.890	4.96E+01	2.8E-02	5.6E-04	4.9E-01	9.8E-03
<b>Cumulative:</b>				<b>4E-02</b>	<b>Cumulative:</b>	<b>7E-01</b>	

**Notes:**

- ADWG = Australian Drinking Water Guidelines
- BW = body weight
- CAS = Chemical Abstracts Service
- CW = concentration in water
- ECHA = European Chemical Agency
- ED = exposure duration
- EF = exposure frequency
- EPC = exposure point concentration
- IR = ingestion rate
- mg/kg/day = milligrams per kilograms per day
- mg/L = milligrams per litre
- NA = not available/applicable
- TRV = toxicity reference value
- 1 - EPC is average concentration presented in Attachment A. If constituent was not detected, 1/2 the detection limit was used to calculate the average.

$$Total\ Intake = \frac{EPC \times IR \times EF \times ED}{BW \times ED \times 365 \frac{days}{year}}$$

$$Hazard\ Quotient = \frac{Total\ Intake \left( \frac{mg}{kg - day} \right)}{TRV \left( \frac{mg}{kg - day} \right)}$$

**Table D-7**  
**Brown Honeyeater**  
**Beetaloo Flowback Water - Avian Risk Assessment**  
**Tamboran**

Constituent Name	CAS No.	Mammal NOAEL (mg/kg-day)	Mammal NOAEL		Avian NOAEL <sup>1</sup> (mg/kg-day)	Avian NOAEL		Avian Receptor	
			Test Animal			Test Animal		Brown Honeyeater	
			Animal	Body Weight (kg)		Animal	Body Weight (kg)	Body Weight (kg)	Derived TRV
Mercury (ECHA)	7439-97-6	0.312	Rat	0.35	0.18	Mallard Duck	1.58	0.0106	6.3E-01
Molybdenum (ECHA)	7439-98-7	4	Rat	0.35	0.35	Chicken	1.5	0.0106	1.2E+00
Aluminium (ECHA - as aluminium citrate)	7429-90-5	200	Rat	0.35	NA	NA	NA	0.0106	4.8E+02
Arsenic (ECHA)	7440-38-2	NA	NA	NA	2.2	Mallard Duck	1.58	0.0106	7.8E+00
Barium	7440-39-3	45	Rat	0.35	NA	NA	NA	0.0106	1.1E+02
Boron	7440-42-8	10.3	Rat	0.35	28.8	Mallard Duck	1.58	0.0106	1.0E+02
Cobalt	7440-48-4	3	Rat	0.35	7.6	Chicken	0.77	0.0106	2.2E+01
Chromium (ECHA - as chromium III)	7440-47-3	1368	Rat	0.35	NA	NA	NA	0.0106	3.3E+03
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	4	Mouse	0.012	NA	NA	NA	0.0106	4.3E+00
Silver	7440-22-4	30	Rat	0.35	NA	NA	NA	0.0106	7.2E+01
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	250	Rat	0.35	NA	NA	NA	0.0106	6.0E+02
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	1000	Rat	0.35	NA	NA	NA	0.0106	2.4E+03
Nickel	7440-02-0	5	Rat	0.35	NA	NA	NA	0.0106	1.2E+01
Nitrogen (Total)	7727-37-9	7	Rat	0.35	NA	NA	NA	0.0106	1.6E+01
Vanadium	7440-62-2	0.21	Rat	0.35	11.38	Mallard Duck	1.58	0.0106	4.0E+01
Zinc	7440-66-6	13	Rat	0.35	15	White Leghorn Hen	1.766	0.0106	5.4E+01
>C10 - C16 Fraction minus Naphthalene (ECHA: Su)	93763-35-0	750	Rat	0.35	NA	NA	NA	0.0106	1.8E+03
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocar)	EC 940-734-7	50	Rat	0.35	NA	NA	NA	0.0106	1.2E+02

**Notes:**

ADWG = Australian Drinking Water Guidelines

CAS = Chemical Abstracts Service

ECHA = European Chemical Agency

kg = kilogram

mg = milligram

NA = not applicable

NOAEL = No observed adverse effect level

NOAELtest = No observed adverse effect level test animal

TRV = toxicity reference value

1/ If an avian NOAEL was not available, the mammal NOAEL was used to derive the TRV for the avian receptor.

2/ LOAEL for copper used.

$$Derived\ TRV = NOAEL_{test} * \left( \frac{Body\ Weight_{test}}{Body\ Weight_{Avian}} \right)^{(1/4)}$$

Exposure Route	Parameter Code	Parameter Definition	Units (a)	Parameter Value	Source (b)
Ingestion	IR	Ingestion rate	L/day	0.0028	Table B-1
	EF <sub>shortterm</sub>	Exposure frequency	day/yr	21	BPJ
	EF <sub>longterm</sub>	Exposure frequency	day/yr	365	BPJ
	ED	Exposure duration	yr	1	BPJ
	BW	Body weight	kg	0.0106	Table B-1
	AT-NC	Averaging time - noncancer	days	365	BPJ

**Notes:**

a/ Units:

L/day = litres per day

day/yr = days per year

yr = year

kg = kilogram

b/ Source:

BPJ = Best Professional Judgement

**Table D-7  
Brown Honeyeater  
Beetaloo Flowback Water - Avian Risk Assessment  
Tamboran**

Constituent Name	CAS No.	EPC <sup>1</sup>		Short-Term Storage (21 days)		Long-Term Storage (1 year)	
		CW (mg/L)	Toxicity TRVs	Total Intake (mg/kg/day)	Hazard Quotient	Total Intake (mg/kg/day)	Hazard Quotient
					Ingestion		Ingestion
Mercury (ECHA)	7439-97-6	0.00070	6.3E-01	1.1E-05	1.7E-05	1.9E-04	2.9E-04
Molybdenum (ECHA)	7439-98-7	0.087	1.2E+00	1.3E-03	1.1E-03	2.3E-02	1.9E-02
Aluminium (ECHA - as aluminium citrate)	7429-90-5	0.2540	4.8E+02	3.9E-03	8.1E-06	6.7E-02	1.4E-04
Arsenic (ECHA)	7440-38-2	0.0174	7.8E+00	2.6E-04	3.4E-05	4.6E-03	5.9E-04
Barium	7440-39-3	22.74	1.1E+02	3.5E-01	3.2E-03	6.0E+00	5.6E-02
Boron	7440-42-8	18.6000	1.0E+02	2.8E-01	2.8E-03	4.9E+00	4.9E-02
Cobalt	7440-48-4	0.00320	2.2E+01	4.9E-05	2.2E-06	8.5E-04	3.8E-05
Chromium (ECHA - as chromium III)	7440-47-3	0.10	3.3E+03	1.5E-03	4.7E-07	2.7E-02	8.1E-06
Copper (ECHA - copper sulphate pentahydrate)	7440-50-8	0.02	4.3E+00	3.5E-04	8.1E-05	6.1E-03	1.4E-03
Silver	7440-22-4	0.002	7.2E+01	7.2E-05	3.4E-07	4.2E-04	5.9E-06
Ammonia (ECHA - Ammonia, anhydrous)	7664-41-7	15.120	6.0E+02	2.3E-01	3.8E-04	4.0E+00	6.7E-03
Total Phosphorus as P (Organic Phosphate as P)	7723-14-0	2.370	2.4E+03	3.6E-02	1.5E-05	6.3E-01	2.6E-04
Nickel	7440-02-0	0.019	1.2E+01	2.9E-04	2.4E-05	5.0E-03	4.2E-04
Nitrogen (Total)	7727-37-9	43.720	1.6E+01	6.7E-01	4.1E-02	1.2E+01	7.2E-01
Vanadium	7440-62-2	0.016	4.0E+01	2.4E-04	6.1E-06	4.2E-03	1.1E-04
Zinc	7440-66-6	0.061	5.4E+01	9.3E-04	1.7E-05	1.6E-02	3.0E-04
>C10 - C16 Fraction minus Naphthalene (ECHA: Su)	93763-35-0	188.468	1.8E+03	2.9E+00	1.6E-03	5.0E+01	2.8E-02
>C16 - C34 Fraction F3 (ECHA: Surrogate hydrocar)	EC 940-734-7	5.890	1.2E+02	9.0E-02	7.5E-04	1.6E+00	1.3E-02
<b>Cumulative:</b>				<b>5E-02</b>	<b>Cumulative:</b>		<b>9E-01</b>

**Notes:**

- ADWG = Australian Drinking Water Guidelines
- BW = body weight
- CAS = Chemical Abstracts Service
- CW = concentration in water
- ECHA = European Chemical Agency
- ED = exposure duration
- EF = exposure frequency
- EPC = exposure point concentration
- IR = ingestion rate
- mg/kg/day = milligrams per kilograms per day
- mg/L = milligrams per litre
- NA = not available/applicable
- TRV = toxicity reference value

1 - EPC is average concentration presented in Attachment A. If constituent was not detected, 1/2 the detection limit was used to calculate the average.

$$Total\ Intake = \frac{EPC \times IR \times EF \times ED}{BW \times ED \times 365\ \frac{days}{year}}$$

$$Hazard\ Quotient = \frac{Total\ Intake\ \left(\frac{mg}{kg - day}\right)}{TRV\ \left(\frac{mg}{kg - day}\right)}$$



## Appendix E Terrestrial Risk Assessment

**Table E-1**  
**Summary of Terrestrial Tier 1 Screening Evaluation**  
**Beetaloo Flowback Water Assessment**  
**Tamboran**

Chemical	Unit	max	median	Maximum Detected Concentration in Water (mg/L)	Maximum Calculated Concentration in Soil (mg/kg)	Soil Screening Level (mg/kg)	Note	Maximum Concentration/ Soil Screening Level Ratio	Median Detected Concentration in Water (mg/L)	Median Calculated Concentration in Soil (mg/kg)*	Soil Screening Level (mg/kg)	Note	Median Concentration/ Soil Screening Level Ratio
>C10-C16 Fraction (F2 minus Naphthalene)	µg/L	2E+06	2040	1760	1.4E+02	120	1	1.20E+00	2.04	0.167901235	120	1	1.4E-03
>C10-C16 Fraction (F2)	µg/L	2E+06	2040	1760	1.4E+02	120	1	1.20E+00	2.04	0.167901235	120	1	1.4E-03
>C16-C34 Fraction (F3)	µg/L	41000	1010	41	3.4E+00	300	2	1.10E-02	1.01	0.083127572	300	2	2.8E-04
>C34-C40 Fraction (F4)	µg/L	40200	50	40.2	3.3E+00	2800	2	1.20E-03	0.05	0.004115226	2800	2	1.5E-06
3&4-Methylphenol (m&p-cresol)	µg/L	6	2	0.006	4.9E-04	0.08	17	6.20E-03	0.002	0.000164609	0.08	17	2.1E-03
Alkalinity (Bicarbonate as CaCO3)	mg/L	554	280	554	4.6E+01	NV		NA	280	23.04526749	NV		NA
Alkalinity (total) as CaCO3	mg/L	554	280	554	4.6E+01	NV		NA	280	23.04526749	NV		NA
Aluminium	mg/L	1.36	0.1	1.36	1.1E-01	NV		NA	0.1	0.008230453	NV		NA
Ammonia as N	mg/L	24.7	19.4	24.7	2.0E+00	NV		NA	19.4	1.596707819	NV		NA
Anions Total	meq/L	603	457	603	5.0E+01	NV		NA	457	37.61316872	NV		NA
Antimony	mg/L	<0.01	0.0014	<0.01	ND	0.27	3	NA	0.0014	0.000115226	0.27	3	4.3E-04
Arsenic	mg/L	0.107	0.0069	0.107	8.8E-03	40	4	2.20E-04	0.0069	0.000567901	40	4	1.4E-05
Barium	mg/L	52	21.7	52	4.3E+00	820	5	5.20E-03	21.7	1.78600823	820	5	2.2E-03
Benzene	µg/L	<5	0.5	<0.005	ND	0.12	17	NA	0.0005	4.11523E-05	0.12	17	3.4E-04
Beryllium	mg/L	<0.01	0.0002	<0.01	ND	NV		NA	0.0002	1.64609E-05	NV		NA
Bis(2-ethylhexyl) phthalate	µg/L	12	5	0.012	9.9E-04	0.02	3,5	4.90E-02	0.005	0.000411523	0.02	3,5	2.1E-02
Boron	mg/L	54	17.3	54	4.4E+00	5.7	6	7.80E-01	17.3	1.423868313	5.7	6	2.5E-01
Bromide	µg/L	459000	205000	459	3.8E+01	50	7	7.60E-01	205	16.87242798	50	7	3.4E-01
Bromine	µg/L	278000	168000	278	2.3E+01	10	18	2.30E+00	168	13.82716049	10	18	1.4E+00
Cadmium	mg/L	<0.001	0.0001	<0.001	ND	0.36	3	NA	0.0001	8.23045E-06	0.36	3	2.3E-05
Chloride	mg/L	21100	13300	21100	1.7E+03	NV		NA	13300	1094.650206	NV		NA
Chromium (III+VI)	mg/L	0.631	0.029	0.631	5.2E-02	100	8	5.20E-04	0.029	0.002386831	100	8	2.4E-05
Cobalt	mg/L	0.008	0.0028	0.008	6.6E-04	NV		NA	0.0028	0.000230453	NV		NA
Copper	mg/L	0.117	0.008	0.117	9.6E-03	20	9	4.80E-04	0.008	0.000658436	20	9	3.3E-05
Fluoride	mg/L	1.6	0.7	1.6	1.3E-01	120	5	1.10E-03	0.7	0.057613169	120	5	4.8E-04
Formaldehyde	mg/L	17.4	2.3	17.4	1.4E+00	NV		NA	2.3	0.189300412	NV		NA
Gross alpha activity	Bq/L	21	6.63	21	1.7E+00	NV		NA	6.63	0.545679012	NV		NA
Gross Beta Activity -K40	Bq/L	6.37	2.82	6.37	5.2E-01	NV		NA	2.82	0.232098765	NV		NA
Iron	mg/L	95.4	21.9	95.4	7.9E+00	19566	10	4.00E-04	21.9	1.802469136	19566	10	9.2E-05
Lead	mg/L	0.022	0.005	0.022	1.8E-03	470	16	3.90E-06	0.005	0.000411523	470	16	8.8E-07
Manganese	mg/L	10.1	0.969	10.1	8.3E-01	4300	11	1.90E-04	0.969	0.079753086	4300	11	1.9E-05
Mercury	mg/L	0.009	0.0002	0.009	7.4E-04	0.013	5,17,18	5.70E-02	0.0002	1.64609E-05	0.013	5,17,18	1.3E-03
Molybdenum	mg/L	0.46	0.011	0.46	3.8E-02	9.9	12	3.80E-03	0.011	0.00090535	9.9	12	9.1E-05
Naphthalene (VOC)	mg/L	0.008	0.0025	0.008	6.6E-04	10	1	6.60E-05	0.0025	0.000205761	10	1	2.1E-05
Nickel	mg/L	0.085	0.0069	0.085	7.0E-03	5	13	1.40E-03	0.0069	0.000567901	5	13	1.1E-04
Nitrate (as N)	mg/L	<0.1	0.02	<0.1	ND	NV		NA	0.02	0.001646091	NV		NA
Nitrite (as N)	mg/L	<0.1	0.01	<0.1	ND	NV		NA	0.01	0.000823045	NV		NA
PAHs (Sum of total)	µg/L	<23.8	0.25	<0.0238	ND	NV		NA	0.00025	2.05761E-05	NV		NA
Phenols (halogenated) EPAvic	µg/L	<10	2	<0.01	ND	NV		NA	0.002	0.000164609	NV		NA
Radium-226	Bq/L	3.21	2.11	3.21	2.6E-01	NV		NA	2.11	0.173662551	NV		NA
Radium-228	Bq/L	1.22	0.86	1.22	1.0E-01	NV		NA	0.86	0.070781893	NV		NA
Reactive Phosphorus as P (Orthophosphate as P)	mg/L	0.21	0.083	0.21	1.7E-02	NV		NA	0.083	0.006831276	NV		NA
Selenium	mg/L	<0.1	0.005	<0.1	ND	0.52	18	NA	0.005	0.000411523	0.52	18	7.9E-04
Silicon as SiO2	mg/L	220	140	220	1.8E+01	NA		NA	140	11.52263374	NA		NA
Silver	mg/L	<0.01	0.0005	<0.01	ND	4.2	3,5,18	NA	0.0005	4.11523E-05	4.2	3,5,18	9.8E-06
Strontium	mg/L	130	83.5	130	1.1E+01	95	5	1.10E-01	83.5	6.872427984	95	5	7.2E-02
Sulfate as SO4 - Turbidimetric (filtered)	mg/L	164	31	164	1.3E+01	NA		NA	31	2.551440329	NA		NA
Thorium	µg/L	<10	0.9	<0.01	ND	NV		NA	0.0009	7.40741E-05	NV		NA
Toluene	µg/L	14	1	0.014	1.2E-03	0.15	17	7.70E-03	0.001	8.23045E-05	0.15	17	5.5E-04
Total Phosphorus as P (Organic Phosphate as P)	mg/L	11.9	1.05	11.9	9.8E-01	NV		NA	1.05	0.086419753	NV		NA
Total Dissolved Solids (Lab)	mg/L	38000	25500	38000	3.1E+03	NV		NA	25500	2098.765432	NV		NA
Total Organic Carbon	mg/L	2640	181	2640	2.2E+02	NV		NA	181	14.89711934	NV		NA
Total Suspended Solids (Lab)	mg/L	970	161	970	8.0E+01	NV		NA	161	13.25102881	NV		NA

**Table E-1  
Summary of Terrestrial Tier 1 Screening Evaluation  
Beetaloo Flowback Water Assessment  
Tamboran**

Chemical	Unit	max	median	Maximum Detected Concentration in Water (mg/L)	Maximum Calculated Concentration in Soil (mg/kg)	Soil Screening Level (mg/kg)	Note	Maximum Concentration/ Soil Screening Level Ratio	Median Detected Concentration in Water (mg/L)	Median Calculated Concentration in Soil (mg/kg)*	Soil Screening Level (mg/kg)	Note	Median Concentration/ Soil Screening Level Ratio
Uranium	µg/L	<10	3.9	<0.01	ND	25	18	NA	0.0039	0.000320988	25	18	1.3E-05
Vanadium	mg/L	<0.1	0.005	<0.1	ND	NV		NA	0.005	0.000411523	NV		NA
Zinc	mg/L	0.27	0.055	0.27	2.2E-02	15	15	1.50E-03	0.055	0.004526749	15	15	3.0E-04

**Notes:**

ACL = Added contaminant limits  
As = Arsenic  
BTEX = Benzene, Toluene, Ethylbenzene, and Xylene  
CEC = Cation Exchange Capacity  
Cu = Copper  
D = dissolved  
DDT = dichlorodiphenyltrichloroethane  
ECHA = European Chemical Agency  
EIL = Ecological Investigation Level  
ESL = Ecological Screening Level  
HQ = hazard quotient

mg/kg = milligrams per kilogram  
mg/L = milligrams per litre  
N = null  
NEPM = National Environment Protection Measures  
NOAEL = no-observed-adverse-effect-level  
NV = No readily available screening criterion  
PNEC = predicted no effect concentration  
T = total  
TPH = total petroleum hydrocarbons  
UCL = upper confidence limit  
USEPA = United States Environmental Protection Agency

- |   |   |
|---|---|
| 1 = NEPM. 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection | 11 = USEPA 2007. Ecological Soil Screening Levels for Manganese Interim Final OSWER                             |
| 2 = NEPM. 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection | 12 = ECHA 2020. Molybdenum predicted no effect concentration (PNEC) in soil for terrestrial species. Hazard for |
| 3 = USEPA 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. Table 3 Region 4 Soil            | 13 = NEPM 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection     |
| 4 = NEPM 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection  | 14 = NEPM 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection     |
| 5 = USEPA 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. Table 3 Region 4 Soil            | 15 = NEPM 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection     |
| 6 = ECHA 2020. Boron Predicted no effect concentration (PNEC) in soil for terrestrial species.              | 16 = NEPM 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection     |
| 7 = ECHA 2020. NOAEL as concentration in food source for Wistar Han rat                                     | 17 = USEPA 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. Table 3 Region 4 Soil Screening     |
| 8 = NEPM 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection  | 18 = USEPA 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. Table 3 Region 4 Soil Screening     |
| 9 = NEPM 2011. Guideline on Investigation Levels for Soil and Groundwater. National Environment Protection  | 19 = ECHA 2020 Propylene glycol Predicted no effect concentration (PNEC) in soil for terrestrial species.       |
| 10 = Background threshold value based on 95 percent upper confidence limit (UCL) of mean for McArthur       |   |