Beetaloo Basin Shenandoah South Sand Wash Plant Environment Management Plan (TAM4-2) EP 117

Prepared by Tamboran B2 Pty Ltd

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APPENDICES A - D:

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Appendix E Erosion and Sediment Control Plan

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Appendix I Risk Assessment

Appendix J Stakeholder engagement:

- Part A Stakeholder engagement log summary & Part B Stakeholder summary of information provided and the relevant sections of the Petroleum (Environment) Regulations 2016
- Supporting information provided for Minister Decision (not attached to EMP)
  - Appendix J.1.1 Pastoral stakeholder engagement
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Executive Summary

Tamboran B2 Pty Ltd (Tamboran) is the registered holder and operator of exploration permits (EP) 76, 98 and EP 117, located in the Beetaloo Sub-basin. This Environment Management Plan (EMP) represents Tamboran's application to the Northern Territory (NT) Minister for Lands, Planning and Environment for the installation and operation of a sand wash plant and associated infrastructure within the Shenandoah South Exploration and Appraisal (SS E&A) area within EP 117.

A key material required for the construction of onshore petroleum wells in the Beetaloo Sub-basin is fine washed sand, which is utilised in hydraulic fracture stimulation (HFS) of the wells. To date, Tamboran has utilised imported sand in its E&A activities, with the volume of sand utilised dependent on the number of wells drilled per year and the length of the lateral component of the well which requires HFS. As Tamboran begins to evaluate the commercial viability of the underlying shales through longer laterals and the appraisal of more wells across its tenure, the importation of sand to support E&A activities becomes unsustainable. The use of local sand will have significant commercial, economic and logistical benefits for the E&A program.

The proposed Shenandoah South sand wash plant (SWP) will process locally sourced sand to a suitable quality for use as a proppant for use in the HFS of E&A wells developed by Tamboran. The SWP is intended to provide sand for E&A appraisal activities only, is not related to production activities (as defined in the NT *Petroleum Act 1984)* and will not be sold to third parties. The SWP is anticipated to operate as a trial for the first 2 years and may be further utilised for a period of up to 5 years if the trial is successful.

The regulated activities covered in this EMP include:

- **Site establishment** of the 11.2 ha SWP site including clearing, topsoil stripping, fencing, etc.
- **Civil construction** for the SWP site including earthworks to contour and grade the SWP pad, stockpile pads and access tracks, and excavation of settlement, decant and raw water basins.
- **Mobilisation and installation** of a mobile/modular SWP including mobilisation to site and installation on prepared pad.
- **Operation and maintenance** of the SWP**.**
- **Stockpiling and load-out** of washed sand to well pads as required**.**
- **Management and recycling** of 'reject' sand and water**.**
- **Rehabilitation** of the SWP site: to meet the mandatory requirements described in Cl A.3.9 of the *Code of Practice: Onshore Petroleum Activities in the Northern Territory,* 19 February 2025 (the Code).
- **Ancillary activities** comprising:
    - Use of existing approved camp facilities.
    - Use of existing gravel pits.
    - Use of existing property access tracks.
    - Extraction of groundwater under existing water extraction licenses (WELs).

This EMP has been prepared in compliance with the NT Petroleum (Environment) Regulations 2016 (the "Regulations"), the Code of Practice: Onshore Petroleum Activities in the Northern Territory (the Code) and the Exploration Agreements between Tamboran, native title holders and the Northern Land Council (NLC). The EMP is designed to ensure that the proposed activities are carried out in such a manner that the environmental impacts and risks will be reduced to as low as reasonably practicable (ALARP) and acceptable.

Location of the regulated activities

The SWP area is located on the Shenandoah pastoral station, NT portion 7026 within EP 117. The location of the proposed activities is provided in Figure 1.

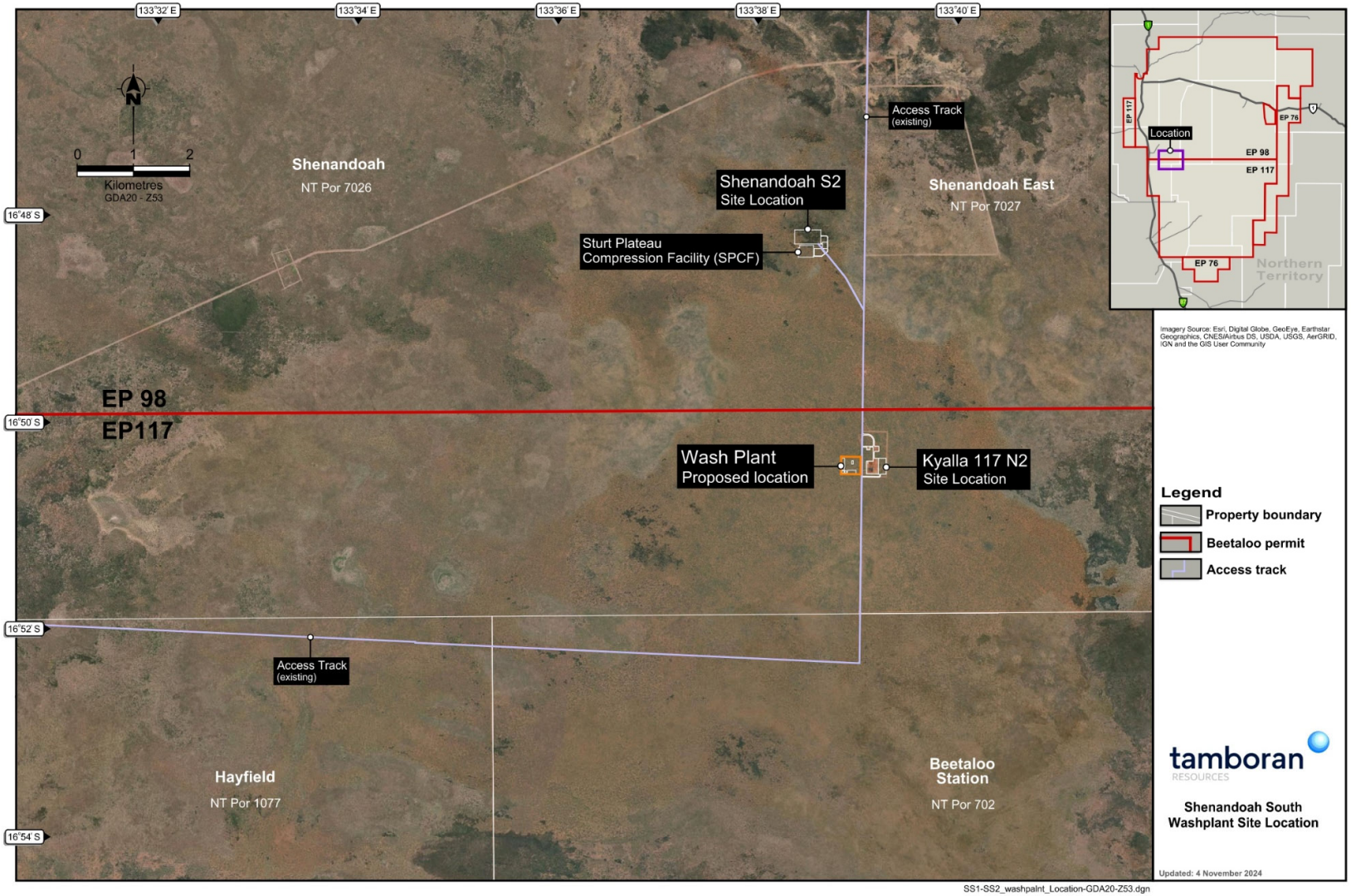


Figure 1: Location of the Shenandoah South SWP site

Description of the activity

A summary of the proposed activities covered in the EMP is provided in Table 1.

Table 1: Description of the proposed activities for the SWP

Activity	Parameter	Description
Site establishment, construction and wash plant installation	11.2 ha of land clearing	• Construction of a temporary wash plant and ancillary infrastructure at a site located ~50 m to the west of the existing Kyalla 117 N2 well pad, including: ○ Construction of an ~11.2 ha pad to house the SWP, water storages/ recycling and sand stockpile area, including fencing, land clearing, topsoil stripping and grading. ○ Construction of site entry and exits points from existing adjoining pastoral assess track. ○ Construction of in-ground water management infrastructure including settlement basins, decant water ponds and raw water ponds. ○ Installation of a mobile/modular sand wash plant, including screens, wash plant and stackers. ○ Construction of raw sand stockpile area and product sand stockpile areas (including temporary/deployable covers as required). ○ Construction of temporary site office, ablutions block, crib hut, potable water tanks, as required. ○ Construction of a ~500 m access track connecting the existing pastoral track to the site. ○ Installation of a predominantly above-ground raw water pipeline from water extraction bores on the existing Kyalla 117 N2 well pad to the raw water pond. Up to two additional bores may be constructed on the SWP site.
	Access tracks	• Use of existing access tracks approved under the TAM1-3 EMP[1] which adjoin the SWP site and require no additional surface disturbance.
	Gravel pits	• Gravel will be sourced from Tamboran's existing approved gravel pits on EP 117 (SSGP1 and SSGP2), approved under the TAM1-3 EMP.
SWP operation	Up to 1 kt/day	• Operation of the mobile/modular sand wash plant, including screening, washing, conveying and storage of sand. • Production of up to 1 kt/day of product sand from a small mobile/modular wash plant. • Sand washing may be undertaken on either a 'campaign' or ongoing basis. • Processing of up to 70 kt of raw sand in 2025, increasing to approximately 150 kt of sand in 2026, with volumes for subsequent years dependent on proppant requirements

[1] *Beetaloo Basin Shenandoah South E&A Program EMP (TAM1-3)*, approved on 23 May 2024 (hereafter referred to as 'the TAM1-3 EMP').

Activity	Parameter	Description
		for Tamboran's E&A activities. Raw sand may be sourced from various locations including: ○ Suitable sand that is generated incidentally during construction activities associated with Tamboran's approved activities within EPs 76, 98 and 117. ○ Suitable sand that is extracted from granted Extractive Mineral Titles held by entities associated with Tamboran*. ○ Suitable sand that is sourced from Extractive Mineral Titles held by third parties*. • The proportion of each raw sand source (as listed above) to be processed through the SWP will be dependent on the physical characteristics of the raw sand and the demonstrated ability of the SWP to process it to produce a suitable proppant material. • Operation of mobile plant, including trucks, front end loaders and supporting equipment • Stockpiling and storage of product sand (covered as required). • Load-out of product sand from product stockpile (loader into haul truck). • Diesel power generation. • Extraction and use of groundwater from approved WELs. • Management and recycling of SWP water, including management of fine 'reject' material (organics, clays, silts, ultra fine sand) in settlement basins. • Stockpiling of separated coarse reject sand for future rehabilitation works. • Servicing and maintenance of plant and equipment. *Sand extracted under Extractive Mineral Titles will be authorised under the relevant assessment and approval processes under the *Mineral Titles Act* and are therefore separate to the SWP scope.
Site rehabilitation		• Drying out of solids (organics, clays, coarse and fine reject material) within sumps/basins. • Removal of wash plant and other ancillary infrastructure. • Backfilling basins/ponds, grading and recontouring to the desired final landform, re-spreading topsoil, re-seeding (where required) and raking back felled vegetation. • Ongoing monitoring and maintenance.
Environmental monitoring	SWP site	• Monitoring activities (including vegetation clearing, soils, weeds, groundwater extraction and other low impact ancillary data collection programs).
Traffic	7 traffic movements per day	• Up to 7 traffic movements per day during site mobilisation and demobilisation. • Up to 4 traffic movements per day during washing operations.
Groundwater extraction	<100 ML/annum	• Use of existing water extraction bores located on the adjacent Kyalla 117 N2 well pad and/or up to 2 new groundwater bores within the SWP site.

Activity	Parameter	Description
		• Groundwater extraction under existing groundwater extraction licence (WEL GRF10285). • <100 ML/year of raw water required for wash plant due to water recycling from settlement basins for wash plant operation and other activities such as dust suppression.
Greenhouse gas emissions	Peak emission 2,616 tCO_2/annum	• All emissions in a financial year (FY) will be offset where the facility-specific 100 $KtCO_2e$ safeguard trigger is exceeded. • Tamboran will offset a percentage of residual emissions in alignment with the NT Net Zero Policy.

Description of the existing environment

The proposed SWP site is approximately 11.2 ha in is located on EP 117 within the Shenandoah pastoral station. The 11.2 ha site is located within the area known as the Shenandoah South E&A area which is 31,418 ha in size. Several land condition and cultural heritage assessments across the Shenandoah South E&A area have been completed over the past 20 years, which supplement the more recent assessments completed specifically for the SWP area and the Northern Territory Government (NTG) Strategic Regional Environmental and Baseline Assessment (SREBA) studies. These assessments include a review of the physical, natural and cultural heritage environment.

The SWP site lies within the Sturt Plateau Bioregion. The bioregion is characterised by undulating plains on sandstone with predominantly neutral sandy red and yellow earth soils. Dominant vegetation is eucalypt woodland, which include extensive areas of Lancewood (*Acacia shirleyi*), Bullwaddy (*Macropteranthes kekwickii*) vegetation and associated fauna, including the Spectacled Hare-Wallaby (*Lagorchestes conspicillatus*). Land condition in the bioregion is moderate to good but is threatened by impacts from weeds, feral animals, pastoralism and changed fire regimes.

A description of the existing environment for the SWP site is provided in section 4 and in Appendix A (Land Condition Assessment) and Appendix B (Heritage Assessment). Figure 2 provides an overview of vegetation communities that occur within and adjacent to the SWP site.

A summary of the existing environment of the SWP site is presented in Table 2. The focus of the description of existing environment is based on the land condition assessment report (Appendix A).

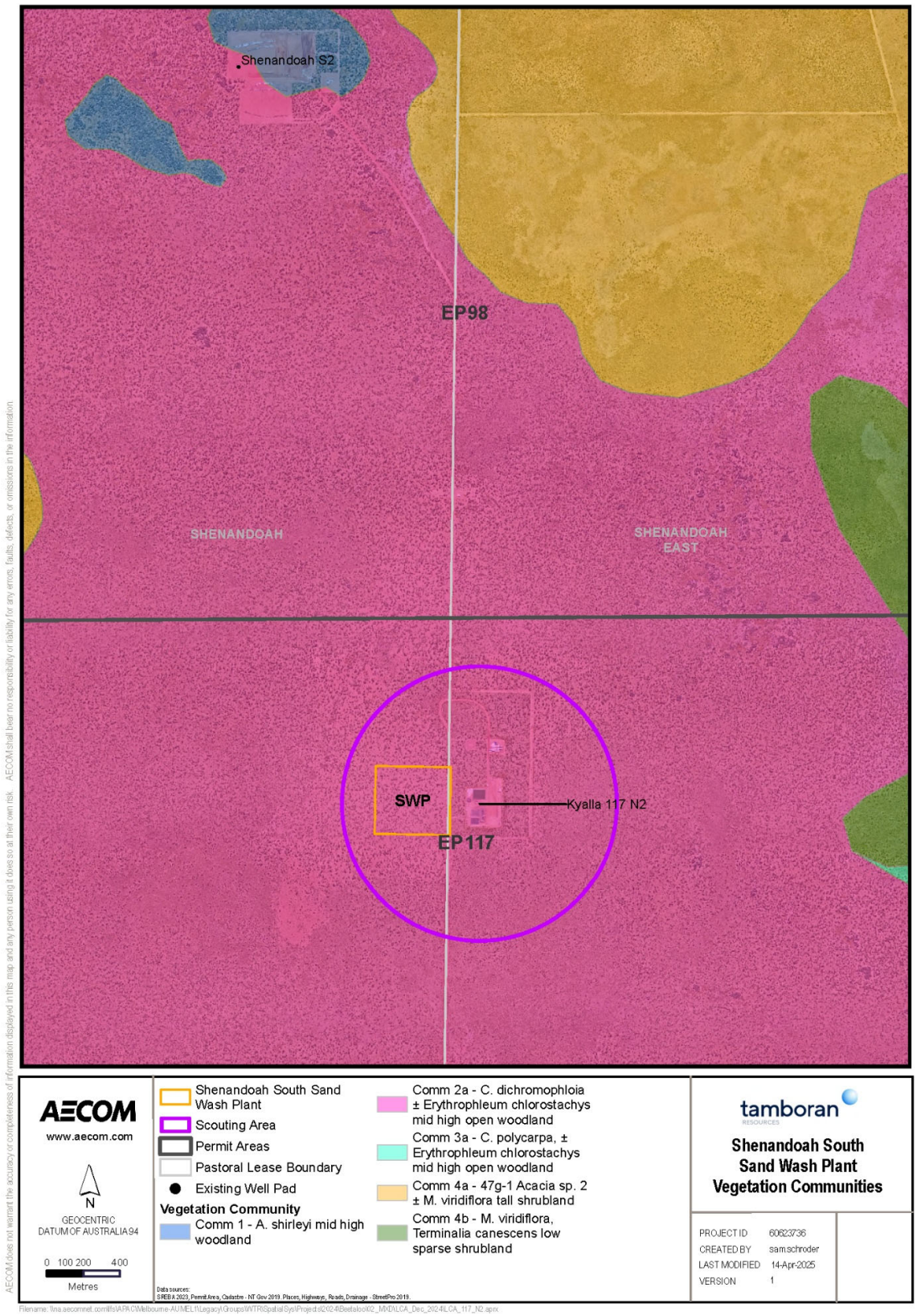
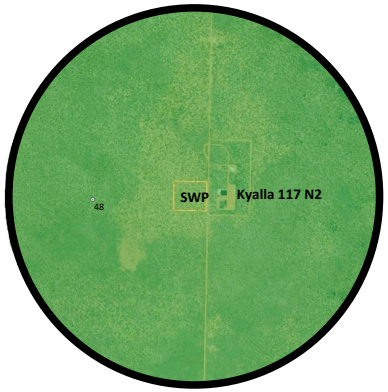


Figure 2: Vegetation communities and other regulated activities within and adjacent to the SWP

Table 2: Summary of existing environment and surrounds – vegetation community 2a

<table>
<tr><th colspan="2">SWP – Vegetation Community 2a</th><th colspan="2">Survey photos of the vegetation/habitat</th></tr>
<tr><td>Location</td><td> 
</td><td colspan="2" rowspan="3"> </td></tr>
<tr><td>Landform and soil</td><td>Level plains of residual plateau surface. Sandy loam.</td></tr>
<tr><td>Vegetation community description</td><td>2a: Corymbia dichromophloia ± Erythrophleum chlorostachys mid high open woodland, over Acacia difficilis, Terminalia canescens, 9g-1 Dodonea sp. 1 mid high open shrubland, over Triodia bitextura ± Chrysopogon fallax, Schizachyrium fragile mid high hummock grassland</td></tr>
<tr><td>Habitat condition</td><td>Good – Scattered tree hollows and flowering plants common. Fallen logs common. Mistletoe absent. Shallow leaf litter. Fire damage low > 2 years ago. No erosion. Minor cattle impacts. Termite mounds sparse. Ground cover: 50% vegetation, 20% litter, 30% bare soil.</td><td colspan="2"></td></tr>
<tr><td>Dominant flora species</td><td>Upper stratum
Mid high open woodland dominated by Corymbia dichromophloia (fq 100%) ± Erythrophleum chlorostachys (fq 27.78%)</td><td>Mid stratum
Mid high open shrubland dominated by Acacia difficilis (fq 61.11%), Terminalia canescens (fq 38.89%), Dodonaea hispidula (fq 33.33%)</td><td>Ground stratum
Mid high hummock grassland dominated by Triodia bitextura (fq 83.33%) ± Chrysopogon fallax (fq 50%), Schizachyrium fragile (fq 44.44%)</td></tr>
<tr><td>Weeds</td><td colspan="3">No weeds of national significance or NT declared weeds present.</td></tr>
<tr><td>Potential listed threatened species (SREBA 2023)</td><td colspan="3">Gouldian Finch Chloebia gouldiae (Endangered EPBC Act, Vulnerable TPWC Act), Northern Shrike-tit Falcunculus whitei (Vulnerable EPBC Act), Painted Honeyeater Grantiella picta (Vulnerable EPBC Act and TPWC Act), Australian Painted Snipe Rostratula australis (Endangered EPBC Act and TPWC Act), Common Brushtail Possum (northern) Trichosurus vulpecula arnhemensis (Vulnerable EPBC Act), Northern Blue-tongue Skink Tiliqua scincoides intermedia (Critically Endangered EPBC Act), Yellow-spotted Monitor Varanus panoptes (Vulnerable TPWC Act).</td></tr>
</table>

Key environmental risks

The environmental, heritage and social risks associated with the activities have been assessed using the Tamboran risk assessment framework. The risk assessment presents the range of potential impacts, corresponding mitigation measures and risk ratings based on their assessed worst-case consequence and likelihood of occurrence. Key risks assessed under this EMP include:

- managing cultural heritage sites and finds
- managing soil impacts from compaction, erosion and sediment movement and dust
- managing disturbance of surface water bodies and associated sensitive vegetation communities (as described by the SREBA Terrestrial Ecosystems Baseline Report (DEPWS, 2022))
- managing vegetation and habitat disturbance
- managing the risk of bushfire in the area
- mitigating the introduction and spread of weeds.

It was considered that with the appropriate controls implemented to mitigate the impacts there were no residual risks above a rating of medium (Table 3).

Table 3: Summary of risk ratings with environmental controls applied

	Environmental risk rating with applied controls			
	Low	**Medium**	**High**	**Very high**
Total - 29	26	3	0	0

The low and medium risks identified were consistent with standard project and pastoral activities conducted throughout the NT. The residual risk sources assessed under this EMP include:

1. Disturbance of sacred site or culturally sensitive areas and the decline in environmental value of area used for cultural purposes through the construction and operation of the SWP and the accidental ignition of fire by the regulated activity – risk ID 12, risk ID 13 and risk ID 14
2. Loss of long-term soil productivity and viability due to soil compaction and erosion in the SWP area – risk ID 5
3. Soil, groundwater and surface water contamination due to spills and leaks of chemicals (fuels, oils and lubricants) – risk ID 1, risk ID 2, risk ID 3, risk ID 4 and risk ID 28
4. Impact to listed threatened habitats and listed threatened flora and fauna, including non-listed fauna and livestock during SWP activities –risk ID 6, risk ID 7, risk ID 8, risk ID 9, risk ID 10, risk ID 11, and risk ID 26
5. Reduction in agriculture productivity through the introduction and spread of weeds in the area or accidental ignition (bushfire) from surface activities – risk ID 16, risk ID 17, risk ID 18, risk ID 19 and risk ID 20
6. Increased nuisance/loss of amenity from dust, noise, vibration and greenhouse gas emissions associated with the activities – risk ID 16, risk ID 22, risk ID 23, risk ID 24, risk ID 27 and risk ID 29.

The environmental risk assessment demonstrates that the risks associated with SWP area, are of "low to moderate consequence, low likelihood" risks. The rating is achieved through the application of multiple controls[2], which reduce the risk rating to as low as reasonably practicable (ALARP) and acceptable.

[2] Mandatory standards and processes applied to the regulated activities are described in the Code, which is designed to ensure that the risk to public, workers and the environment are reduced to a level that is ALARP and acceptable (Cl 1).

The environmental outcomes to be achieved during the proposed activities include no significant impacts to the following aspects:

- The protection and enhancement of community and cultural values, places and amenity.
- Ecological function and productivity of soils.
- Ecological function of surface water bodies and associated sensitive vegetation communities (as described by the SREBA Terrestrial Ecosystems Baseline Report (2022)).
- The protection of high valued habitats and threatened flora and fauna.
- The maintenance of air quality.

At completion of the SWP activities, the area will be returned to a safe, stable and non-polluting form generally consistent with pre-disturbed conditions.

Stakeholder engagement

Stakeholder engagement for Tamboran's SWP development has focused on the host traditional owners (facilitated by the NLC) and host pastoralists directly affected by the proposed activity. Contact details are as follows:

NLC	Various	[redacted]	[redacted]
Shenandoah Pastoral Station	Val Dyer	[redacted]	[redacted]

Detailed community and stakeholder engagement is ongoing and covers Tamboran's activities on a broader level and includes the information required under the Regulations. This includes providing the stakeholders of the activity description, location, impacts, potential risk, proposed environmental controls and potential impacts to the stakeholders' rights.

Further information on stakeholder engagement is provided in section 5.

Key objectives of this EMP

The scope covered in this EMP is considered an important step in the confirmation of the technical and commercial feasibility of the underlying shale resources within the SS E&A area. The wider E&A program within the area aims to further improve understanding of the lateral continuity of the shale resource in the area, leading to increased reserve bookings (e.g. through assessment of shale continuity and thickness) and more effective well designs.

The implementation of the SWP will enable use of local sand resources for use as a proppant in HFS activities, in place of imported sand which is the current practice. The use of local sand will have significant commercial, economic and logistical benefits for the E&A drilling activities, including significantly reducing traffic volumes on the Stuart Highway, overall greenhouse gas emissions, and increasing local employment opportunities.

1 Introduction

1.1 Purpose

Tamboran B2 Pty Ltd (Tamboran) is the registered holder and operator of exploration permits (EP) 76, 98 and EP 117, located in the Beetaloo Sub-basin. This Environment Management Plan (EMP) represents Tamboran's application to the Northern Territory (NT) Minister for Lands, Planning and Environment for the installation and operation of a sand wash plant and associated infrastructure. The regulated activity is situated on an 11.2 ha site adjacent tom and west of the existing Kyalla 117 N2 well site, located within the Shenandoah South Exploration and Appraisal area within EP 117 (refer Figure 3 and Figure 4).

A key material required for the construction of onshore petroleum wells in the Beetaloo Sub-basin is fine washed sand, which is utilised in hydraulic fracture stimulation (HFS) of the wells. To date, Tamboran has utilised imported sand in its E&A activities, with the volume of sand utilised dependent on the number of wells drilled per year and the length of the lateral component of the well which requires HFS. As Tamboran begins to evaluate the commercial viability of the underlying shales through longer laterals and the appraisal of more wells across its tenure, the importation of sand to support E&A activities becomes unsustainable. The use of local sand will have significant commercial, economic and logistical benefits for the E&A program.

The proposed Shenandoah South sand wash plant (SWP) will process locally sourced sand to a suitable quality for use as a proppant for use in the HFS of E&A wells developed by Tamboran. The SWP is intended to provide sand for E&A appraisal activities only, is not related to production activities (as defined in the NT *Petroleum Act 1984)* and is not for sale. The SWP is anticipated to be in place for a period of up to 5 years.

The regulated activities covered in this EMP include:

- **Site establishment** of the 11.2 ha SWP site including clearing, topsoil stripping, fencing, etc.
- **Civil construction** for the SWP site including earthworks to contour and grade the SWP pad, stockpile pads and access tracks, and excavation of settlement, decant and raw water basins.
- **Mobilisation and installation** of a mobile/modular SWP including mobilisation to site and installation on prepared pad.
- **Operation and maintenance** of the SWP**.**
- **Stockpiling and load-out** of washed sand to well pads as required**.**
- **Management and recycling** of 'reject' sand and water**.**
- **Rehabilitation** of the SWP site: to meet the mandatory requirements described in Cl A.3.9 of the *Code of Practice: Onshore Petroleum Activities in the Northern Territory,* 19 February 2025 (the Code).
- **Ancillary activities**:
    - Use of existing approved camp facilities.
    - Use of existing property access tracks.
    - Use of existing gravel pits.
    - Extraction of groundwater under existing water extraction licenses (WELs).

This EMP has been prepared in compliance with the Petroleum (Environment) Regulations 2016 (the Regulations), the Code and the Exploration Agreement(s) between Tamboran, native title holders and the Northern Land Council (NLC).

The overall objective of the EMP is to ensure that the proposed activities are carried out in such a manner that the environmental impacts and risks will be reduced to a level that is as low as reasonably and practicable (ALARP) and acceptable.

Specifically, this EMP aims to:

- Address regulatory requirements.
- Provide site-specific impact management strategies to assist Tamboran in maintaining a positive position in the local community throughout its program.
- Align with the principles of Ecological Sustainable Development (ESD) through the adoption of responsible development practices that are designed to maximise social benefit, while minimising the level of impact on the surrounding ecosystems.
- Provide a description of site-specific aspects of the existing environment (physical, biological, social and cultural).
- Provide site-specific plans for monitoring and rehabilitation.
- Be a practical and usable document, with environmental management principles that are easily implemented and effective.

While every effort has been made to ensure current and accurate information in this EMP, it is intended to be adaptive by design, while fulfilling the need for sufficient controls. As such, it must remain responsive to fluctuations and alterations in field conditions.

1.2 Proponent

Attribute	**Details**
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Non-operating proponent	
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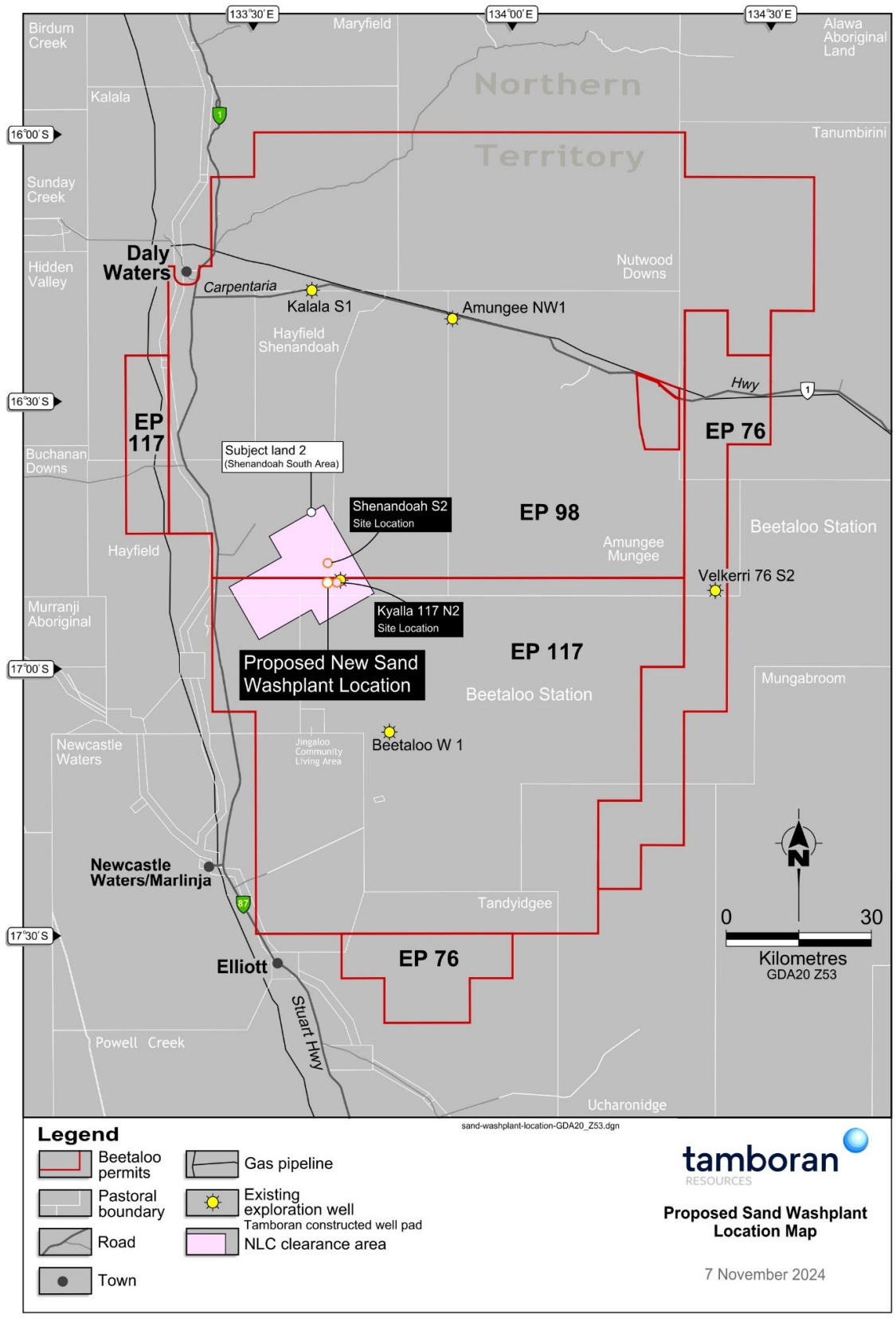


Figure 3: Overview of Tamboran's proposed wash plant site in relation to EPs 76, 98 and 117.

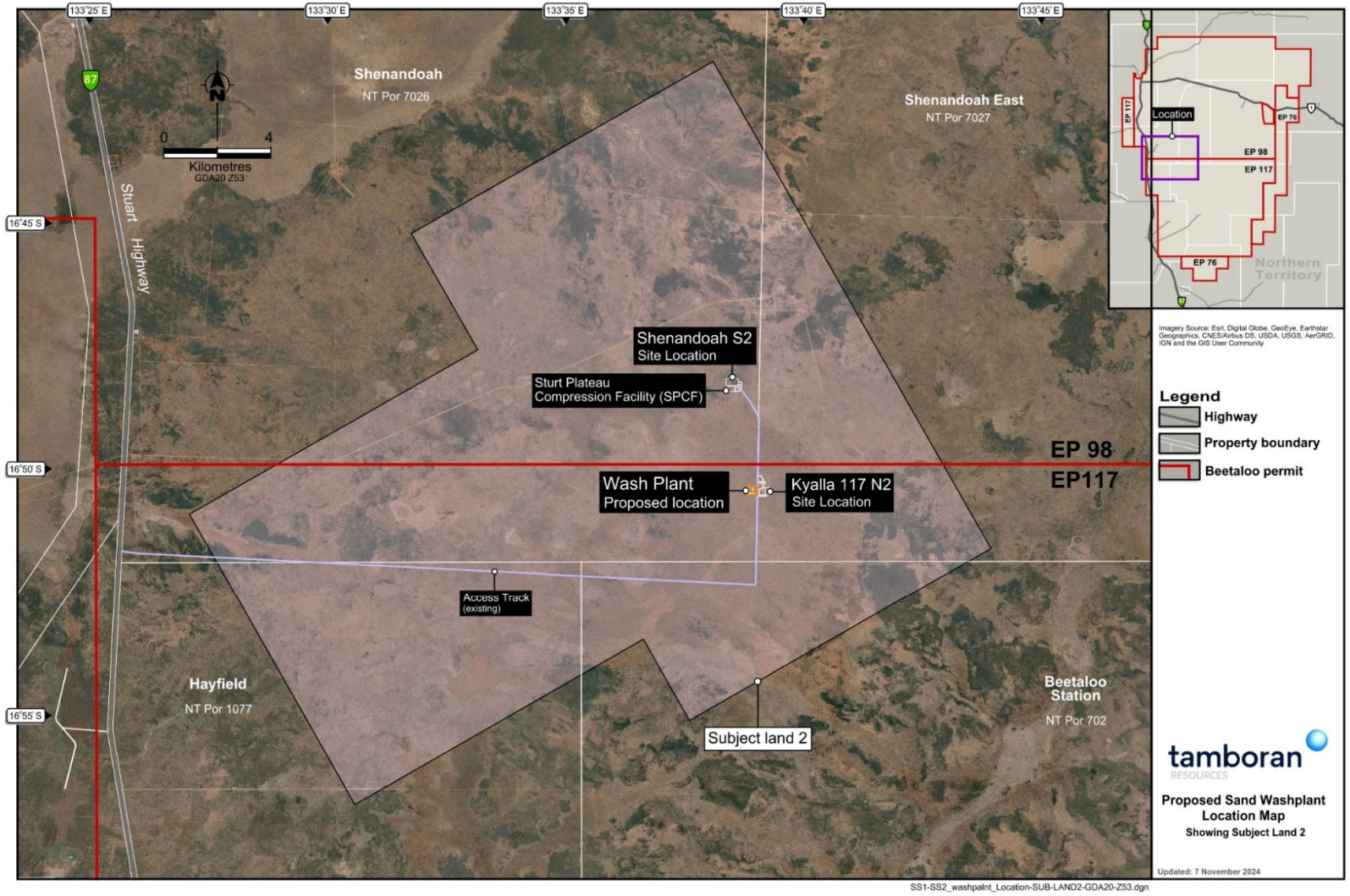


Figure 4: SWP location within the Shendandoah South E&A area (Subject land 2)

2 Environmental legislation and other requirements

Key NT and Commonwealth legislation, agreements, operating consents, guidelines and Codes of Practice relevant to the activities described in this EMP are summarised in Table 4. This EMP has been prepared in relation to these requirements.

Table 4: Key legislation

Legislation	Requirement	How Tamboran meets the requirement	Administered by
Northern Territory			
Petroleum Act 1984	Petroleum exploration licences are required in the areas where activities are proposed.	Exploration permits obtained. Minister provides the final sign off authorising Petroleum activities.	Department of Mining and Energy (DME)[3] Department Lands, Planning and Environment (DLPE)[4] Department of Treasury and Finance[5]
	Compensation to be paid to native title holders and owners/occupiers of land where petroleum activities are proposed.	Exploration Agreements obtained with native title holders. Compensation paid to pastoralists for all activities proposed under this EMP.	
	Prescribes the provisions of the Financial Assurance Framework, which introduces mandatory environmental remediation and petroleum infrastructure decommissioning securities as well as mandatory insurance requirements for all petroleum interests.	Environmental security is assessed by the DLPE and paid to DME. Petroleum infrastructure decommissioning securities is assessed by DME and paid to DME	DLPE and DME
	Outlines the framework for the fees and levies prescribed in the Petroleum Regulations 2020 (below), including publication.	Fees are paid to DME but in some cases assessment of the fees is undertaken by DLPE	DLPE and DME
	Ensuring all regulated activities have an approved EMP.	This EMP has been developed to satisfy this requirement.	DLPE

[3] Except provisions about royalties, provisions relating to environmental regulation of exploration and production of petroleum and Part V, Division 2.

[4] Part V, Division 2 and provisions relating to environmental regulation of exploration and production of petroleum.

[5] Provisions about royalties.

Legislation	Requirement	How Tamboran meets the requirement	Administered by
NT Petroleum (Environment) Regulations 2016	That the EMP is developed in accordance with the NT Petroleum (Environment) Regulations 2016 (the Regulations).	Tamboran has developed this EMP in accordance with the Regulations.	
	That stakeholder engagement for the regulated activities is undertaken.	Tamboran has completed stakeholder engagement in accordance with the Regulations, as summarised in section 5 of this EMP.	
	That activities are conducted in accordance with the Code.	The EMP outlines how the activities will be conducted in accordance with the Code.	
	Reporting requirements for incidents and hydraulic fracturing.	The EMP summarises how incidents will be reported. This EMP does not cover hydraulic fracturing activities.	
Petroleum (Transitional) Regulations 2023	Provides clarity around how and when new arrangements will apply to existing titles, applications, approvals and requirements, including a current insurance policy, new fees, levies and securities.	Fees are paid to DME. Copy of insurance policy is submitted to DME.	DME
Petroleum Regulations 2020	Provides for land access agreements between interest holders and owners or occupiers of the land.	Land access agreements in place for the regulated activities described in this EMP.	DME
	Prescribes the fees relating to the general administration of petroleum titles, including those for the grant, renewal and variation of exploration permits, retention licences and production licences (Schedule 1).	Fees are paid to DME for the administration of all titles, permits and licences.	DME
	Prescribes the fees for resource management, activity and infrastructure plans (Schedule 1A).	Fees are paid to DME.	
	Describes fees and calculation processes for EMPs based on complexity of the regulated activity described in an EMP (Schedule 1B).	Fees are paid to DLPE for all regulated activities proposed under this EMP.	DLPE
	Prescribes the monitoring and compliance levy intended to recover the costs of a range of DME and DLPE monitoring and compliance activities (Schedule 4A).	A calculation tool is submitted to DLPE, then approved and invoiced by the Energy Development Branch, DME on the advice of DLPE.	DLPE and DME

Legislation	Requirement	How Tamboran meets the requirement	Administered by
	That the WOMP must be developed in accordance with Regulation 66AA Schedule 4B.	Not applicable.	DME
	Prescribes the information that must be included in a petroleum surface infrastructure plan in accordance with Regulation 66AAD and Schedule 4D.	Requirements addressed in the surface infrastructure plan.	
	Reporting requirements prescribed under Regulation 66AAN (Schedule 4E) to Regulation 66AAX(2) (Schedule 4R).	Requirements addressed through various reports provided to the regulator that are relevant to the regulated activities described in this EMP.	
Bushfires Management Act 2016 and Regulations	Compliance with total fire bans and fire permitting.	Tamboran will not light fires during periods of total fire bans and will obtain a permit where occurs during declared fire danger periods.	Bushfires NT
	Requirements for occupiers to prevent and control fires.	Addressed through Tamboran's Bushfire Management Plan **(**Appendix C) which includes bushfire preventative and response measures.	
	Aerial burning permits.	Tamboran will acquire permits where aerial burning to manage fuel loads is proposed as a part of its ongoing bushfire management activities. Tamboran does not consider that aerial burning will be required.	
Control of Roads Act 1953 and *Northern Territory Traffic Act 1987*	Any proposed development which may affect the NT road network, including traffic, operation, management, capacity or safety, or result in the construction or installation of new infrastructure within the NTG road network, requires assessment and Road Agency Approval.	Tamboran will continue to engage with the Department of Infrastructure, Planning and Logistics (DIPL) regarding proposed and ongoing traffic management.	Department of Logistics and Infrastructure (DLI)
Emergency Management Act 2013	Establishes the requirements for local, regional and Territory emergency management plans. Describes the functions and powers of the Northern Territory Emergency Service (NTFES), Territory Emergency Controller, Territory Recovery Controller and Territory Emergency Management Committee.	Tamboran complies with the Act through the development of an emergency response plan and the identification of NTFES as a stakeholder.	NTFES

Legislation	Requirement	How Tamboran meets the requirement	Administered by
Environment Protection Act 2019	Activities which have the potential to cause a significant impact to the environment are required to be referred to the NT EPA for assessment under the *Environment Protection Act 2019*.	Tamboran has completed a self-assessment. The level of potential environmental impact is not considered significant.	Northern Territory Environment Protection Authority (NT EPA) DLPE
Heritage Act 2011	Requirements to avoid impacts to heritage places and objects.	Tamboran completed desktop studies and field scouts to confirm the presence / absence of heritage places and objects within the vicinity of the proposed activities. Unexpected finds procedure to be implemented during activities (Appendix B).	Heritage Branch, DLPE
Medicines, Poisons and Therapeutic Goods Act 2012	Establishes the requirements for minimising harm from scheduled substances and therapeutic goods. Regulates the possession, supply or administration of drugs and poisons.	Tamboran will abide by the limitations of use of any potent medicines, drugs and poisons to ensure their save and effective use and protection of humans and the environment.	Department of Health
Mineral Titles Act 2010	Establishes the requirements for obtaining Extractive Mineral Titles to explore for, mine and process extractive minerals. Further information is provided in Section 2.1 below in regard to why an Extractive Mineral Title is not being sought by Tamboran to authorise the SWP.	The SWP site will not be subject to the MTA. Extraction of raw sand from Extractive Mineral Titles by Tamboran or other entities will be subject to the MTA, however any such extraction is outside the scope of this EMP	DME
Northern Territory Aboriginal Sacred Sites Act 1989	The legislation establishes a procedure for the protection and registration of sacred sites and the issuing of sacred site clearance certificates. Access and work within sacred sites require authorisation.	The SWP site is within an area that has previously had sacred site clearances completed by traditional owners. A variation to the existing Aboriginal Areas Protection Authority (AAPA) certificate C2024/065 will be obtained to include the specific activities proposed in this EMP.	AAPA
Public and Environmental Health Act 2011	Requirements for camp kitchens and wastewater (sewage and greywater) management and permitting in the NT.	This EMP does not include provision for a new camp, with existing camps approved under other EMPs to be used. Tamboran's camps are registered, and a wastewater works design approval for the camps	Department of Health

Legislation	Requirement	How Tamboran meets the requirement	Administered by
		sewage treatment plan irrigation area has been obtained.	
Territory Parks and Wildlife Conservation Act 1976	Prohibits impacts to protected places, impacts to threatened flora and fauna and interference with protected wildlife.	Tamboran complies with the Act through the avoidance of impacts to protected places (essential habitat, sanctuaries, parks etc.) and flora and fauna. This is completed through ecological surveys and the controls implemented to limit the impact on wildlife.	Parks and Wildlife DLPE
Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Regulations 2011	Regulations stipulating the transportation requirements for dangerous goods by road and rail. This includes implementing all required signage, spill management, reporting and licencing requirements for chemical transportation during drilling and stimulation activities.	Any chemical transported and stored for Tamboran's activities is undertaken in a manner that will comply with these requirements.	NT WorkSafe, Department of the Attorney-General and Justice
Waste Management and Pollution Control Act 1998 (WMPCA)	Requirements covering general environmental duty, waste management, including waste management hierarchy, waste transportation and waste disposal requirements.	The storage, transportation and disposal of wastes will comply with the requirements of this Act. The transportation and disposal of listed wastes will only be completed by a licenced contractor and at a licenced disposal facility. Any interstate disposal will be completed with an approved consignment authority.	NT EPA
	S12 General environmental duty: Applies to activities outside of the lease area, or if a spill or leak occurs that leaves the lease area, or 1 km from the centreline of a pipeline.	Tamboran will conduct all activities associated with this EMP (i.e. within the wash plant site), as well as activities within disturbance areas authorised under other EMPs (e.g. camp areas, lease pads, access tracks, etc) in a manner that prevents offsite environmental harm.	
	S14 Duty to notify of incidents causing or threatening to cause pollution: Applies if an incident occurs outside of the lease area, or if a spill or leak occurs that leaves the lease area, or 1 km from the centreline of a pipeline, that causes or threatens to cause material or serious environmental harm.	Tamboran will report all incidents that causes or threatens to cause pollution beyond the boundary of the authorised activity (beyond the lease or camp pad), in accordance with Section 14 of the WMPCA.	

Legislation	Requirement	How Tamboran meets the requirement	Administered by
Water Act 1992 and Water Regulations 1992	The Act requires that all groundwater take in the Beetaloo Sub-basin must have obtained a Water Extraction Licence (WEL).	Tamboran has obtained a WEL GRF 10285 (450 ML/year) covering water usage for exploration and appraisal activities. This WEL allocation will be used for the operation of the SWP. WELs are renewed every 10 years to support operational activities. WEL GRF 10258 has sufficient volume for the SWP activities, as well as future proposed exploration activities in the area. This application is covered under the Water Act and is separate to this EMP.	DLPE
	The take of surface water for petroleum activities is prohibited.	No surface water take is proposed under this activity.	
	Prohibits wastewater releases to surface water bodies or reinjection.	No wastewater release to surface water is proposed. Water sources associated with the SWP include raw water, storm water, and process water stored within settlement basins for reuse/recycling. These water sources are not considered to be 'wastewater' as described in the Code.	
	The Act requires an interest holder to obtain a permit if activities undertaken under the Act all result in interference with a waterway.	The SWP has been sited to minimise the extent of disturbances on significant vegetation communities. Specifically, clearing has been minimised to the greatest extent practicable for key habitat features (i.e. large trees with hollows). In accordance with the NT *Water Act* 1992 and associated *Interference with a Waterway Guideline* (June 2023), due to the lack of any waterways within the vicinity of the SWP, it will not cause a material change or alteration to any waterways and a permit will therefore not be required.	

Legislation	Requirement	How Tamboran meets the requirement	Administered by
	The Act requires an interest holder to obtain a bore work permit for any new groundwater bores.	While existing groundwater bores at the Kyalla 117 N2 well site will be used as a preference, up to 2 new groundwater bores may be required, to be located within the SWP area.	
Weeds Management Act 2001	Requires the occupier of the land (in this case Tamboran) to: • prevent the land being infested with a declared weed • prevent a declared weed or potential weed on the land spreading to other land • notify the weeds officer of the presence of the declared weed • comply with any declared weed management plans.	Tamboran will comply with the requirement of this Act through the implementation of weed prevention, detection and eradication controls through its approved Weed Management Plan (Appendix D).	DLPE
Work Health and Safety (National Uniform Legislation) Act 2011	Provides for a nationally consistent framework to secure the health and safety of workers and workplaces. Includes requirements for hazardous chemical assessments, hazardous chemical register, access to safety data sheets, labelling, and the use, handling, generation and storage of hazardous chemicals at a workplace.	Tamboran has a Safety Management Plan that outlines how the requirements of the Act are achieved. This includes the management of chemical storage dossiers, safety data sheets (SDS) and appropriate procedures and controls to prevent worker exposure to hazards.	NT WorkSafe, Department of the Attorney-General and Justice
Commonwealth			
Environment Protection and Biodiversity Conservation Act 1999	Requires approvals for any activity likely to have an impact on a Matter of National Environmental Significance (MNES).	A self-assessment was completed as a part of this EMP to determine whether a MNES is likely to be impacted by the proposed activities within this EMP. Impacts to MNES are not anticipated to occur.	Department of Climate Change, Energy, the Environment and Water (DCCEEW)
National Greenhouse and Energy Reporting Act 2007	An Act that requires operators who generate emissions over a threshold to report information related to greenhouse gas emissions, greenhouse gas projects, energy consumption and energy productions of corporations. The Act also introduces a Safeguard Mechanism aimed to reducing emission from large industrial facilities. It sets legislated limits—known as baselines—on the greenhouse gas emissions of these facilities. The Safeguard Mechanism applies to industrial facilities emitting more than 100,000	All energy consumption and greenhouse gas data used/generated form this activity will be reported as required in accordance with this Act. Upon exceeding the 100,000 tonnes CO_{2e} trigger in a given financial year, all emissions in that financial year and subsequent financial years will be required to be offset.	DCCEEW

Legislation	Requirement	How Tamboran meets the requirement	Administered by
	tonnes of carbon dioxide equivalent (tCO_2-e) per year. The safeguard requires that all emissions form the Beetaloo basin be offset with ACCUs once the 100,000 tCO_2e trigger is exceeded.		
National Environment Protection Council Act 1994 (National Environment Protection (Assessment of Site Contamination) Measure 1999) (NEPM)	This Act provides a nationally consistent approach to the assessment of site contamination to ensure sound environmental management practices to protect human health and the environment.	Tamboran uses the NEPM to assess risk of contamination and determine disposal requirements.	DCCEEW
Native Title Act 1993	Legislation that provides for ways in which future dealings affecting native title may proceed and the recognition and protection of native title. The Right to Negotiate requirements are the most relevant provisions applying to Tamboran's exploration activities.	The Right to Negotiate process was applied to the grant of Tamboran's permits, resulting in Section 31 Agreements and Exploration (Ancillary) Agreements covering Tamboran's permits. The traditional owners were and continue to be represented by the NLC. Tamboran continues to implement the Exploration Agreements, with all work programs being reviewed and approved by traditional owners. This includes engagement with the NLC as the nominated representative of the Native Title Holders (NTH). Tamboran has engaged with traditional owners on the activities proposed in this EMP in accordance with the requirements of the Exploration Agreement. This includes on country meetings where the proposed activities covered under this plan have been discussed.	Prime Minister and Cabinet (Divisions 6 and 7 of Part 2, and Part 11) Attorney-General's Department (except to the extent administered by the Minister responsible for Indigenous Affairs)

2.1 Mineral Titles Act Approvals

As noted in Table 2, the *Mineral Titles Act* (MTA) provides the process for obtaining extractive mineral titles which are required for the exploration and development of extractive mineral resources (including sand). Tamboran considered siting the SWP on an extractive mineral title specifically granted for that purpose, however the MTA has a number of limitations which would limit/preclude the proposed activity.

Tamboran considers that the authorisation of the SWP via this EMP to be appropriate and lawful for the following reasons:

- The construction and operation of the SWP facility constitutes an activity that is proposed to be carried out in connection with a technical works programme for a petroleum interest, and is therefore a regulated activity under the Petroleum (Environment) Regulations 2016.
- Suitable sand that is incidentally extracted during construction of Tamboran's approved petroleum activities will form part of the raw sand feed to the SWP. Extraction of this material is not considered to be 'mining' under the MTA and does not require a mineral title.
- The MTA does not allow for extractive minerals to be moved from either an Extractive Mineral Permit (ExtMP) or Extractive Mineral Lease (EML) to another granted EML for processing, storage and removal. This would mean material supplied to Tamboran from a third-party owned extractive mineral title could not be transported to a SWP EML for processing.
- The MTA does not allow for an EML to t be granted solely for purposes that are ancillary to the mining of extractive minerals (e.g. a stand-alone wash/processing plant without a quarry/mine).

Due to these reasons, an EMP under the Petroleum (Environment) Regulations 2016 is the appropriate approval pathway for the regulated activity.

2.2 Ecologically Sustainable Development (ESD)

The EMP is consistent with the principles of ESD through the adoption of responsible practices that are designed to maximise social benefit, while minimising the level of impact on the surrounding ecosystems.[6]

Tamboran's exploration and appraisal activities align with the principles of ESD:

- Exploration activities are an essential step in defining a potential future commercial resource which can generate sustainable, long-term benefits to the local community, to the Barkly region generally and more broadly into the rest of the NT (principles 1, 2, 3 and 5).
- Complying with the Code and industry best practice to reduce the risk to the environment and communities to an acceptable level. Noting the Inquiry Panel's Final Report Statement that "… provided that all of the recommendations made in this Report are adopted and implemented in their entirety, not only should the risks associated with an onshore shale gas industry be minimised to an acceptable level, in some instances, they can be avoided altogether." (Scientific Inquiry into Hydraulic Fracturing in the Northern Territory 2018) (all ESD principles).
- The activities that are the subject of the EMP do not constitute threats of serious or irreversible environmental damage and there is no impact on the conservation of biological diversity and ecological integrity (principles 2, 4, 6 and 7). This has been confirmed through various inquiries/ research program including the independent Scientific Inquiry into Hydraulic Fracturing of Onshore Unconventional Reservoirs in the Northern Territory and Commonwealth Geological and Bioregional Assessment Program.

[6] Referred to in the NT Petroleum (Environment) Regulations 2016 and the *Petroleum Act 1984* and set out in sections 18 to 24 of the *Environment Protection Act 2019*.

- Beyond royalty payments to the NT Government (as owner of the natural resource), and payments to Native title holders (as per Exploration Agreements) and host pastoralists (as per Access and Compensation Agreements), Tamboran seeks to maximise broad-based local participation in education, training, employment and enterprise opportunities engendered by its presence (principles 1 and 5).
- Prioritising the use of local employment to deliver exploration activities (principles 1 and 5).
- Obtaining sacred site clearances from host traditional owners through open engagement with custodians, the statutory representative body – the NLC and AAPA (principles 1, 4 and 5).
- Obtaining Land Access Agreements with host pastoralists (principles 1 and 5).

3 Description of regulated activities

3.1 Activity summary

This EMP covers the regulated activities required to enable Tamboran to construct and operate the SWP within the SS E&A program area over an initial period of 5 years, as summarised in Table 5 and shown in Figure 6.

The planned activities include:

- Site establishment for the SWP site including clearing, topsoil stripping, fencing.
- Civil construction for the SWP site including:
- Earth works to contour and grade the wash plant and stockpile pads and access tracks
- Gravel sheeting of access tracks and mobile plant work areas as required
- Excavation of settlement, decant and raw water basins
- Installation of raw water pipeline, pumps, groundwater bores (if required)
- Installation of minor administrative facilities – temporary site office, ablutions block, and ancillary services.
- Mobilisation and installation of a mobile/modular SWP including:
- Mobilisation to site and installation on prepared pad
- Operation and maintenance of the SWP including:
- Stockpiling of raw sand for processing
- Processing of raw sand
- Stockpiling and load-out of washed sand to well pads as required
- Management and recycling of 'reject' sand and process water
- Ancillary activities including:
- Use of existing approved camp facilities
- Use of existing approved gravel pits
- Use of existing property access tracks
- Extraction of groundwater under existing WELs
- Demobilisation and rehabilitation of the wash plant site:
- Demobilisation of mobile/modular SWP and buildings
- Rehabilitation to meet the mandatory requirements described in Cl A.3.9 of the *Code of Practice: Onshore Petroleum Activities in the Northern Territory* (the Code).

Table 5: Site activity summary

Activity	Parameter	Description
Site establishment, construction and wash plant installation	11.2 ha of land clearing	• Construction of a temporary wash plant and ancillary infrastructure at a site located ~50 m to the west of the existing Kyalla 117 N2 well pad, including: ○ Construction of an ~11.2 ha pad to house the SWP, water storages/ recycling and sand stockpile area,

Activity	Parameter	Description
		including fencing, land clearing, topsoil stripping and grading. ○ Construction of site entry and exits points from existing adjoining pastoral assess track. ○ Construction of in-ground water management infrastructure including settlement basins, decant water ponds and raw water ponds. ○ Installation of a mobile/modular sand wash plant, including screens, wash plant and stackers. ○ Construction of raw sand stockpile area and product sand stockpile areas (including temporary/deployable covers as required). ○ Construction of temporary site office, ablutions block, crib hut, potable water tanks, as required. ○ Construction of a ~500 m access track connecting the existing pastoral track to the site. ○ Installation of a predominantly above-ground raw water pipeline from water extraction bores on the existing Kyalla 117 N2 well pad to the raw water pond. Up to two additional bores may be constructed on the SWP site. The raw water pipeline will only be trenched/buried fro short distances (<20m) under access tracks. Trenches will be open for short duration (~1 hour) with plant and personnel in attendance and will pose negligible risk of fauna entrapment.
	Access tracks	• Use of existing access tracks approved under the TAM1-3 EMP[7] which adjoin the SWP site and require no additional surface disturbance.
	Gravel pits	• Gravel will be sourced from Tamboran's existing approved gravel pits on EP 117 (SSGP1 and SSGP2), approved under the TAM1-3 EMP.
SWP operation	Up to 1 kt/day	• Operation of the mobile/modular sand wash plant, including screening, washing, conveying and storage of sand. • Production of up to 1 kt/day of product sand from a small mobile/modular wash plant. • Sand washing may be undertaken on either a 'campaign' or ongoing basis. • Processing of up to 70 kt of raw sand in 2025, increasing to approximately 150 kt of sand in 2026, with volumes for subsequent years dependent on proppant requirements for Tamboran's E&A activities. Raw sand may be sourced from various locations including: ○ Suitable sand that is generated incidentally during construction activities associated with Tamboran's approved activities within EPs 76, 98 and 117.

[7] *Beetaloo Basin Shenandoah South E&A Program EMP (TAM1-3)*, approved on 23 May 2024 (hereafter referred to as 'the TAM1-3 EMP').

Activity	Parameter	Description
		○ Suitable sand that is extracted from granted Extractive Mineral Titles held by entities associated with Tamboran*. ○ Suitable sand that is sourced from Extractive Mineral Titles held by third parties*. • The proportion of each raw sand source (as listed above) to be processed through the SWP will be dependent on the physical characteristics of the raw sand and the demonstrated ability of the SWP to process it to produce a suitable proppant material. • Operation of mobile plant, including trucks, front end loaders and supporting equipment • Stockpiling and storage of product sand (covered as required). • Load-out of product sand from product stockpile (loader into haul truck). • Diesel power generation. • Extraction and use of groundwater from approved WELs. • Management and recycling of SWP water, including management of fine 'reject' material (organics, clays, silts, ultra fine sand) in settlement basins. • Stockpiling of separated coarse reject sand for future rehabilitation works. • Servicing and maintenance of plant and equipment. *Sand extracted under Extractive Mineral Titles will be authorised under the relevant assessment and approval processes under the *Mineral Titles Act* and are therefore separate to the SWP scope.
Site rehabilitation		• Drying out of solids (organics, clays, coarse and fine reject material) within sumps/basins. • Removal of wash plant and other ancillary infrastructure. • Backfilling basins/ponds, grading and recontouring to the desired final landform, re-spreading topsoil, re-seeding (where identified during rehabilitation monitoring as a necessary action) and raking back felled vegetation. • Ongoing monitoring and maintenance.
Environmental monitoring	SWP site	• Monitoring activities (including vegetation clearing, soils, weeds, groundwater extraction and other low impact ancillary data collection programs).
Traffic	7 traffic movements per day	• Up to 7 traffic movements per day during site mobilisation and demobilisation. • Up to 4 traffic movements per day during washing operations.
Groundwater extraction	<100 ML/annum	• Use of existing water extraction bores located on the adjacent Kyalla 117 N2 well pad and/or up to 2 new groundwater bores within the SWP site. • Groundwater extraction under existing groundwater extraction licence (WEL GRF10285).

Activity	Parameter	Description
		• <100 ML/year of raw water required for wash plant due to water recycling from settlement basins for wash plant operation and other activities such as dust suppression.
Greenhouse gas emissions	Peak emission 2,616 tCO_2/annum	• All emissions in a financial year (FY) will be offset where the facility-specific 100 $KtCO_2e$ safeguard trigger is exceeded. • Tamboran will offset a percentage of residual emissions in alignment with the NT Net Zero Policy.

3.1.1 Vehicles and Workforce

Personnel numbers required to support the SWP activities will vary dependant on the specific activities being undertaken. As previously noted, the wash plant may be operated either on a 'campaign' or ongoing basis, depending on the sand volumes required for the ongoing E&A activities.

The estimated workforce numbers for the SWP activities are provided in Table 6, and will be a minimum 30:70 split between interstate and local hire respectively.

Table 6: Workforce numbers for SWP activities

Activity	Workforce
Site establishment and construction	6
Site operation	4
Sand haulage ('campaign' haulage of product sand to nearby well sites for use in well completions)	6
Site demobilisation and rehabilitation	6
Support operations (i.e. camp operations crew, paramedic, environmental monitoring etc.)	6
Cultural managers	4
Total workforce (non-concurrent)	**32**

The estimated number of vehicles required to conduct the SWP activities are provided in Table 7.

Table 7: Vehicle type and numbers for SWP activities

Vehicle	Quantity
Site establishment and construction	
4x4 dual cab vehicle	3
Dozer/loader	2
Mobile/modular SWP mobilisation	1
Total	**6**
Site operation	
4x4 dual cab vehicle	3
Dozer/loader	2
Mobile/modular WSP (trailer mounted)	1
Water truck (fire tender and dust suppression) (shared resource)	1
Total	**7**
Sand haulage (campaign basis)	

Haulage trucks	6
Total	**6**
Site demobilisation/rehabilitation	
Dozer/loader	2
4x4 dual cab vehicle	3
Mobile/modular SWP demobilisation	1
Water truck (fire tender, dust suppression and ground stabilisation)	1
Total	**7**
Total vehicles (non-concurrent)	**26**

3.2 Schedule

Estimated key activity dates and timeframes for the SWP establishment and operation are provided in Table 8.

The below timeframes and order of activities are indicative, with final dates and decision to complete activities dependent on a range of additional considerations, including approvals, access, commercial and joint venture constraints. The SWP is anticipated to be established as a 2-year trial to prove the concept of washing locally sourced sand to support E&A activities. The ultimate duration and extent of the sand washing activities will be dependent on the success of the initial sand washing trial onsite and the volume of sand required for Tamboran's E&A activities.

The initial site establishment and construction of the site will occur relatively quickly, involving the installation of a small mobile/modular SWP and various other minor ancillary infrastructure (e.g. water management structures. It is expected that sand washing will commence within a month of the commencement of clearing of the SWP site.

Depending on the success of the trial and ongoing proppant requirements for Tamboran's E&A completion activities, sand washing may be undertaken either on a continual or 'campaign' basis across the 5-year period. Where the SWP is not being used for an extended period (likely >3 months), it may be temporarily demobilised from the site. During these periods, the site will be placed on care and maintenance until such time as the SWP is remobilised back to the site.

Following permanent cessation of sand washing at the site, the SWP and associated facilities will be demobilised and the site will be rehabilitated. Upon completion of rehabilitation of the site, an ongoing monitoring program will be conducted to ensure successful restoration of the disturbance areas. It is anticipated that the ongoing monitoring program will be required over 5 years post-activity.

Table 8: Indicative SWP activities

Activity	Estimated Duration	Indicative Timeframe
Site establishment	2 weeks	~October-November 2025
Wash plant/mobile plant mobilisation and installation*	1 week	~October-November 2025
Commissioning*	1 week	~October-November 2025
Initial sand washing trial	10 weeks	~November 2025 – January 2026
Demobilisation	1 week	~January 2026
2026 sand washing	~12 weeks	During the period April-October 2026**
2027 sand washing	~12 weeks	During the period April-October 2027**
2028 sand washing	~12 weeks	During the period April-October 2028**
2029 sand washing	~12 weeks	During the period April-October 2028**
Rehabilitation**	4 weeks	During the period April-October 2030
Rehabilitation Monitoring	Every 6 months for first 12 months following the completion of rehabilitation, then every 12 months over 5 years	Annually for a period of 5 years***

*Activity can occur concurrently with previous activity.
**The SWP assumes the trial is successful and periodic washing of sand for the completion of exploration and appraisal wells will continue on a annual basis (subject to sand demand for E&A activities).
***Dependent on the success of rehabilitation. If data obtained confirms early rehabilitation success, the 5-year duration may be reduced.

3.3 Site setting

3.3.1 Site selection

The proposed SWP site has been selected and sized to enable the establishment of a SWP and all required ancillary infrastructure to support efficient ongoing sand washing operations. The proposed activities will be undertaken on an 11.2 ha site adjoining an existing pastoral access track to the immediate west of the existing Kyalla 117 N2 well pad. The proposed SWP site was selected for the following reasons:

- Proximity to future drilling sites - limiting haulage distance, truck movements and associated noise and dust emissions.
- Proximity to suitable raw sand sources for processing, including sand incidentally extracted during construction activities.
- Availability of services – namely existing groundwater bores at the Kyalla 117 N2 well site.
- Availability and proximity to existing infrastructure – e.g. property access track and camp accommodation and administration facilities near the Kyalla 117 N2 well site.
- Distance from sensitive receptors.
- Slope within the site is extremely flat with <0.5% natural fall.

The selection of the site was undertaken in accordance with the NT Land Clearing Guidelines, with particular attention paid to the implementation of buffers to protect drainage lines, watercourses or sensitive vegetation communities and to improve public amenity (DEPWS 2021a).

Given the proximity of the SWP to existing regulated activities, and the limited scale of the activities to be undertaken under this EMP (i.e. construction and operation of the SWP only, not sand mining), the site location has been adequately assessed through existing noise and air quality impact assessments which have been completed to assess the existing approved E&A activities on receptors, such as homesteads, Aboriginal community living areas and communities. These assessments are provided in section 3.12. The activities to be undertaken as part of the SWP construction and operation are similar to those undertaken as part of the development of a E&A well lease pad (e.g. the adjoining Kyalla 117 N2 lease pad) – i.e. clearing, topsoil stripping, excavation of sumps/basins, handling and stockpiling of excavated material, etc.

Approximate separation distances to the nearest environmental and community receptors from the SWP site, including other Tamboran sites, are shown in Figure 4 and summarised in the following sections.

3.3.2 Location and disturbance summary of activity

The proposed location relative to Tamboran's other approved regulated activities is summarised in Table 9 below, with the location of the regulated activities illustrated previously in Figure 4. It is expected that no more than 11.2 ha of vegetation clearing will be required for the SWP activities.

It is noted that the disturbance summary is based on the SWP site footprint and does not include incidental disturbance associated with felled vegetation that may be pushed beyond the line width. As the felled vegetation will be returned to the site during rehabilitation, it is anticipated that impacts from this activity will be negligible.

Table 9: Approximate location of SWP site and other Tamboran approved infrastructure

Infrastructure	EP	Zone*	Easting (approx.)	Northing (approx.)
SWP site	117	53	355995	8137514
Kyalla 117 helipad, camp pad and access tracks**	117	53	356379.72	8137498.48

Infrastructure	EP	Zone*	Easting (approx.)	Northing (approx.)
Gathering line: Kyalla 117 N2 to/from Shenandoah S2 (start to end)**	117 & 98	53	356274 355060	8137505 8140071
Shenandoah S2 well pad, camp pad and access track**	98	53	355291	8140676
SPCF site**	98	53	355194.96	8141323.49
SPCF camp**	98	53	355408.98	8141316
Gravel pit SSGP1**	117	53	333877.96	8135080.04
Gravel pit SSGP2**	117	53	362753.93	8135089.25
*Universal Transverse Mercator (UTM) geographic coordinate system is Geocentric Datum of Australia (GDA) 94. **Previously approval under the TAM1-3 EMP.				

3.3.2.1 Surface disturbance – cumulative impact

As outlined above, an additional disturbance of 11.2 ha is proposed under this EMP for the SWP. The combined surface disturbance from all Tamboran B2 Pty Ltd activities is approximately 415 ha across 3 EPs (18,555 km^2), or ~0.02% of the total EP surface area, including the SWP site.

The cumulative impact of disturbance from Tamboran B2 Pty Ltd and third-party operators has been progressively assessed. **Table 10** shows the estimated cumulative clearing across Tamboran's and neighbouring EPs by onshore petroleum operators. Onshore petroleum activities have a disturbance of approximately 0.03% of the total surface area of all current operational EPs. This figure (~1,112.35 ha) is highly conservative, as it indicates approved clearing areas and not actual clearing undertaken to date. Compared to the approved clearing (2003 – 2025) on neighbouring pastoral stations within the Barkly/Gulf districts (~26,000 ha), land clearing for onshore petroleum activities is negligible.[8]

Table 10: Approximate cumulative surface disturbance (%) vs EPs (all interest holders)

Interest holder	EP	Exploration permit areas		Clearing	Land clearing
		km^2	ha	ha	%
Tamboran	117	6,375	637,500	182.80	0.029
	98	10,300	1,030,000	224.90	0.022
	76	1,880	188,000	7.65	0.004
Sweetpea (a wholly owned subsidiary of Tamboran)	136	4,181	418,100	212.00	0.051
Santos	161	13,350	1,335,000	233.00	0.017
Imperial	187	2,998	299,800	252.00	0.084
TOTAL		**39,084**	**3,908,400**	**1,112.35**	**0.028**

[8] See pastoral land clearing applications and permits: https://nt.gov.au/property/land-clearing/pastoral-land/pastoral-land-clearing-applications-and-permits.

3.3.3 Proximity to sensitive receptors

The SWP area predominantly consists of open woodlands consisting of mixed Eucalyptus/Corymbia species with a mixed tussock grass understorey. Scattered stands of Lancewood (*Acacia shirleyi*) and Bullwaddy (*Macropteranthes kekwickii*) vegetation communities also occur throughout, along with individuals of each species dispersed throughout. In the wider landscape, additional vegetation communities associated with drainage lines, grasslands/floodplains and *Acacia* sp. shrublands also occur and are well represented across the region.

Approximate separation distances to the nearest environmental and community receptors are illustrated in Figure 5 and summarised in Table 11.

Table 11: SWP site proximity to environmental and community receptors

Sensitive Receptor	Distance from SWP activities (approximate)
Closest pastoralist bore - Hayfield	20 km north-west
Nearest homestead - Hayfield	20 km north-west
Nearest community - Daly Waters	70 km north-west
Nearest Service Station – Dunmarra Roadhouse	30 km north-west
Jingaloo community living area	30 km south
Lily Hole community living area	42 km south
Stuart Highway	24 km west
Carpentaria Highway	61 km north
Bullwaddy Conservation Reserve	76 km north-east
Frew Ponds Reserve	27 km south-west
Lake Woods	101 km south
Nearest mapped major watercourse	19 km
Aquatic ecosystem (SREBA 2023) (P = Palustrine system and F = Floodplain system)	There are no palustrine or floodplain systems in the vicinity of the SWP.
Archaeological site	No archaeological sites recorded

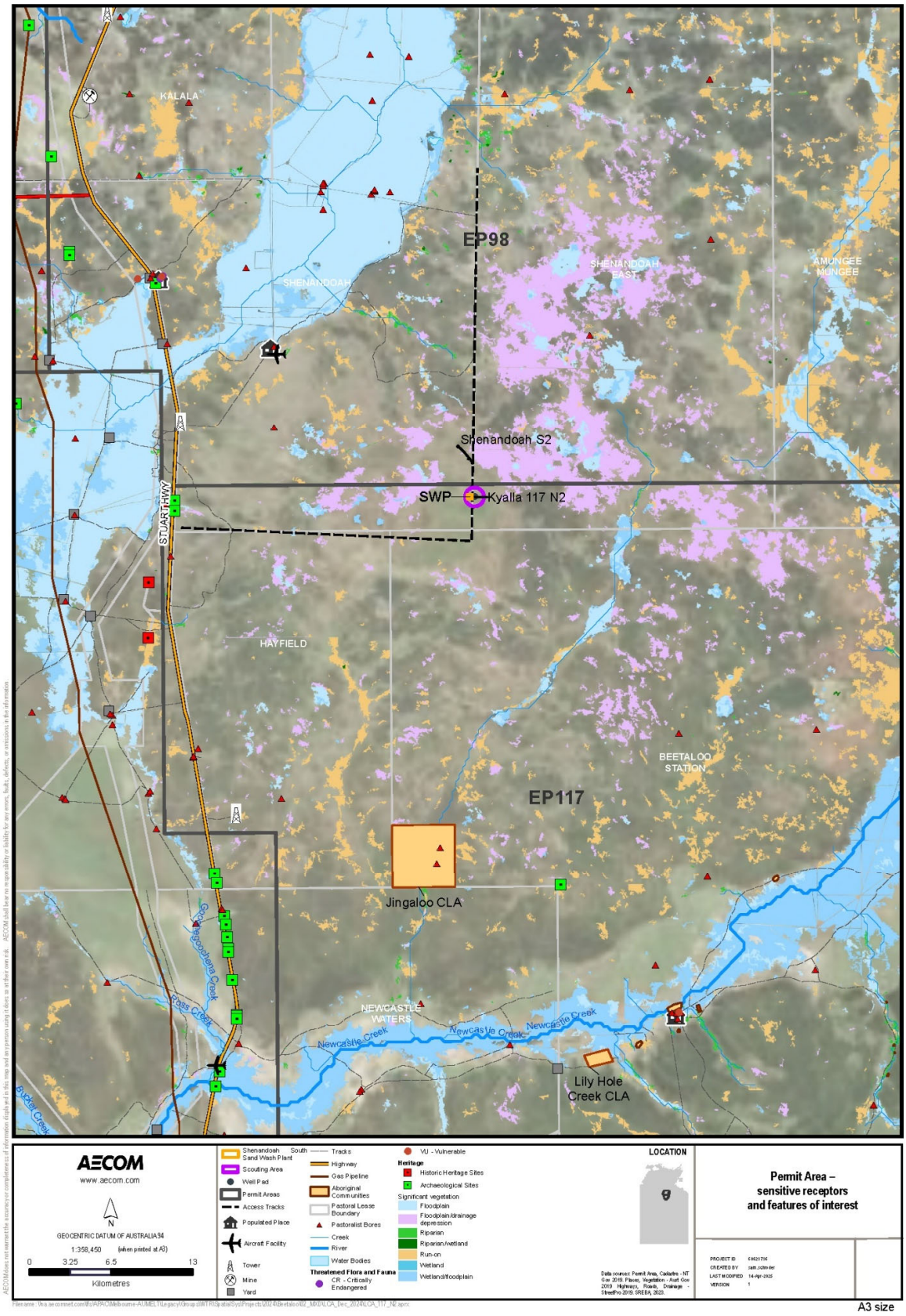


Figure 5: Proximity of SWP to sensitive receptors and features of interest

3.4 Site establishment, construction and installation

The SWP site has been selected and sized to enable the establishment of a wash plant and all required ancillary infrastructure to enable its ongoing operation (Figure 6). Initial construction activities within the wash plant site will include the following:

- Site establishment including:
- Land clearing and topsoil stripping of initial 5.2 ha trial area
- Construction of a fence line / firebreak around full 11.2 ha SWP site
- Construction of a bund around the perimeter of the site to prevent livestock access and overland flow entering the site.
- Civil construction including:
- Surface preparation for the SWP and stockpiling pads, including grubbing, grading, sheeting areas with gravel and compaction as required.
- Excavation of wash plant water management infrastructure, including settlement basins, decant water ponds and raw water ponds. Tamboran will progressively construct basins and ponds within the approved disturbance area on an as-required basis, rather than fully install during the initial construction activities.

The indicative location for the initial settlement basins and decant/raw water ponds were previously shown in Figure 6. Ongoing wash plant operations will require the periodic installation of replacement basins and ponds within the footprint of the 11.2ha wash plant site. The initial settlement basins have been sized to enable the storage of the expected volume of reject material and process water from the initial SWP trial. This will result in an initial site clearance of approximately 5.2 hectares in year 1, increasing to 11.2ha (total inclusive) by year 5 should the trial be successful. Sand extracted during the SWP construction (incidental construction sand) may form part of the raw sand supply for the initial SWP operation if suitable.

- Installation of minor support facilities – demountable site office, crib hut, ablutions block, potable water storage, etc.
- Construction of access tracks connecting the SWP site to the existing pastoral tracks.
- Construction of a ~500 m temporary above-ground/partially buried raw water pipeline to transfer bore water from existing extraction bores on the Kyalla 117 N2 site to the SWP. If required, up to two additional bores may be constructed on the wash plant site.
- Installation/delineation of work areas and stockpile areas through the installation of barriers/bunding.

- Mobilisation and installation of a mobile/modular SWP, including screens, stockpiling conveyors and connection to services (e.g. raw water supply).

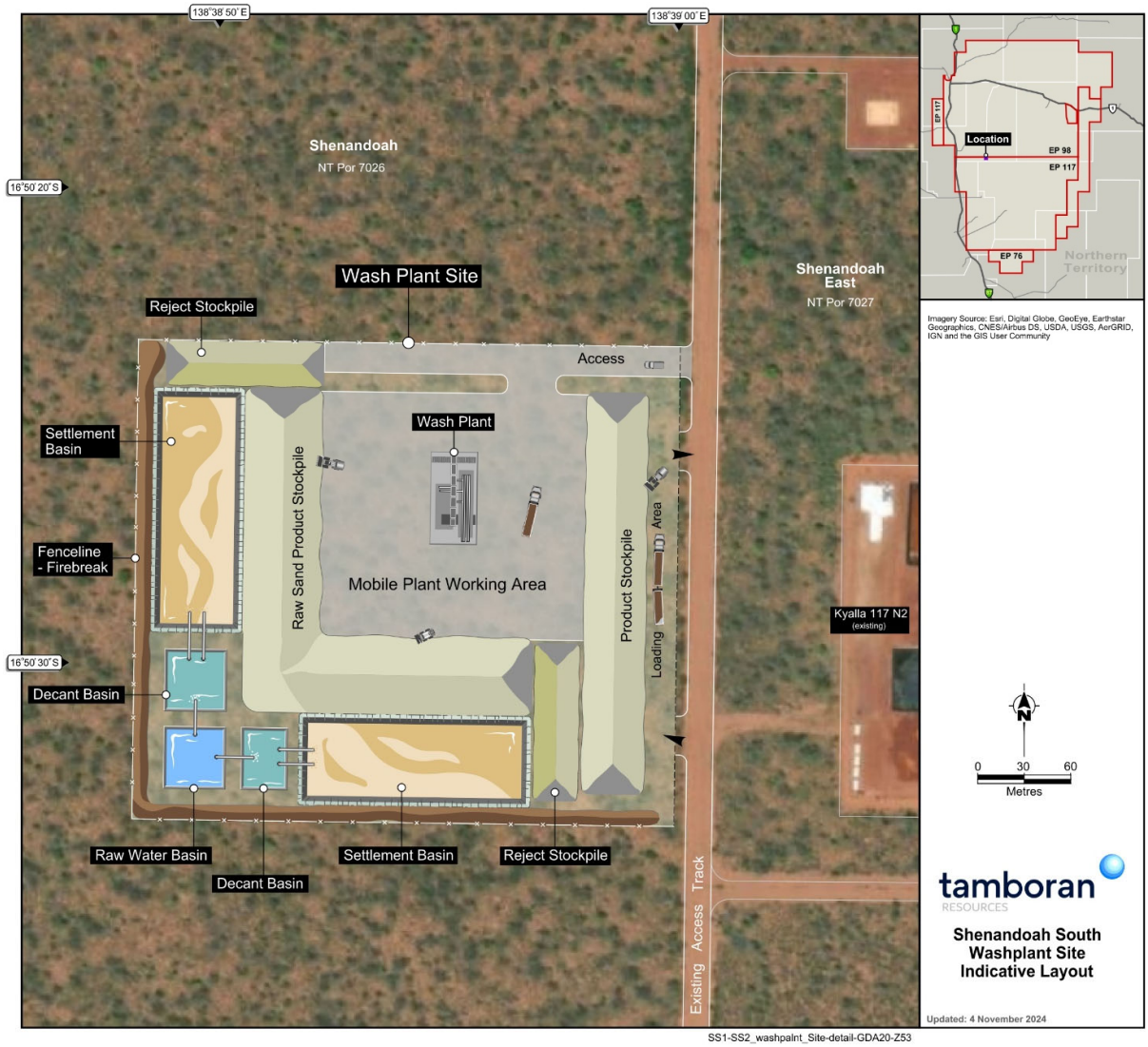


Figure 6: SWP indicative site layout once fully constructed

3.5 Raw sand supply

To be suitable for use as hydraulic fracturing proppant, product sand must meet a range of specifications. These specifications include (but are not limited to):

- Particle Size Distribution (PSD)
- Crush resistance
- Sphericity/roundness
- Acid solubility

Many of these parameters are directly related to the physical qualities of the raw source sand. As such, not all raw sand sources can be processed to produce a product sand that meets the required specifications to be suitable for use in hydraulic fracturing. The key parameter that requires raw sand to be washed is the required PSD range, which requires the removal of oversize (coarse sand) and undersize (very fine sand, silts, clays) material.

Suitable raw sand to feed the SWP may be obtained from a variety of sources, including:

- incidental sand generated during Tamboran's construction activities within EPs 76, 98 and 117. It is noted that the construction activities related to Tamboran's wider petroleum activities typically result in a net excess of material being available, mainly due to the generation of drill cuttings from down-hole, which are permanently deposited into drilling sumps. Much of the material removed from the initial sump construction is therefore surplus material and its use (if suitable) as raw sand to be processed through the SWP will not result in a deficit of material required for the rehabilitation of Tamboran's petroleum activities;
- sand sourced from existing/new extractive mineral titles held by entities associated with Tamboran locally/ regionally;
- from existing/new extractive mineral titles held by third parties locally/ regionally.

Raw sand generated during Tamboran's construction activities in the Shenandoah South area will likely form a significant part of the raw sand supply to the SWP. Samples of raw sand from areas which have/will be extracted during Tamboran's construction activities has been analysed by x-ray fluorescence (XRF), which indicates the material is predominantly silica dioxide, with other metal oxides present in minor quantities (primarily aluminium oxide and iron oxide), as shown in Table 12.

Table 12: Mean XRF Results for Sand Samples

Sample Count	Al_2O_3	BaO	CaO	Cr_2O_3	Fe_2O_3	K_2O	MgO	Na_2O	SiO_2	TiO_2	Acid Solubility	Loss on Ignition
#	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(Wt. % Dry Wt.)
44	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

In 2024, a detailed analysis of samples from the nearby Sturt Plateau Compression Facility (SPCF) site (~3 km to the north of the SWP) was undertaken by Douglas Partners on behalf of Tamboran (see Appendix L). The SPCF site has the same soil unit present as the SWP site, and excess material from this site (and the immediately adjacent Shenandoah South 2 well pad which to date has ~15kt of excess material stockpiled) will likely be processed through the SWP as part of the raw sand supply.

The samples were extracted from test pits within the SPFC site, primarily for geotechnical and engineering testing for design of the SCCF, however preliminary contamination testing was also undertaken of the samples which included:

- Physical Chemistry (pH, EC and TDS-(1:5 and SE), dispersivity)
- Major ions (sodium, magnesium, potassium, calcium, chloride, carbonate, sulphate, borate, bicarbonate, Cation Exchange capacity (calc), SAR (calc))
- Nutrients
- Metals/ metalloids (Aluminium, Arsenic, barium, boron, Cadmium, chromium, copper, fluoride, iron, lead. Manganese, mercury nickel, Strontium, zinc)
- Leachability (Aluminium. Arsenic, barium, boron, Cadmium, chromium, copper, fluoride, iron, lead. Manganese, mercury nickel, Strontium, zinc)
- Total recoverable hydrocarbons (TRH)
- Polycyclic aromatic hydrocarbons (PAH)
- Monocyclic Aromatic hydrocarbons (MAH)

- Benzene, toluene, ethylbenzene, xylenes, naphthalene (BTEXN)
- Per- and polyfluoroalkylated substances (PFAS).

The samples analysed were primarily from <4 m depth (i.e. the likely horizon from which material extracted during construction activities would be used as raw sand for the SWP), at which depth the material is primarily silty sands and clayey sand. Material in this horizon were described as:

- **Surface Layer (Unit 1):** The surface layer ranged in thickness from 0.2 m to 0.4 m, and comprised Silty Sand; low plasticity silt with some roots, noting that surface vegetation had been stripped but minimal organic matter was present.
- **Residual Sand (Unit 2):** Encountered in all boreholes and test pits underlying the topsoil, between 2 m and 4 m thickness, and comprising Clayey Sand (SC), with gravel: red-brown; fine to coarse grained; loose to medium dense; fine to medium grained, subrounded, pisolitic gravel.

Physico-chemical results from samples in the target horizons are reproduced in Table 13. The contamination testing further indicated that VOCs, TRH, TPH, PAH, MAH, BTEX and PFAS levels were below the limit of detection for all samples. Sulphides were noted as absent for all samples.

Table 13: Physico-chemical test results for sample from the SPCF site

Sample	Depth (m)	Soil Description	Chloride (mg/kg)	Sulphate (mg/kg)	pH	EC (µS/cm)
TP01	0.1-0.2	Silty SAND	<10	<10	5.9	9
TP01	0.5-0.7	Clayey SAND	<10	<10	6.4	9
TP02	1.0-1.3	Clayey SAND	<10	<10	6.4	6
TP02	2.0-2.2	Clayey gravelly SAND	<10	<10	6.2	4
TP03	1.5-1.7	Clayey SAND	<10	<10	6.0	3
TP03	2.0-2.5	Clayey Sandy Gravel	<10	<10	5.9	3
TP05	0.8-1.0	Clayey SAND	<10	<10	5.9	5

For clarity, any sand extracted from a granted extracted mineral title, obtained from a third-party or incidentally extracted during construction associated with a previously approved regulated activity is not subject to this EMP. Any raw sand sourced from extractive mineral titles and/or third parties outside the Shenandoah South area will be subject to a number of different tests to determine its suitability for processing for use as a proppant, including XRF and acid solubility testing. Tamboran will also conduct due diligence investigations on the raw sand extraction site, including reviewing relevant public registers and other resources, and seeking a declaration from the vendor that the material is contamination-free.

3.6 SWP site operation

Following the completion of civil construction of the site and installation of the SWP, the facility will become operational and washing of raw sand will commence. During the operational phase, the following activities will be ongoing:

- Raw sand delivery (to be obtained from various sources as discussed in Section 3.5) to the raw sand stockpiles.
- Extraction of groundwater from existing bores on the Kyalla 117 N2 pad and pumping to the raw water pond via the installed raw water pipeline.
- Screening and washing of raw sand using the mobile/modular SWP (Figure 7 and Figure 8). A sand wash plant is typically configured based on the specific characteristics of the raw sand to be washed, as well as the required specifications of the product sand, but will typically involve multiple stages/components including (but not limited to):

  - raw material hoppers and conveyors
  - raw water supply inlet
  - initial oversize material screens
  - wet screens with spray bars
  - screw/other classification
  - spirals/hydrocyclones
  - dewatering screens
  - process water outlet
  - product and reject sand conveyors.
- Stockpiling and storage of product sand, primarily using loaders to manage stockpiles. Product sand stockpiles may be covered if required.
- Load-out of product sand primarily using loaders to load haul trucks to move product sand to the point of use via pastoral access tracks.
- Stockpiling of separated coarse sand for future rehabilitation works.
- Management and recycling of SWP process water and entrained fine 'reject' material, including water pumping, settlement of solids from water (including flocculation if required) and recovery of process water for reuse. As noted in Section 3.4, installation and alteration of existing settlement basins and decant/raw water ponds may be ongoing during the operational phase as required, while periodic removal of deposited sediment from retention basins to maintain capacity and freeboard may also be undertaken if required. Any sediment that has been removed from a settlement basin during operations will be stored adjacent to the settlement basin such that any run-off from the stockpiled material will report to the settlement basin. Sediment that has been removed from a settlement basin (that is not utilised elsewhere for TBNs activities) will ultimately be re-deposited in a settlement basin during rehabilitation. The material will be deposited to a minimum depth of 0.6m below natural ground level, which is beyond the root zone of the typical grass and shrub species which will establish during rehabilitation. Depending on availability, the fine material may be further blended with coarse reject material or settlement basin embankment material to achieve a suitable rehabilitation media, reducing the risk of poor vegetation establishment post rehabilitation.
- Ongoing servicing and maintenance of the wash plant and other plant and equipment as required.
- Where the wash plant is sufficiently mobile and is only used on a temporary 'campaign washing' basis, Tamboran may elect to temporarily demobilise the wash plant when it is not required; and remobilise for future washing campaigns. During periods where the wash plant has been demobilised, the remainder of the wash plant site will be retained and placed into care and maintenance until such time as the wash plant is remobilised and washing recommences.

Tamboran intends to use the SWP to process approximately 70,000 t of raw sand to meet its 2025 completions program requirements, and up to 150,000 t of raw sand for its 2026 completions program. The volume of raw sand required to produce these quantities will be dependent on the yield of the required PSD range that can be extracted from the raw sand. Yields of between 50 – 70% would be considered typical.

Future years sand production volumes will be dependent on the scale of the E&A activities that are proposed to be undertaken at that time.

Figure 7: Example of a mobile sand wash plant

Figure 8: Example of a modular sand wash plant

3.6.1 Wet season operations

Ground conditions following rainfall events across the region can make ongoing operations difficult. Installation and operations within the SWP area are anticipated to occur predominantly during the dry season. However, in the event sand washing activities are required to be undertaken into the wet season (1 October to 30 April inclusive as defined by the Code) the following wet weather contingencies have been identified in the erosion and sediment control plan (ESCP) (Appendix E) and below:

- Wet weather contingency procedures to be implemented from 1 October to 30 April.
- 7-day forecast from the Bureau of Meteorology (BOM) to be monitored, and operations planned around the forecast.
- Weather monitoring to commence prior to mobilisation to site and continue daily from commencement of site works.
- Where forecasts indicate rainfall is likely to result in an event that has potential to limit access to the work area, wash plant personnel will stabilise the current work areas and go into standby mode until such time they can assess ground conditions to recommence activities.
- Emergency response – a post-rainfall/flood damage reconnaissance and assessment will be completed once the area is accessible. Any damage observed would be repaired as soon as practicable after the event.

Where required, areas within the SWP site (e.g. access road, mobile plant work areas) will be sheeted with hardstand material to enable all-weather operations.

3.7 Support activities

The following support activities will be required for the implementation of the SWP.

3.7.1 Water supply and use

Raw water sourced for the SWP activities will likely be extracted from the existing Gum Ridge Formation extraction bores located at the existing Kyalla 117 N2 location. Additional extraction bores may be constructed for efficiency (i.e. to meet required raw water input flow rates, minimise pumping distance, etc), however these are not anticipated to be required. All water bores constructed as per the Water Act with a valid water bore permit. Any bores constructed to support the exploration activities will be registered and covered by an existing Water Extraction Licence (WEL). The current GRF 10285 WEL statement of reason is available from DLPE Water Resources website at http://www.ntlis.nt.gov.au/walaps-portal/report/current/gwel.

Water use within the SWP will be primarily a function of the SWP throughput rate. The wash plant site has been designed to maximise the reuse of process water through the plant, with a recycling rate of >80% targeted. Based on the likely sand requirements for the ongoing exploration and appraisal activities, it is estimated that groundwater extraction will be <100 ML/annum to support the SWP activities.

All groundwater take will be metered with continuous flow meters and reported to DLPE as per the WEL conditions. Water take records will be kept and updated weekly during operation of the SWP, to ensure the water take volumes are not exceeded.

As shown previously in Figure 6, the SWP site has been designed with sufficient water management infrastructure to support its ongoing operations. This includes the provision of raw water ponds, as well as settlement basins and decant water ponds to facilitate ongoing water recycling (refer Section 3.4). While raw water ponds pose no risk to the environment, a 300mm freeboard will be implemented with any overflow to be directed to a settlement basin to minimise water losses. A 300mm freeboard for decant pond will also be maintained, with a spillway to divertto a settlement basin.

3.7.2 Process water and reject management

As previously noted, process water settlement basins will be progressively installed within the SWP site footprint as required, with significant freeboard/excess volumetric capacity to be always maintained. Process water commingled with fine reject material will be pumped from the SWP to the operational settlement basin/s. The settlement basin has sufficient residence time to enable the deposition of most fine sediment from the water column in a subsurface 'beach' which will progressively extend along the settlement basin. Decant supernatant water from the settlement basin will be recovered from the opposite end of the basin from the deposition point and will be pumped/overflow to the decant pond for temporary storage before being reused in the SWP. While not anticipated to be required, a flocculant may be added to assist in the separation and deposition of entrained fine sediment within the settlement basins. In the event a flocculant is required, an environmentally benign, fast-acting liquid product (e.g. 'Turbiclear' or similar) will be used at the required rate.

The settlement basins have been sized and designed to progressively fill with fine sediment until such time as decant water can no longer be efficiently recovered for recycling. The concentrated fines (clays/silts) within the fine reject stream will settle out of suspension in the basins, which will provide a rapid and effective seal to reduce losses of process water through infiltration into the surrounding strata.

The settlement basins are not intended to be desilted during the operational life of the facility; however, some desilting may be undertaken if required. Any sediment that has been removed from a settlement basin during operations will be stored adjacent to the settlement basin such that any run-off from the stockpiled material will report to the settlement basin. Sediment that has been removed from a settlement basin (that is not utilised elsewhere for TBNs activities) will ultimately be re-deposited in a settlement basin to a minimum depth of 0.6m below natural ground level, which is beyond the root zone of the typical grass and shrub species which will establish during rehabilitation. It is noted that this 'fine' material will still retain a proportion of coarse material which is not removed by the SWP.

Coarse reject sand (which will also contain a proportion of finer material which is not separated by the SWP) will be stockpiled separately and will be similarly used to backfill settlement basins or for other suitable purposes. Once a settlement basin is no longer required, a minimum 0.5m thick layer of the coarse reject material will be placed over the deposited fine material. Ongoing SWP operations will likely result in the installation of replacement basins and ponds within the footprint of the SWP beyond those shown in Figure 6.

It is important to note that 'reject' sand generated through the sand washing process is not considered to be waste. This material is predominantly inert silica dioxide (SiO_2) which unsuitable for use solely due to it being outside the required PSD range for use in HFS and is separated from the product sand (proppant) on that basis alone. As the SWP will use an entirely physical wet process to separate the sand fractions, the reject sand will retain a similar chemical composition to the raw in-situ sand and is therefore not expected to have any contaminants which would require specific consideration (as discussed in section 3.5). Process water will, however, be kept separate from the stormwater sediment basins installed and operated as part of the ESCP for the site. Process water is not proposed to be released from the SWP site at any time and is not considered to be 'wastewater' (as defined in section C.2.1 of the Code).

As noted in section 3.5, in 2024 Douglas Partners undertook a detailed soil investigation at the nearby SPCF site, which is in the same soil unit as the SWP site, and from which raw sand will likely be sourced for processing in the SWP. The soil investigation included leachability testing on the extracted sand samples using the Toxicity Characteristic Leach Procedure (TCLP) which uses a weak acidic solution to simulate leaching of industrial wastes under acidic conditions within a putrescible landfill.

The results from the TCLP testing are shown in Table 14. These levels can be used to identify any potential contaminants of concern in the reject material, although given the nature of the reject material (i.e. undersize/oversize silica sand fractions with no waste or chemical products added), and the method of placement/disposal of the reject (i.e. direct placement within settlement basins), this is considered to be a highly conservative approach. The results in Table 14 broadly align with the xrf results summarised in section 3.5.

In the absence of other suitable guidelines for inert reject sand being replaced into excavations, the results contained within Table 14 have been compared with the various health investigation levels (HILs) in the *National Environment Protection Measure on the Assessment of Site Contamination 1999*, with none of the HILs exceeded.

Table 14: Acid Extractable Metals in SPCF soil samples

Your Reference	Units	TP1A	TP1B	TP2A	TP2B	TP3A	TP3B
Depth	m	0.25	0.5	0.25	0.5	0.25	0.5
Arsenic	mg/kg	<4	<4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	67	47	50	44	46	43
Copper	mg/kg	4	2	2	2	2	2
Lead	mg/kg	6	5	4	5	4	4
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	3	2	2	2	2	2
Zinc	mg/kg	1	<1	<1	<1	<1	<1
Phosphorus	mg/kg	40	30	30	20	30	20
Aluminium	mg/kg	2,100	2,800	2,600	3.200	2,500	3,000
Barium	mg/kg	62	25	14	12	16	10
Boron	mg/kg	<10	<10	<10	<10	<10	<10
Iron	mg/kg	13,000	10,000	1200	10,000	11,000	9,100
Manganese	mg/kg	140	71	84	57	120	55
Strontium	mg/kg	10	5	3	3	2	3

3.7.3 Chemical and fuel management

Storage and usage of chemicals during the construction and operation of the SWP will be managed in accordance with the spill management plan (SMP, Appendix F). All reasonable and practicable measures will be implemented to prevent or minimise pollution or environmental harm; and reduce waste). A summary of expected chemical storage on the SWP site is provided in Table 15 and includes the following chemical types:

- Bulk diesel to fuel vehicles and equipment.
- Typical maintenance chemicals including hydraulic oil, coolant, greases, paints, solvents and engine oils.
- Degreasers and domestic cleaning chemicals.

Bulk diesel will be stored onsite in double-lined diesel storage tanks as per AS 1940:2004 - The storage and handling of flammable and combustible liquids. These will be stored within a designated area at the SWP site. A refuelling truck will be used to refuel stationary equipment, which will have dedicated spill containment onboard.

Chemicals will be stored within designated bunded areas and will be routinely inspected. Due to the limited volumes of chemicals stored onsite, portable storage bunds will be used for temporary chemical storages. The storage bunds will be able to contain a volume not less than 120% of the total stored volume.

Table 15: Anticipated chemical volume and storage for the SWP

Material name	Typical volume	Maximum volume	Unit	Storage area
Diesel	22	30	kL	Diesel storage tank
Hydraulic oil	1,000	3,000	L	Adjacent to the SWP
Engine oil	1,000	3,000	L	Adjacent to the SWP
Degreasers	100	300	L	Adjacent to the SWP
Flocculant	1,000	3,000	L	Adjacent to active settlement basin

3.7.4 Waste management

Waste management for the SWP area is summarised in Table 16. Waste is managed in accordance with the internationally accepted guide for prioritising waste management practices, with the objective of achieving optimal environmental outcomes. The remote location of the SWP and limited volume of several of the waste streams that will be generated dictates the practical waste management options available.

Waste will be managed in accordance with the following hierarchy principals:

- **Avoid:** eliminate the generation of wastes through design modification
- **Reduce**: reduce unnecessary resource use or substitute a less resource intensive product or service
- **Re-use**: reuse a waste without further processing
- **Recycle**: recover resources from a waste
- **Treatment**: treat the waste to reduce the hazard of the waste prior to disposal
- **Disposal**: dispose of waste if there is no viable alternative

Waste transfer certificates will be retained and provided to DLPE upon completion of the project.

The volume of waste produced from the activities is likely to be small (<5t/y over the operational life of the facility). All specifically listed wastes (as described in Schedule 2 of the Waste Management and Pollution Control (Administration) Regulations 1998) generated as part of the regulated activity will be removed from the activity area, for disposal or recycling at a licensed facility authorised to receive those wastes (as per the NT EPA listed waste company spreadsheet).

Waste management methods for the proposed wash plant activities are summarised in Table 16. It is noted that existing camps will be used by wash plant personnel for the duration of the activities and a new/additional camp will not be required. Waste generated from the operation of the relevant camp is therefore covered under the applicable EMP for the camp operation.

Table 16: Waste and disposal methods

Activity	Disposal method
Sewage, grey and stormwater	**Treatment:** Sewage, grey water and stormwater treatment covered under separate EMP for camp operations.
Food waste, paper and plastic	**Disposal:** Collected in dedicated waste bins for back-loading to an approved landfill under separate EMP for camp operations.
Glass and cans	**Recycled:** Collected in separate waste bins for recycling at an off-site facility under separate EMP for camp operations.
Chemical bags and cardboard packaging materials	**Recycled:** Collected in separate waste bins for recycling at an off-site facility under separate EMP for camp operations.
Used chemical and fuel drums/IBCs	**Recycled:** Collected in designated skip for recycling at an approved location under separate EMP for camp operations.
Vehicle tyres	**Disposal:** Disposed of at an approved landfill.
Oily rags, oil-contaminated material, filters and any hydrocarbon material	**Recycled/disposal:** Oil from machinery will be collected in suitable containers for disposal at approved landfill or recycled at an approved recycling facility.
Spill contaminated soils and water	**Disposal:** All contaminated material (solids and liquids) will be disposed of off-site at a licenced facility.

3.7.5 Stormwater management

The SWP site will be operated in a manner that minimises the contamination of stormwater and overland flow to the extent practicable. Stormwater runoff in the region is typically characterised by low electrical conductivity (<100 µs/cm) and will contain sediment sourced from the cleared SWP site. The following management measures will be utilised for stormwater management on the site:

- The SWP site is extremely flat with <0.5% natural grade. This means stormwater infiltration will be maximised and the volume and velocity of stormwater run-off will be limited.
- The SWP site has been sited and designed to divert external stormwater around the site to prevent contamination (i.e. perimeter bunds around the SWP).
- Trafficked areas of the wash plant site will be sheeted with gravel for all-weather access where required, which will limit the exposure of erodible material.
- The remainer of the site features in-situ sand at surface which is highly permeable and minimally erodible.
- Stormwater from within the site will be diverted through erosion and sediment control devices/sediment basins to minimise the discharge of suspended solids. The sediment basins will operate independently of the site process water management system which will be designed and operated to prevent releases. Typically, one sediment basin will be in place to manage run-off within the site, with drainage/diversion structures implemented as required to divert stormwater to the sediment basin. Sediment basins will be designed and operated as Type C (per IECA, due to coarse nature of soils) 'fill and spill' type devices, which is consistent with current practice for Tamborans's existing approved sites. Figure 9 shows a typical ESC arrangement within the SWP site, noting that the site will continually evolve within the approved footprint as new settlement and sediment basins are constructed and backfilled, and as stockpiles are constructed and removed, etc.
- Stormwater quality in non-process water impoundments (i.e. sediment basins) will be tested following rainfall events of greater than 20 mm in the first flush and then weekly during the wet season. Stormwater quality parameters for off-site release or use in dust suppression are defined in

Table 17, which are consistent with the criteria for other approved Tamboran EMPs. The rationale for the derivation of these common stormwater limits for Tamboran's EMPs is outlined in section 3.7.5.1.

- The Erosion and sediment control plan (ESCP) (Appendix E) will be fully implemented during SWP operations.

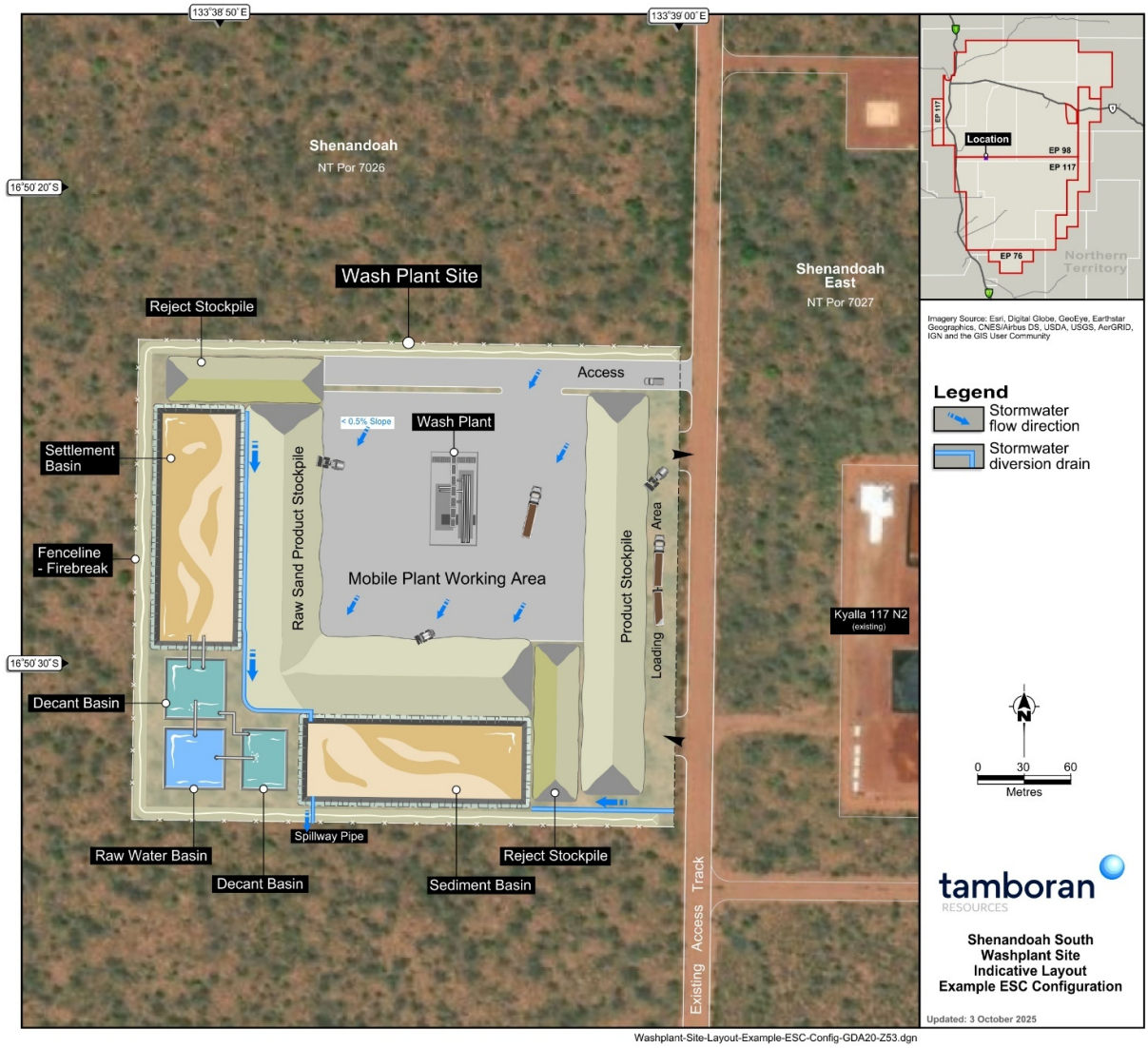


Figure 9: Example ESC Configuration for Indicative SWP Layout

Table 17: Stormwater off-site release and dust suppresion re-use limits

Monitoring parameter	Release limit
Electrical conductivity	1,300 µs/cm
pH	5.2 – 9.0
Visible hydrocarbons, sheens, foaming or discolouration.	No visible oil, grease or other hydrocarbons No visible foams caused by surfactants and detergents No visible abnormal discoloration

3.7.5.1 Stormwater limit justification

The main purpose of monitoring stormwater quality is to identify if stormwater runoff quality has been impacted by sediment and/or process water, oils or chemicals stored within the SWP.

The difference in EC between rainwater, stormwater and other water used on site (such as raw water/process water from the Gum Ridge formation) makes it the most suitable indicator.

EC measurements can be easily collected using standard equipment, is reliable and reproducible. In the unlikely event the EC of stormwater collected in a settlement basin exceeds the limit in Table 14, this will be recorded as an incident and an investigation onto the source of the contamination initiated and additional laboratory testing will be undertaken to determine the source of the elevated level. The stormwater will be tested in accordance with the suite identified in C.8 of the Code. Laboratory testing is not considered an appropriate method of confirming contamination given the long sample analysis times and the inability to hold stormwater for extended periods without impacting the integrity of the site.

The proposed limit of 1,300 µs/cm was chosen as this aligned with the EC of the Gum Ridge formation (the main source of water used on proposed sites and the ANZECC short term irrigation guideline value for moderately sensitive crops (Table 9.2.5 of the ANZEC Guidelines (2000) Volume 3, Chapter 9, Primary industries).

Irrigation salinity values were considered relevant due to the absence of adjacent watercourses, with the protection of soils the most relevant environmental Value (EV). The ANZECC method (and associated references) is the only method available in Australia to evaluate the potential risk of application of water to land. The methods evaluate the impact of water to receptors such as terrestrial ecosystems, crops, and stock. The method is used across Australia for this kind of evaluation.

To assess the potential impact of a stormwater release at the specific limit, modelling was completed to assess the changing soil salinities and the potential for impact on the receiving vegetation types. The model used the maximum observed Gum Ridge Salinity of 1,600 µs/cm (1,046 mg/L Total Dissolved Solids) released over a 5-year period. This included estimates of stormwater collected and discharged from the site over the period. This modelling is extremely conservative as it: a) assumed all water ran off from the site; and b) that all water was of a quality consistent with the Gum Ridge. In theory, the amount of water released from site is likely to be significantly lower and of quality consistent with rainwater.

To understand the sensitivity of the receiving vegetation to salinity, a literature review was completed. The receiving environment is characterised by native grasses (including spinifex and tussock) and trees that are moderately to highly tolerant to salinity.[9] Eucalyptus species are known for their salt tolerance and can withstand salinity levels up to 8,000 µs/cm and greater. For example, *Eucalyptus camaldulensis* is present in the area (Table 19 of the Land Condition Report) is tolerant to salinity up to 8,000 µs/cm.[10] Several of the eucalyptus species in the area including *Eucalyptus microtheca* and *Eucalyptus camaldulensis* are specifically noted in the Salinity Management Handbook (Queensland Government) as suitable for saline discharge sites.[11] Acacia and Melaleuca species found in the area can tolerate at least 2,000 µs/cm and greater than 16,000 µs/cm. *Corymbia* (Bloodwood) generally exhibit moderate to low salinity tolerance compared to eucalypts, yet still greater than 2,000 µs/cm and up to 4,000 µs/cm.

Modelling of 3 scenarios in accordance with ANZECC defined methodology was undertaken using meteorological data, indicative activity sites and indicative data on receiving soils. The scenarios included:

[9] EHS 2024, *Response to Comments on Environment Management Plan for Shenandoah South - Stormwater and Brine releases from Water Treatment Plant (Revision 1)*

[10] https://www.agric.wa.gov.au/soil-salinity/salinity-tolerance-plants-agriculture-and-revegetation-western-australia.

[11] Table 43 Salinity Management Handbook, Queensland.

1. During wet season operations (December to April inclusive), i.e. water is only associated with rainfall.
2. Hydrotesting during wet season operations (December to April inclusive), i.e. conservatively assumes hydrotest is undertaken during wettest month. (scenario not applicable to the SWP activities).
3. Hydrotesting during the dry season, i.e. negligible rain (scenario not applicable to the SWP activities).

The results of the modelling indicates the maximum root zone salinity will be in the order of 1.6 dS/m (for a sandy loam) to 1.7 dS/m (for a clay). This is below the likely vegetation root zone salinity of the vegetation type in the area as previous discussed.

Elevated levels of Na^+ in irrigation water can lead to sodicity problems in the soil profile under irrigation. An estimation of sodicity levels in irrigation water can be predicted using the sodium adsorption ratio (SAR). This is calculated using the following equation, where ionic concentrations are in mmolec/L:

$$SAR = \frac{Na^+}{\sqrt{\frac{Ca^{2+} + Mg^{2+}}{2}}} \qquad (4.2)$$

The inputs and results are shown in Table 18. The SAR calculated from the analytical results for sodium, magnesium, and calcium is consistent with that reported by the laboratory (2.24).

Table 18: Calculation of sodium adsorption ratio (SAR) based on observed Gum Ridge Formation

Parameter	Average value	Maximum value	Comment
Sodium (Na)	87 mg/L	107 mg/L	
Calcium (Ca)	72 mg/L	109 mg/L	
Magnesium (Mg)	33 mg/L	49 mg/L	
Sodium	3.8 meq/L	4.6 meq/L	Conversion – divide by 23
Calcium	3.6 meq/L	5.4 meq/L	Conversion – divide by 20
Magnesium	2.7 meq/L	4.0 meq/L	Conversion – divide by 12.2
SAR	= Na[] / sqrt((Ca[] + Mg[])/2) = 2.1	= Na[] / sqrt((Ca[] + Mg[])/2) = 2.1	Inputs in meq/L

The SAR for the Gum Ridge Formation was calculated at 2, which when combined with the EC values, falls to the right of the dashed line of the figure provided in the ANZECC guideline below (Figure 10). This result indicates that the release is unlikely to cause soil structural problems.

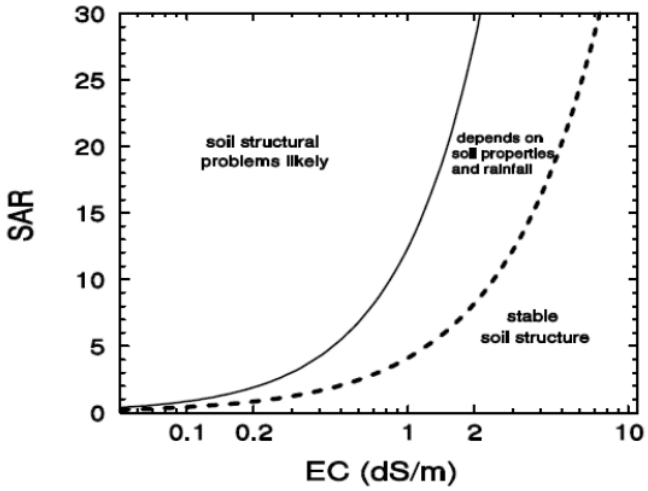


Figure 10: Relationship between SAR and EC of irrigation water for prediction of soil structural stability (from DNR 1997a, adapted from DNR 1997b; note that 1 dS/m = 1,000 µS/cm)

The proposed pH limit is a suitable indicator for a range of chemicals used in the process, including acids (hydrochloric acid, hypochlorite, acetic acid, etc) and bases (sodium hydroxide). The proposed minimum pH is reflective of observed regional rainfall pH levels, with pH levels of 5.24 observed at Daly Waters on 20 March, 2024. Tamboran has observed pH levels on its enclosed tank lids and sediment basins around the pH of 5 level. Given the large volume of rainwater that falls on a site in a very short period, the pH in the sediment basin is anticipated to be low, before increasing as they interact with the receiving soils. This has been observed in sediment basins onsite, with pH increasing from 5.2 to 6.5 over several hours after a rainfall event due to the low buffer capacity of rainwater. Given the existing pH of rainwater is approximately 5.2, we believe this to be an appropriate release limit for stormwater.

The proposed visible limits are designed to identify visual evidence of contamination, primarily associated with onsite storages/usage of fuels, oils, and chemicals (such as oils, coolants, glycols etc). This combined with the pH and EC limit, ensure the majority of chemicals are likely to be detected, including all wastewater streams.

When assessing whether the release limit could result in wastewater being released from the site, the following should be considered.

- The salinity difference between wastewater and stormwater is significant and will result in rapid increases in salinity should contamination occur.
- The code requires mandatory inspection of tanks and secondary containment during the wet season- leaks and spills will be detected daily.
- Wastewater is not authorised to be released to waters- it is prohibited under the Water Act and Code.
- any large spill would be detected, limiting the potential impact of an event.
- Any small leak impacting site stormwater quality is anticipated to be small and temporary. The leak would be detected promptly through other inspection and wastewater tracking mechanism.
- The modelled salinity at the limit for 5 years does not result in a changed soil salinities beyond the sensitivity of the receiving vegetation.
- The presence of other metals or metalloids would be diluted by either the size of the spill and/or the volume of stormwater runoff. Given the short nature of the release and likely dilution, these are not anticipated to represent any material risk of harm.

3.7.6 Camp accommodation

Camp accommodation will be required to support the workforce for the SWP (up to ~10 personnel at peak). Tamboran proposes that personnel will be accommodated at one of the existing approved camps located in the Shenandoah South E&A area (i.e. at either Kyalla 117 N2, Shenandoah South 2 or any other established camp within EP 98 or EP 117).

Generally, the camps provide onsite accommodation for 30 to 60 personnel, supporting up to two crews working 12-hour shifts, plus additional camp staff, supervisory staff and service company personnel as required.

The camp operations will continue to be operated under the Shenandoah South E&A EMP (TAM1-3).

3.7.7 Gravel pits

Gravel which may be required for sheeting hardstand areas will be sourced from existing approved gravel pits, including SSGP1 and SSGP2 on EP 117. All ongoing management and maintenance of the existing gravel pits will continue to be undertaken under the relevant EMP (TAM1-3).

3.8 Rehabilitation

When the SWP site is no longer required, rehabilitation of the area will commence. The objective of the rehabilitation activities will be to remove all infrastructure and return the area to the pre-disturbance land use (low intensity pastoral grazing).

Rehabilitation of the site will involve the following activities:

- Removal/demobilisation of the wash plant.
- Removal of other built infrastructure (e.g. demountable buildings, aboveground pipelines).
- Removal of sheeting material (i.e. gravel).
- Backfilling of residual settlement basins and ponds (i.e. those structures that have not been progressively backfilled during operations) with stockpiled coarse sand material, and/or gravel. Areas of residual settlement basins which are to be permanently retained below natural ground level (typically <4m below natural ground level) will be shaped exclude external run-off from entering, and to shed internal run-off to pond at the lowest point of the basin. The remainder of the basin area will be retained as a shallow slope up to natural grade. This sloped area will remain above the ponded water level and will be rehabilitated to the surrounding pre-disturbance land-use. These areas will function as 'internally draining land forms' whereby the majority of the area will function as a low-intensity grazing land-use, with the low-point to become a semi-permanent watering point. An example of this type of rehabilitation is shown in Figure 11.
- Grading of the site to reinstate the approximate pre-disturbance topography where possible.
- Compaction relief by light ripping of subsoil where required (e.g. access tracks, mobile plant work areas).
- Respreading of topsoil/organic layer.
- Respreading of felled/stockpiled vegetation (where present).
- Re-seeding (where required).
- Removal of fences/bunds in consultation with the landowner.
- Ongoing monitoring and maintenance.

Following a period of vegetation establishment, the site will be returned to a safe, stable and non-

polluting landform that is suitable to be utilised for low-intensity grazing, which reflects the pre-disturbance land-use. Based on previous experience in the region, most areas will naturally regenerate following rehabilitation. Rehabilitation monitoring will occur on an annual basis until the vegetation has become re-instated, with maintenance on rehabilitated area undertaken as required (refer Appendix G).

Figure 11: Rehabilition at an NT sand extraction site

3.9 Traffic

The periods of highest traffic generated from the SWP activities will generally occur over a short duration and are associated with the mobilisation and demobilisation of equipment and personnel. The SWP activities are expected to commence in ~August 2025 following the approval of this EMP.

To assess the potential impact on pastoralist, road user and tourism amenity and experience, a Traffic Impact Assessment (TIA) is discussed below. This assessment includes heavy equipment mobilisation to and from site and is a suitable conservative scenario to assess the potential associated traffic impacts and considers existing exploration activities with the Shenandoah South E&A program area.

The TIA involved the following steps:

- Identification of project traffic movements including approach and departure direction
- Existing traffic levels and road level of service
- Assessment of total traffic levels and potential impacts
- Determine required impact-mitigating treatments

The results of the TIA are discussed below.

3.9.1 Identification of project traffic movements

Access to the SWP site is via the Stuart Highway, approximately 23 km south of the town of Dunmarra. The Stuart Highway is a 130 km/h posted speed limit in the vicinity of the project. The Stuart Highway is also being upgraded and sealed to DLI specifications. A road corridor permit and traffic control for the Stuart Highway intersection is in place to mitigate the risk to road users.

The peak maximum anticipated traffic flow increase associated with the SWP activity will be approximately 7 vehicles per day during site establishment, mobilisation and demobilisation of the wash plant, and no more than 4 vehicles per day during operation of the wash plant (associated with shift changeovers/ deliveries).

Daily traffic volumes associated with the sand wash plant will largely be reduced by using on-site camps for the wash plant personnel. The implementation of the SWP will also eliminate significant numbers of heavy vehicles movements on public roads which would otherwise be required to import sand for use in well completions. As a comparison, to import sufficient sand for a typical well completion for a single well, over 100 haul truck movements would be required for the return journey haul from Darwin to the SS2 E&A area (~1400 km round trip). The proposed sand wash plant provides the opportunity to largely eliminate these haul truck movements.

3.9.2 Existing traffic levels, road capacity and level of service

Existing traffic figures were obtained from station RTVDC020 in the DIPL Annual Traffic Report 2024 (DIPL 2024), showing Average Annual Daily Traffic (AADT) figures for the Stuart Highway. The station is located approximately 20 km north of Elliott and 65 km south of the turn-in to the Kyalla 117 access track. It can be assumed that the traffic figures at the Kyalla 117 access turn-in will be equivalent to those at the RTVDC020 station.

The total daily traffic flows on the Stuart Highway from the 2024 annual survey data are estimated as 598. The total traffic flows are split relatively evenly between north and south bound traffic (

Rural Coverage Count Stations — **Year: 2024**

Table: 4.1 AADT For Coverage Stations - 10 Year Period — **Region: Tennant Creek**

Road Name / Location	ADT Station	Direction	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Carpentaria Highway	RTVDC033	Inbound	Veh		42		46		41		50		70
5km East of Tablelands Highway		Outbound	Veh		42		47		37		48		71
		Both	Veh		84		93		78		98		141
Nathan River Road	RTVDC034	Inbound	Veh		4		6		11		14		9
2km North of Ryans Bend Road		Outbound	Veh		5		6		9		18		8
		Both	Veh		9		12		20		32		17
Newcastle Waters Road	RTVDC037	Inbound	Veh	40		39		29		52		75	
2km West of Stuart Highway		Outbound	Veh	50		51		33		45		68	
		Both	Veh	90		90		62		97		143	
Old Bing Bong Road	RTVDC035	Inbound	Veh		59		67		38		75		90
5km North of Borroloola		Outbound	Veh		49		68		39		74		89
		Both	Veh		108		135		77		149		179
Ranken Road	RTVDC028	Inbound	Veh	1		2		3		1		4	
5km East of Brunette Downs		Outbound	Veh	2		3		1		1		4	
		Both	Veh	3		5		4		2		8	
Stuart Highway	RTVDC020	Inbound	Veh	229	223	280	262	233	174	284	292	220	302
20km North of Elliott		Outbound	Veh	213	222	271	247	227	167	263	273	178	296
		Both	Veh	442	445	551	509	460	341	547	565	398	598
Stuart Highway	RTVDC021	Inbound	Veh	183	198	185	225	235	152	151	216	189	135
15km South of Wauchope		Outbound	Veh	170	186	161	213	195	154	143	273	180	145
		Both	Veh	353	384	346	438	430	306	294	489	369	280
Stuart Highway	RTVDC022	Inbound	Veh	163	208	197	197	189	129	206	202	213	175
30km North of Barrow Creek		Outbound	Veh	142	191	171	184	150	133	211	175	188	173
		Both	Veh	305	399	368	381	339	262	417	377	401	348

Figure 12). For previous traffic impact assessments, Tamboran inflated the annual traffic figures to account for peak dry season traffic. However, given the estimated daily traffic numbers for the SWP area account for a small increase in the number of vehicles per day (i.e. typically <4 vehicles per day), this assessment uses the existing traffic, approved EMP traffic volumes associated with the Shenandoah South EMP (TAM1-3) and proposed traffic volumes associated with the SPCF EMP (TAM2-2) and the slight increase in traffic volume in the vicinity of the Kyalla 117 turn-in associated with the SWP EMP.

AUSTROADS guidelines (Austroads 2020) were used to determine the typical capacity that would be expected by traffic on the Stuart Highway to maintain a free-flow level of service (LOS). The capacity of roads is based on the maximum rate at which persons or vehicles can reasonably be expected to traverse a point or uniform section of lane or roadway during a given timeframe. The LOS relates to the operating conditions encountered by traffic as defined in the AUSTROADS guidelines (Austroads 2020). This data was then used to determine the capacity of the Stuart Highway to maintain a Category A (free flowing) LOS for the site. A conservative 700 – 1,000 vehicle/hr/lane figure was used to determine the vehicle movement capacity.

In an urban situation it can be assumed that the peak hour volumes will be about 10% of the daily traffic volumes. However, the remoteness of this site means that a peak hour is not realistic and has not been considered. Due to the low volumes that are likely to be spread over the duration of the day, this is considered appropriate.

Rural Coverage Count Stations **Year: 2024**
Table: 4.1 AADT For Coverage Stations - 10 Year Period **Region: Tennant Creek**

Road Name / Location	ADT Station	Direction	Units	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Carpentaria Highway	RTVDC033	Inbound	Veh		42		46		41		50		70
5km East of Tablelands Highway		Outbound	Veh		42		47		37		48		71
		Both	Veh		84		93		78		98		141
Nathan River Road	RTVDC034	Inbound	Veh		4		6		11		14		9
2km North of Ryans Bend Road		Outbound	Veh		5		6		9		18		8
		Both	Veh		9		12		20		32		17
Newcastle Waters Road	RTVDC037	Inbound	Veh	40		39		29		52		75	
2km West of Stuart Highway		Outbound	Veh	50		51		33		45		68	
		Both	Veh	90		90		62		97		143	
Old Bing Bong Road	RTVDC035	Inbound	Veh		59		67		38		75		90
5km North of Borroloola		Outbound	Veh		49		68		39		74		89
		Both	Veh		108		135		77		149		179
Ranken Road	RTVDC028	Inbound	Veh	1		2		3		1		4	
5km East of Brunette Downs		Outbound	Veh	2		3		1		1		4	
		Both	Veh	3		5		4		2		8	
Stuart Highway	RTVDC020	Inbound	Veh	229	223	280	262	233	174	284	292	220	302
20km North of Elliott		Outbound	Veh	213	222	271	247	227	167	263	273	178	296
		Both	Veh	442	445	551	509	460	341	547	565	398	598
Stuart Highway	RTVDC021	Inbound	Veh	183	198	185	225	235	152	151	216	189	135
15km South of Wauchope		Outbound	Veh	170	186	161	213	195	154	143	273	180	145
		Both	Veh	353	384	346	438	430	306	294	489	369	280
Stuart Highway	RTVDC022	Inbound	Veh	163	208	197	197	189	129	206	202	213	175
30km North of Barrow Creek		Outbound	Veh	142	191	171	184	150	133	211	175	188	173
		Both	Veh	305	399	368	381	339	262	417	377	401	348

Figure 12: Traffic flows on the Stuart Highway at ADT station RTVOC020, approximately 65 km south of the site access turn-in (DIPL, 2024)

3.9.3 Assessment of total traffic levels and reduction to road capacity and level of service

The typical average traffic volume for the Stuart Highway – Kyalla 117 turn-in associated with the SWP has been determined at 4 vehicles per day, with a slight increase to 8 vehicles during the initial mobilisation (~2 days) and demobilisation (~2 days). This consists of a temporary additional peak project vehicle movement level of 4-8 vehicles per day in addition to the existing peak dry season traffic volumes of ~598 vehicles per day.

The total volume of traffic is considerably lower than the capacity of the Stuart Highway, with any reduction in LOS from the volume of the SWP traffic considered extremely unlikely.

Traffic LOS may also be impacted through changes in traffic compositions, with the volume of trucks affecting the road capacity greater than light vehicles. To assess the changes in traffic composition, vehicle category data obtained from the DIPL Annual Traffic Report 2024 were assessed against expected total project traffic figures. These figures were then increased by 50% to represent peak dry season traffic volumes. The assessment is provided in Table 19.

Table 19: Traffic impact summary for the Stuart Highway – existing versus proposed additional based on 50% increase

Vehicle category	Existing vehicles per day (vpd) and % (approx.)	SWP EMP additional vpd*	Total vpd during activity and % (approx.)
Short (light vehicles)	475 (53%)	2	497 vpd (74%)

Vehicle category	Existing vehicles per day (vpd) and % (approx.)	SWP EMP additional vpd*	Total vpd during activity and % (approx.)
Medium (heavy vehicles or short towing)	262 (29%)	0	98 vpd (15%)
Long (heavy vehicles)	70 (2%)	2	21 vpd (3%)
Medium combination (heavy vehicles)	26 (4%)	0	25 vpd (4%)
Large combination (heavy vehicles)	0 (0%)	0	30 vpd (4%)
(adapted from DIPL 2024) *During steady-state operation of the SWP			

The results in Table 19 demonstrate that there are no significant changes in traffic composition associated with the SWP area, and there is unlikely to be any significantly impact upon the road's capacity and LOS.

As previously noted, the proposed sand wash plant provides the opportunity to eventually eliminate approximately 150 return haul truck movements between Darwin and the proposed wash plant location (~1400 km round trip) per well completion, and therefore will result in a significant net reduction in usage of the Stuart Highway going forward.

3.9.4 Traffic risk management strategies

The management of risks of injury to staff, contractors and the community is a key focus of every Tamboran activity. To reduce the risks associated transport, all vehicle movements undertaken as a part of Tamboran activities must comply with the National Land Transport Directive. Mandatory controls include:

- Avoiding vehicle movements where possible (by using buses and aircraft to transport personnel)
- Driving at night to be avoided
- All drivers hold appropriate drivers' licence
- Zero alcohol and drug policy – with all staff breath tested when on-site and random drug tests completed.
- Fatigue management policy – with mandatory breaks required for every 2 hours and maximum 10 hours in a single 24-hour period working hours (unless the driver of a fatigue regulated heavy vehicle, where the driver must then comply with the applicable law for fatigue management where the vehicle is operated).
- Chain of responsibility training for all logistics/supply chain roles to ensure they understand their obligations to ensure the safety of their transport activities under the Heavy Vehicle National Law.
- Journey management plan requirements for all remote journeys, with all journeys lodged with the Tamboran HSE team.
- Requirements to comply with the National Transport Code Load Restraint Guide.
- Contractor and employee driver performance tracking and reporting, with all breaches investigated, formally documented and disciplinary actions taken.

In addition to the above requirements, Tamboran has also implemented the following additional controls:

- Current use of the intersection of the site access track with the Stuart Highway was previously approved by DIPL with traffic management in place where required. Ongoing engagement with DIPL is underway covering all future exploration activities and intersection upgrades, including obtaining approval under the Planning Scheme 2020, which is separate to the approval required under the Petroleum (Environment) Regulation 2016.

- Communication with pastoralists when /multiple transports are likely to occur.
- Peak transport period to be restricted to mobilisation and demobilisation of the SWP equipment and personnel, with most mobilisations occurring via internal access tracks.
- The use of existing Tamboran camps in the exploration permit area reduces vehicle movements between site and the local communities.

Other potential risks and controls associated with traffic are discussed further in section 6.0.

3.10 Greenhouse gas emissions

The greenhouse gas (GHG) emissions estimates for the SWP are provided in Table 20. The emissions for the SWP are restricted to those associated with vegetation clearing and fuel consumption. Emissions from the camp operations have been excluded as these are captured under the existing EMP TAM 1-3.

Table 20: Greenhouse gas calculation for the proposed activities

Activity	Anticipated volume	Anticipated (tCO_2-e)	Estimate methodology and assumptions
Diesel combustion – wash plant operation	646 KL	1,752	Diesel estimates multiplied by NGERS emission factor from NGER Determination: Division 2.4.2 Method 1 emissions of carbon dioxide, methane and nitrous oxide from liquid fuels other than petroleum-based oils or greases, section 2.41 Method 1—emissions of carbon dioxide, methane and nitrous oxide and Part 3—Fuel combustion—liquid fuels and certain petroleum-based products for stationary energy purposes item 40: • Energy Content Factor (GJ/kg) 38.6 • CO_2 Factor 69.9 $kgCO_2$-e/ GJ of diesel • CH_4 Factor 0.1 kgO_2-e/ GJ of diesel • N_2O Factor 0.2 $kgCO_2$-e/ GJ of diesel
Land disturbance as part of initial wash plant site establishment (11.2 ha)	11.2 ha land clearing (77 tCO_2e/ ha)	862	Transport Authorities Greenhouse Group 2013 Appendix I vegetation clearing methodology, Table 6, assumed maximum potential biomass class = 1.
Total over SWP (5-year) life (tCO_2-e)		**9,622**	

3.10.1 GHG cumulative emissions

The cumulative annual emissions for Tamboran's activities are predicted to be 197,941 tCO_2-e in FY 2025 (Table 21), largely attributed to existing approved activities associated with TAM1-3. This peak in emissions during 2025 is associated with the proposed well testing approved under the TAM1-3 EMP, prior to the operation of the proposed Sturt Plateau Compression Facility (TAM2-2 EMP). In the FY 26/27/28 and 29 periods, the cumulative emissions total (including the SWP construction and operation) is predicted to fall under the 100 $KtCO_2$-e thresholds, with emissions under the TAM1-3 EMP reducing due to the decreasing in flaring associated with appraisal gas sale. Emissions associated with the SWP represents an increase of 2.6% compared to the existing approved activities.

The potential (residual - not offset) maximum scope 1 emissions (for FY 2025) of Tamboran's activities represent 1.15%[12] of the total NT GHG emissions for 2022 or 0.05% of Australia's total emission for the March 2024 quarter[13]. Tamboran's total contributions will fall to 0.60% of the total NT GHG emissions in FY 2026 demonstrating the reduction in scope 1 emissions associated with the sale of appraisal gas, as well as the construction and operation of the SWP.

Based on the life cycle analysis of a similar (but different) unconventional gas development in Australia completed by the Gas Industry Social and Environmental Research Alliance (GISERA) (Heinz 2019), the current net climate benefits of using natural gas in replacing coal for electricity generation is up to 50% less emissions (Heinz 2019). This life cycle analysis is based upon the existing QLD Coal Seam Gas industry, which does not include abatement of LNG emissions or the deployment of substantial upstream emission reduction technology (other than electrification of gas processing facilities).

A future Beetaloo shale gas development will be net zero scope 1 and 2 emissions, through the utilisation of world's best practice emission reduction technology, such as field electrification, flare minimisation strategies, use of renewable energy sources and procurement of emission offsets. Scope 3 emissions will also be reduced through investigation in low emission technologies, such as carbon capture and sequestration (CCS) and blue ammonia/ hydrogen and electricity export. This would further reduce the emission intensity of a future gas developments and highlights the role of natural gas as a transition or 'firming' fuel to support the roll out of large-scale renewables in the future. This is reflected by Tamboran's ongoing commitment to invest in both renewable energy sources and firming fuels such as natural gas.

Table 21: Cumulative 2025 –2029 financial year worst case greenhouse gas emission assessment by period for approved, proposed and potential future exploration activities

Activity	FY 25	FY26	FY27	FY28	FY29	Comments
Beetaloo W-1 EMP (ORI8-2)	46	46	46	46	46	No material emissions anticipated.
Kalala S EMP (ORI9-2)	0	0	0	0	0	No material emissions anticipated.
Amungee multi-well (Amungee NW-2H and NW-3H; Velkerri 76 S2-2H and S2-3H) (ORI10-3)	46	46	46	46	46	No material emissions anticipated – activities restricted to ongoing wastewater management.
Amungee delineation EMP (ORI11-3)	0	0	0	0	0	No material emissions anticipated.
Shenandoah South E&A Program EMP (TAM1-3)	188,847	45,928	38,826	36,208	57,705	Activities include all those required to construct, drill, stimulate and well test the E&A wells over the FY 2025-2029 period. Wells drilled in FY 2026/27/28 and 29 will have limited flaring – restricted to initial well clean up where gathering lines are not available.
Sturt Plateau Appraisal Gas Compression Facility EMP (TAM2-3)	4,081	50,709	58,078	58,077	29,935	Activities associated with the construction, commissioning and operation of the SPCF facility.

[12] https://www.greenhouseaccounts.climatechange.gov.au/

[13] Quarterly Update of Australia's National Greenhouse Gas Inventory: March 2024 (dcceew.gov.au).

Activity	FY 25	FY26	FY27	FY28	FY29	Comments
Shenandoah South 3D Seismic Program (TAM3-1)	4,875	0	0	0	0	Activities associated with seismic line preparation (vegetation clearing) and diesel consumption.
Emissions related to activities introduced by this EMP						
Shenandoah South SWP (TAM4-1)	0	2614	1,752	1,752	1,752	Activities associated with sand wash plant site establishment – e.g. vegetation clearing and diesel use during clearing and operations
Total annual emissions (tCO_2e)	197,941	99,391	98,794	96,175	89,530	

3.10.2 Residual emissions offsets

Table 22 provides a summary of cumulative anticipated greenhouse gas emissions breakdown per financial year, along with the estimated offset requirements and total residual emissions.

In accordance with the updated NGERS safeguard mechanism requirements released in 2023, an activity becomes a "facility" once the emission threshold has been triggered. The safeguard mechanism requires a facility to have all scope 1 emissions offset in the year triggered, using Australian Carbon Credit Units (ACCU's) granted under the Commonwealth *Carbon Credits (Carbon Farming Initiative) Act 2011*.

Tamboran also proposes to offset a percentage of residual greenhouse gas emissions where they are generated below the safeguard trigger level to meet the NT net zero by 2050 target. Tamboran will offset any residual emissions as per the following:

- That residual emissions be offset using carbon credit units approved by the Commonwealth Clean Energy Regulator or the Commonwealth's Climate Active Carbon Neutral Standard.
- Minimum offset levels shall increase year-on-year by 3.7% (based on a baseline financial year of 2023) to result in a linear decrease in residual emission levels to net zero by 2050 as per the following schedule:
    - Financial year 2025: 11.1% of total emissions offset
    - Financial year 2026: 14.7% of total emissions offset
    - Financial year 2027: 18.4% of total emissions offset
    - Financial year 2028: 22.1% of total emissions offset
    - Financial year 2029: 25.8% of total emissions offset
- Actual emission levels produced during a financial year must be estimated in accordance with the National Greenhouse and Energy Reporting Scheme (NGERS) reporting methodology.
- Offsets volumes shall be calculated retrospectively, by multiplying the actual emission volumes generated during a financial year with the corresponding financial year offset % requirement level.
- Offsets shall be secured and retired within 6 months of the end of a financial year. Noting any emission offset under the NGERS Safeguard mechanism will satisfy any obligation under the NT Large emitters policy and vice versa. This will avoid double counting.
- An appropriately qualified independent person with extensive carbon accounting experience shall verify the actual emission levels generated, the procurement and retirement of the required offset volumes for emission generated in the specified financial year.

- A report from the appropriately qualified independent person shall be provided to DLPE by October 31 each year verifying the actual emission levels estimated and confirming the required offset for the previous financial year have been acquired and retired.
- That the GGAP is updated annually based on actual emissions from the preceding year to ensure currency.

Table 22: Estimated cumulative greenhouse gas emissions, offsets and residual emission levels

Emission period	Cumulative tCO_2-e	Potential emission offset requirements (tCO_2)	Total cumulative residual emissions tCO_2 (Total emissions minus offsets)
FY 2025	197,941	197,941*	0*
FY 2026	99,391	14,611	84,780
FY 2027	98,794	18,178	80,616
FY 2028	96,175	21,254	74,921
FY 2029	89,530	23,098	66,432
Total	581,831	77,141	306,749

*Assumes the NGERS safeguard 100 ktCO_2trigger has been reached and offset requirements triggered.

3.11 Cumulative impact summary

This section provides a summary of the cumulative impacts associated with the proposed activity in accordance with Section 3b of the Regulations. These include cumulative impacts associated with groundwater extraction, flora and fauna, greenhouse gas generation, traffic and social impacts. The assessment of cumulative impacts is summarised in Table 23.

Table 23: Summary of cumulative impacts addressed within the EMP

Aspect	Summary	EMP section
Water	Groundwater extraction cumulative impacts have been assessed and approved under the WEL GRF 10285. This includes water use for Tamboran's future exploration program, adjacent petroleum operators and surrounding users. No material impacts on surrounding users are expected from Tamboran's activities associated with the SWP EMP.	Section 3.7.1
Flora and fauna	Estimated clearing associated with this EMP is approximately 11.2 ha. The site has been selected in consideration of avoiding mature trees and dense vegetation areas to the extent possible. Impacts associated with the introduction of weeds are managed through the WMP (Appendix D). All other petroleum operators and pastoralists are required to have a WMP.	Section 3.3 Section 4.2
Greenhouse gases	Cumulative emissions from all of Tamboran's FY 2025-2029 activities have been provided. Emission levels are mainly attributed to activities under separate EMPs that include flaring. In a development scenario, gas production is likely to have 50% less emissions than coal, thus playing an important role as a transition or firming fuel to support large scale renewable energy supply. Emissions from the SWP for FY26 2,616 tCO_2-e which is 2.63% of Tamboran's proposed FY26 emissions.	Section 3.10

Aspect	Summary	EMP section
Traffic	Impacts of traffic are anticipated to be minor, with no reduction in level of service of the Stuart Highway. Maximum peak traffic level assessment considers cumulative user traffic load, with project movements anticipated to be no more than 8 movements per day during mobilisation and demobilisation (2-week period), and 4 movements per day during the operation of the SWP.	Section 3.9
Social	Risk associated with increased competition for labour from exploration activities, including other petroleum operators is low and well within the capacity of existing service providers. Ongoing engagement with local and regional businesses is underway, providing information and updates on the status of any future projects. The likelihood of a loss of amenity and tourism value of the area resulting from increased industrialisation of the landscape is considered to be low due to limited extent of petroleum activities, including from other petroleum or mining operators.	Section 4.4

3.12 Monitoring

A series of monitoring programs has been developed under this EMP to:

- Monitor and detect changes in environmental values associated with Tamboran's activities, such as groundwater extraction, erosion and sedimentation and weed establishment.
- Report on rehabilitation progress.

An overview of each of the monitoring programs is provided in Table 24. A summary of the SWP commitment register is provided in Appendix F.

Table 24: Monitoring program summary

Monitoring program	Purpose	Monitoring points	Parameters	Frequency	Investigation thresholds	Reference document
Groundwater take	Groundwater volume.	Groundwater extraction bore	Litres	Continuous flow meter	450 ML/yr[14]	NT Water Act WEL GRF 10285
Local weather conditions	To identify potential for rainfall events and bushfire risk that may impact the activities.	Bureau of Meteorology (BoM) North Australia Fire Index (NAFI)/Secure NT	% chance of rainfall (mm) Bushfire Alerts and Warnings	7-day forecast from (BOM) from 1 October to 30 April. Subscribe to Bushfire NT for alerts, warnings and advice including total ban declaration.	50% chance greater than 20 mm. Alerts and warnings indicate bush fire within 20 km of site.	BMP (Appendix C)
Stormwater	Manage stormwater collected during activities.	Sediment/settlement basin release point	Field EC and pH. Visible oil, grease, other hydrocarbons, foams or abnormal discoloration.	Weekly during the wet season or per each release during dry season.	Off-site release and dust suppression limits: • pH 5.2 – 9.0 • EC 1,300 µs/cm	N/A
Erosion and sediment control	To detect the presence of erosion and sedimentation from infrastructure.	Inspection of all disturbed areas, including access tracks, hardstand areas, stockpiles, fence lines.	Visual inspection of infrastructure and erosion and sediment controls.	Visual inspections pre- and post-wet season	Visible erosion or failure of erosion and sediment control.	ESCP (Appendix E)
Weeds	Identify weeds potentially introduced or	Inspection of all disturbed areas, including access tracks,	Visual inspection.	Visual inspections post-wet season	Positive confirmation of the detection of a weed of national significance	WMP (Appendix D)

[14] Tamboran's water extraction licence GRF 10285 allows for maximum annual entitlement of 450 ML/yr. Groundwater take for SWP is estimated to be < 100 ML/annum.

Monitoring program	Purpose	Monitoring points	Parameters	Frequency	Investigation thresholds	Reference document
	spread by Tamboran's activities.	hardstand areas, fence lines.			species within Tamboran's disturbance footprint. An increase in existing weed density and spatial extent.	
Heritage	Avoidance of impact to identified cultural heritage sites.	Inspection by cultural managers prior to ground disturbance activities. The cultural managers referenced are the native title holders for the Shendandoah South area and are therefore inherently suitable to undertake heritage checks.	Visual inspection.	During site establishment.	Positive confirmation of unexpected heritage finds.	Heritage Find Procedure (Appendix B.2)
Post rehabilitation	Monitor ongoing rehabilitation success	Inspection of all rehabilitated areas within the SWP site	Visual inspections of: • Canopy cover % • Ground cover % • Species diversity • Erosion	Annually	Decline in rehabilitation criteria value compared to previous year results	Section 7.5 and RMP (Appendix G)

3.12.1 Investigation and response framework

Where an exceedance of a monitoring program investigation trigger is observed from one of the monitoring programs outlined in Table 24, an investigation and response will be implemented as summarised in Figure 13.

The investigation and response process will be divided into the following components:

- Verification – is the result real?
- Evaluation – is the result related to petroleum activities?
- Remediation or management – what is the potential impact?
- Ongoing monitoring.

The initial step in the process is *verification* of the measurement. This process begins with a check on integrity of the measurement, including a review of the protocol used to collect the measurement, calibration of equipment and the integrity of the monitoring infrastructure itself (such as the integrity of a monitoring bore). If the original data point is found to be correct, then a risk-based (appropriate to the scale and nature of the exceedances) investigation of the results is conducted, and an evaluation phase is initiated.

The *evaluation* phase will have two major goals; to identify the origin or source of the trigger exceedance and characterise the potential effects on environmental factors to reduce or eliminate negative consequences. This phase of investigation is conducted in a manner consistent with the type of threshold exceedance observed. Simple exceedances of water quality triggers during stormwater releases for example, may require simple investigations into the procedures and processes contributing to the event. Groundwater threshold exceedances may require more detailed assessment, whereby a comprehensive set of information is accessed and utilised, including a review of operational activities, the influence of other regional activities (e.g. mining or pastoral activities), changes in climatic conditions etc. Detailed investigation may include the identification of knowledge and/or data gaps and collection of additional data to fill these gaps and bring the issue into proper context.

If the *evaluation* phase of the investigation identifies the issue as being natural or not associated with petroleum activities, then the result is documented, and monitoring continues. This may lead to the revision of a trigger or threshold. However, if the results indicate an influence of a petroleum activity, an assessment of risks is undertaken to assess the potential impact on environmental factors. This will involve a more in-depth evaluation or characterisation of the affected area and potential source. Regulatory notification may be required in accordance with section 8.6.

If the *evaluation* phase of the investigation indicates the influence of a regulated activity, then mitigation measures may need to be implemented to prevent ongoing impacts to an environmental factor. These mitigation measures will be appropriate to the nature of the incident and will be based upon a risk assessment and technical feasibility assessments. Such mitigation measures may include:

- Stopping the activity; and/or
- Modifying the activity to directly address the source of harm (i.e. additional procedures, training, ceasing or redesigning an activity); and/or
- Implementation of mitigation measures to reduce the potential effects (i.e. make good agreements, direct removal and treatment of contaminants).

Upon implementation of mitigation measures, further *evaluation* through increased monitoring is undertaken to determine the success of the mitigation measures. If a positive result is observed, and trends begin to stabilise or reverse, then the result is documented and a return to regular monitoring occurs. If not, then the continued operation of the identified activity or activities causing the effected may need to be reviewed and adjusted in consultation with the regulator and other affected parties.

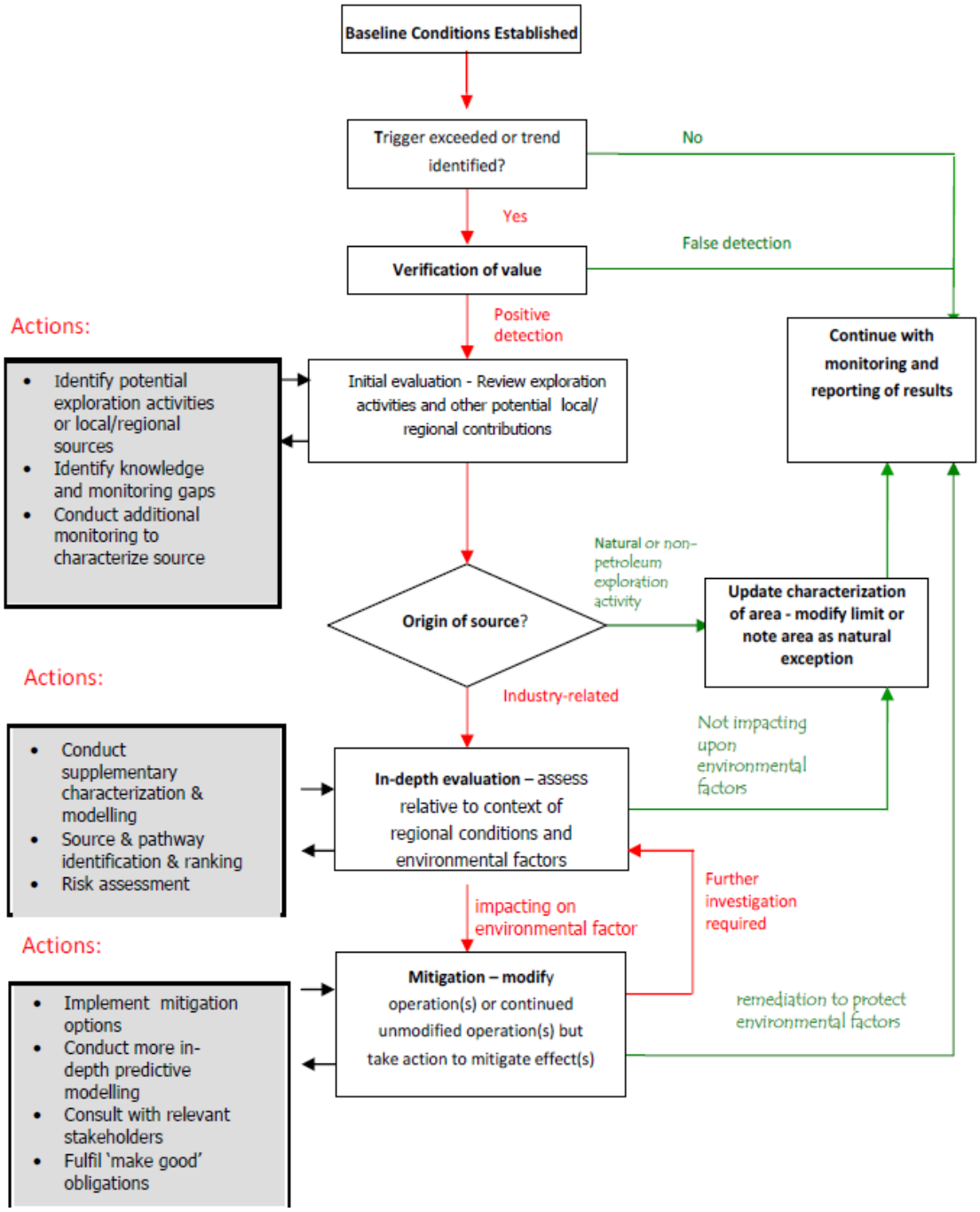


Figure 13: Investigation and response process

4 Description of the existing environment

The full description of the biological environment of the SWP site and surrounding areas is provided in the land condition report (Appendix A) completed by AECOM (2025). Broader information on the existing environment is provided in the following sections with an overview of the survey site shown in Figure 14.

A summary of all the matters of national environmental significance under the EPBC Act is provided in section 4.5.

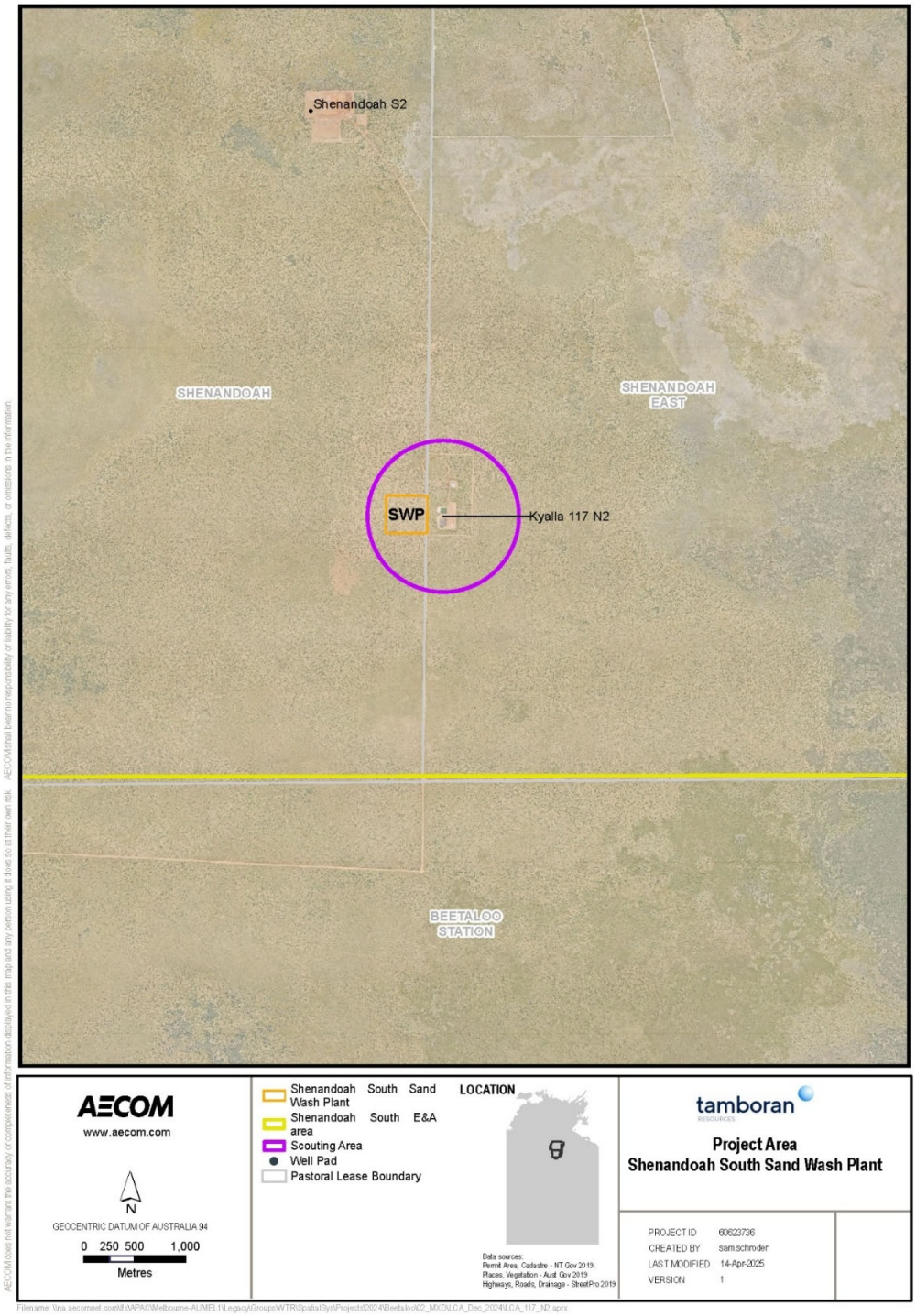


Figure 14: SWP survey area

4.1 Physical environment

4.1.1 Climate

The climate of the permit areas is arid to semi-arid, with rainfall decreasing in frequency and quantity from north to south. The climate is monsoon influenced, with a distinctive wet summer between October and April, and a dry winter season between May and September, with September and April being transitional months with occasional rainfall.

Mean annual rainfall in the north of the Beetaloo exploration area is recorded at 678 mm at Daly Waters (SREBA, 2022). The southern portion of the permit areas records an average annual rainfall of 536 mm at Newcastle Waters and 602 mm at Elliott. Approximately 90% of the rainfall occurs during the wet season from November to April but primarily in December to March (SREBA, 2022).

The SWP site is characterised by a net precipitation deficit of between -1,800 mm and -2,150 mm per year.

4.1.1 Geology

The Beetaloo Sub-basin comprises a thick sequence of mudstone and sandstone formations (Roper Group) that were deposited during the Mesopreterozoic era[15], approximately 1,500 – 1,300 million years ago (Ma). The Roper Group is estimated to reach more than 5,000 m in thickness in the centre of the Sub-basin and estimated to be thinner outside the formally defined Beetaloo Sub-basin. The Roper Group is overlain unconformably by the yet to be formally defined Neoproterozoic Group. Unconformably overlying the Neoproterozoic group is the Georgina Basin (Cambrian) sedimentary package, which includes widespread extrusive flood basalts and a thick limestone sequence that forms the Cambrian Limestone Aquifer (CLA), a significant water supply aquifer.

The Georgina Basin is capped unconformably by a thin section of Cretaceous mudstone and sandstone (Albian aged ~100-113 Ma) and recent alluvial and laterite deposits. The shale and sandstone layers of the Beetaloo Sub-basin - specifically the Kyalla Formation and Velkerri Formation — hosts the gas plays that are the target for petroleum exploration activities in the area (SREBA, 2022).

Tamboran's exploration and appraisal activities are targeting the Roper Group Velkerri Formation; specifically, the organically enriched shale intervals within the Velkerri's Amungee Member. These intervals are found at a depth of approximately 3,000 m in the vicinity of the SWP.

The Amungee Member is overlain with thick series of low permeability units (mudstone, siltstones, tight sandstone and Volcanic units) which include the Velkerri Formation Wyworrie Member, Kyalla Formation, Shenandoah-East Formation, and Antrim Plateau Volcanics. These formations provide thick and multilayered effective geological barriers, with the Gum Ridge Formation separated from the target formations by >1,500 m.

4.1.2 Soils

The Sturt Plateau bioregion covers an area of 103,857 km^2 and comprises undulating plains on sandstones, with mostly neutral sandy red and yellow earth soils (ANRA, 2008; SREBA, 2022).

The soil types located within the plateau range from the very strongly leached lateritic soils of the Tertiary land surface to the calcareous desert soils and desert loams in the southern drier areas, through to cracking clays in the south-east.

The lateritic plains, located with the permit area, are classed as very strongly leached soils of the Tertiary land surface. The three main soil types located within the permit area, include:

[15] A geologic era that occurred from 1,600 to 1,000 million years ago. Known as the first era of Earth's geologic history.

1. Tertiary Lateritic Red Earths: which occur on the gently undulating topography. The soil profile can be described as:

A-Horizon	Grey-brown sandy loam
B-Horizon	Reddish-brown sandy clay loam
C-Horizon	Red-brown to red light clay, overlying heavy ferruginous gravel and massive laterite

2. Tertiary Lateritic Red Sands: which occur on gently undulating to undulating topography of the Tertiary Lateritic Plain, formed from sandstones and complex parent materials of the deep sandy soils. The soil profile can be described as:

A-Horizon	Grey-brown to brown sand
B-Horizon	Brown sand
C-Horizon	Red-brown to yellow-brown sand overlying pisolitic ferruginous gravel and massive laterite. Altered colouring of highly siliceous parent sandstone is only evident in the mottled and pallid zones

3. Tertiary Lateritic Podzolic Soils: formed on the gently undulating topography over a variety of rocks. These soils are located in the northern section of the Barkly Basin. The soil profile can be described as:

A-Horizon	Grey sand
B-Horizon	Yellowish-grey sand
C-Horizon	Yellow-grey sandy loam with ferruginous gravel overlying massive laterite, mottled and pallid zones

The primary soil type present at the SWP site is the Tertiary Lateritic Red Sands.

Table 25 and Table 23 present the erosion risk rating based on average monthly rainfall for Daly Waters and Newcastle Waters, using the rating system provided in the IECA (2008) Table 4.4.2. The settlement basins to be installed on the SWP site will also fill the role of sediment basins during site establishment and construction activities to minimise potential for erosion and sedimentation. Limited clearing and/or construction activities are planned for the wet season, during periods of high rainfall. The overall risk of erosion is considered very low.

Table 25: Erosion risk rating based on average monthly rainfall at Daly Waters

Item	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	165.4	165.4	120.1	23.6	5.0	5.6	1.5	1.7	4.9	22.5	59.4	110
Erosion Risk*	H	H	H	VL	VL	VL	VL	VL	VL	VL	M	H

* E = Extreme (>225 mm); H = High (100+ to 225 mm); M = Moderate (45+ to 100 mm); L = Low (30+ to 45 mm); VL = Very Low (0 to 30 mm)

Table 26: Erosion risk rating based on average monthly rainfall at Newcastle Waters

Item	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	125.5	130.9	93.7	24.6	9.3	5.3	3.4	1.0	5.4	20.9	35.7	77.3
Erosion Risk*	H	H	M	VL	VL	VL	VL	VL	VL	VL	L	M

*E = extreme (>225 mm); H = High (100+ to 225 mm); M = Moderate (45+ to 100 mm); L = Low (30+ to 45 mm); VL = Very Low (0 to 30 mm)

4.1.3 Seismicity

Large earthquakes are relatively rare in Australia with an earthquake exceeding magnitude 7 on the Richter scale occurring somewhere in Australia every 100 years (SRC 2017). Earthquakes are comparably rare in the NT, aside from limited areas around Tenant Creek and west of Alice Springs (Figure 15) where several earthquakes with a magnitude of 6.2-6.4 occurred in a 12-hour period. Thousands of aftershocks have occurred since and whilst the rate has decreased, it has not yet returned to its pre-1987 level (McCue 2013).

In the Beetaloo, there have been no earthquakes over magnitude 3 measured since records began. The area is not prone to seismic activity and there is no evidence of recent earthquake activity as most faults and the major subsurface structure are confined to Cambrian or older strata.

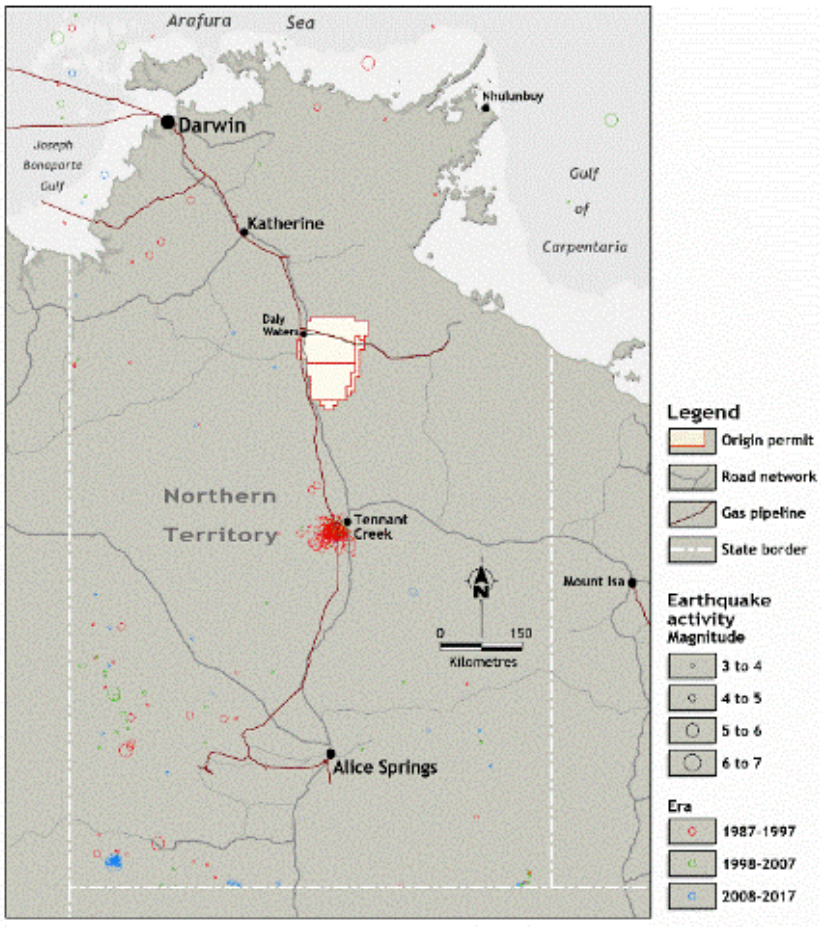


Figure 15: Earthquakes greater than magnitude 3 from 1987 to 2017 across the NT showing an absence of seismic activity in the Beetaloo area

4.1.4 Hydrology

The SWP site falls within the Wiso River Basin (Figure 16). The Wiso River Basin covers the southern half of EP 98 (south of the Carpentaria Highway) and the majority of EP 76 and a large portion of EP 117 and is internally drained by Newcastle Creek and several small ephemeral creeks (DEPWS, 2022a).

Newcastle Creek ultimately flows into Lake Woods, which is located south of the Newcastle Waters Station, approximately 87-110 km south of the Shenandoah South E&A area. Lake Woods covers an area of inundation of approximately 50,000 ha in normal rainfall years, extending to 80,000 ha in exceptionally wet years, after which it can retain water for several years (AECOM, 2015). Lake Woods is described as a major quasi-permanent surface water body and is listed on the NT Government Sites of Conservation Significance and on the Directory of Important Wetlands in Australia (DIWA: NT013 Lake Woods) (DEPWS, 2022a). Some semi-permanent and many ephemeral waterholes are located across the permit area.

There are no creeks or intermittent streams (e.g. stream order 1) in the vicinity of the SWP (Figure 16). In addition, there are no occurrences of palustrine (non-riverine or non-channel systems) or floodplain systems in the vicinity of the SWP.

In accordance with the NT Land Clearing Guideline (2024) the wetlands, for example the floodplain systems that occur within the broader region of the SWP area, are considered low value wetland because:

- the area does not have any permanent waterbodies
- the area only intermittently flows during a good wet season
- the area is only a small part of the much larger wetland system of the Newcastle Creek Catchment, which has a large diversity of habitat for native plants and animals
- the area is not part of the Directory of Important Wetlands in Australia, nor is it listed as a RAMSAR site.

Based on SREBA Environmental Health Baseline Report (DEPWS, 2022a) on water, surface water quality across the Beetaloo study area varied widely due to climate conditions, associated with signification rainfall during the wetter months of the year and lower rainfall during drier periods which has the potential to influence surface water quality across the study area. The historical water summary data on Newcastle Creek and Daly Waters show neutral surface water pH, while spring water shows higher alkaline pH. Salinity varies from fresh to brackish conditions, however, it is greatly reduced during the wet season due to rainfall.

4.1.4.1 Aquatic systems

There were no surface aquatic ecosystems recorded within the SWP area. The nearest aquatic ecosystem is Johnston Lagoon, located approximately 25 km to the west (SREBA Beetaloo Aquatic Ecosystems – Refugia points meta data set).

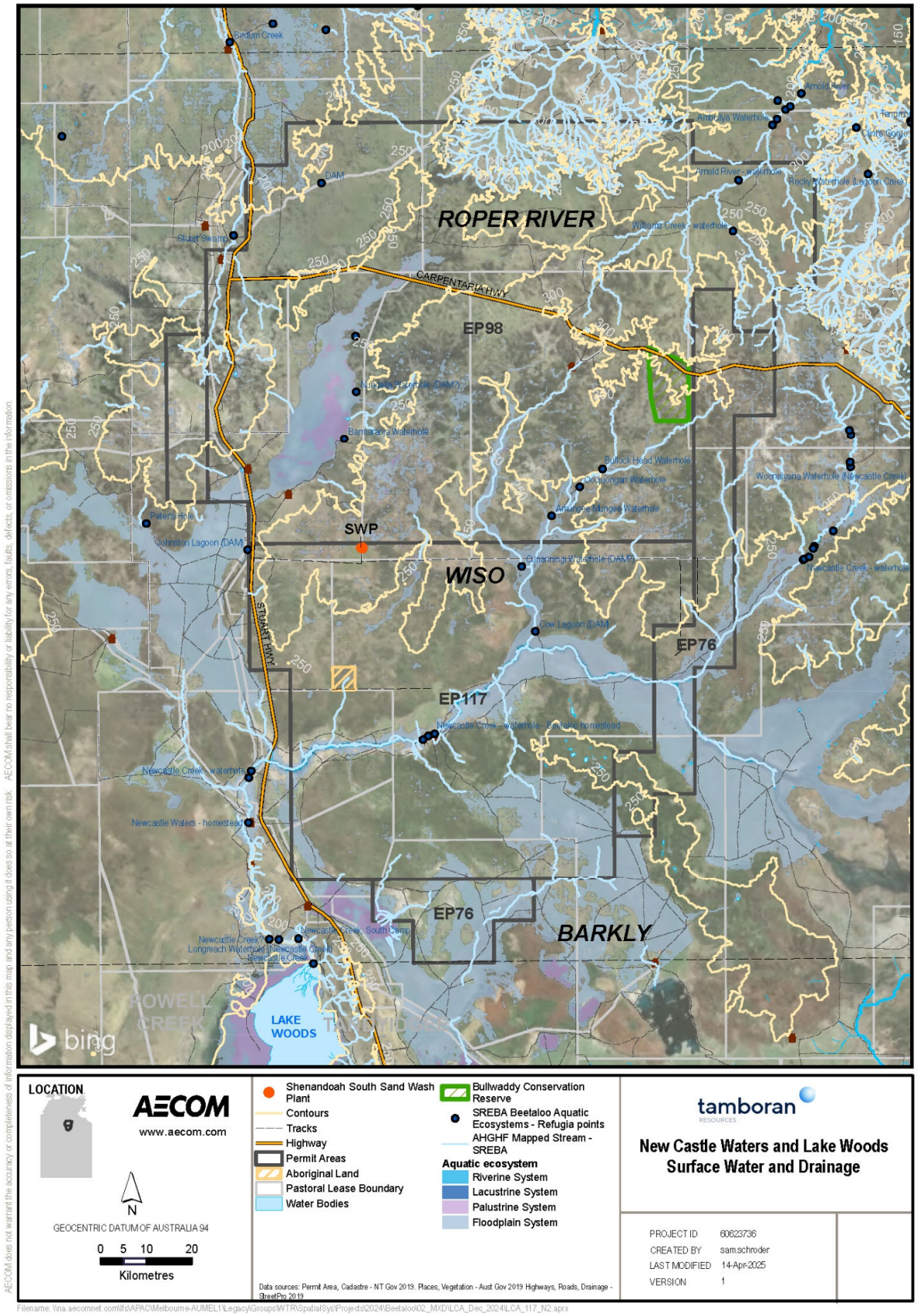


Figure 16: Regional surface water and drainage

4.1.5 Flood risk assessment

The extent of inundation within the permit area depends on the severity of the wet season and can range from remaining completely dry to widespread flooding. AECOM has assessed the 1% Annual Exceedance Probability (AEP) flood depths of the SWP area as part of the broader flood modelling to determine the risk of flood inundation during the 100-year flood event from a local or a regional flooding using the TUFLOW.

Figure 17 shows the modelled 1% AEP flood depth. The result raster has been filtered to exclude areas with flooding depth less than 50 mm given the TUFLOW uses a Rain on Grid (ROG) approach. The SWP site is subject to inundation from localised flooding depths ranging from 0.05 to 0.24 m.

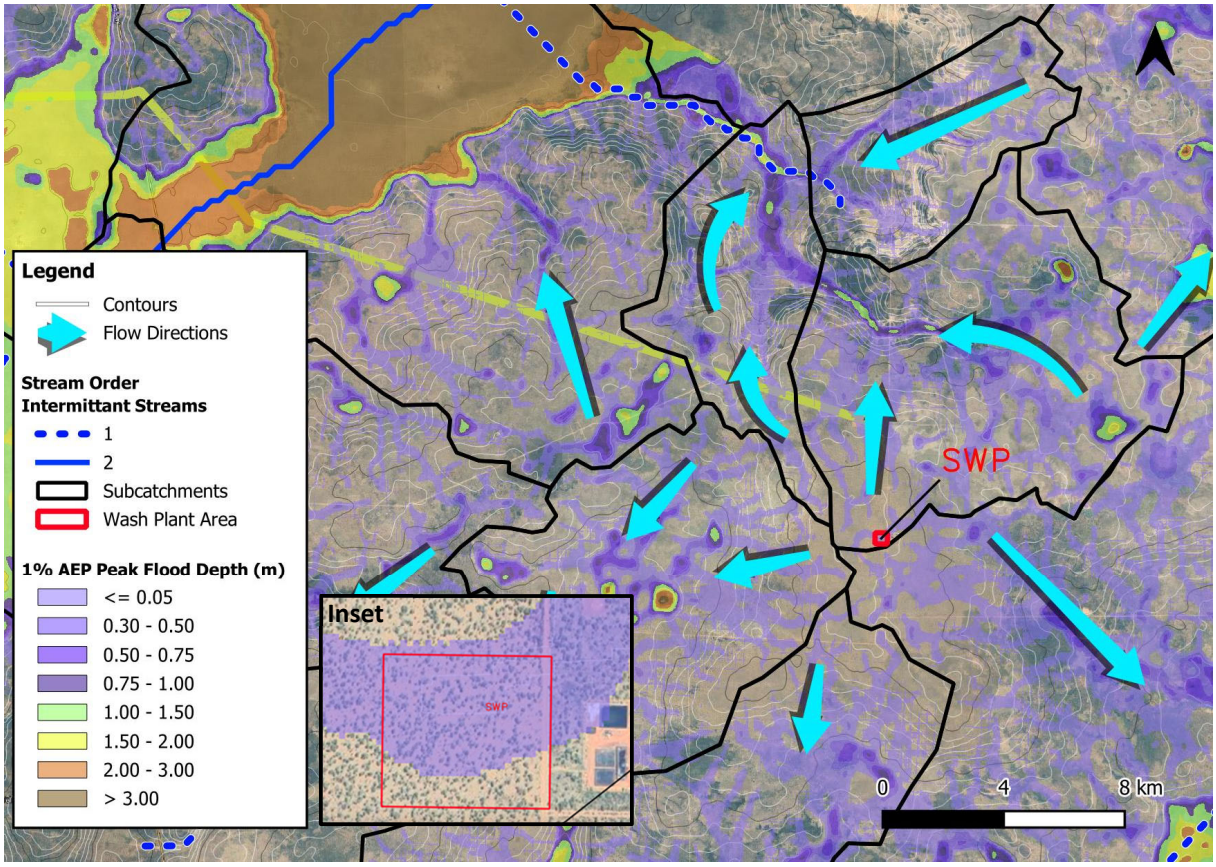


Figure 17: Surface water and drainage in the vicinty of the SWP

4.1.6 Hydrogeology

Within the Beetaloo exploration area, groundwater use is primarily from the Cambrian Limestone Aquifer (CLA) with minor, localised use from formations where shallower groundwater is intersected, where the CLA is too deep, or where the CLA is absent from erosion. This includes:

- Overlying Cretaceous sediments where it is saturated in the central south of the Beetaloo Sub-basin.
- Antrim Plateau Volcanics in the north-west.
- Bukalara Sandstone in the north-east.

Table 27 summarises the stratigraphy based on previous drilling at the Kyalla 117 N2 well site which adjoins the SWP site. Descriptions of the stratigraphic units have been revised to align with the generalised hydrostratigraphy presented in SREBA (2022a).

The CLA, comprising the Gum Ridge Formation and the Anthony Lagoon Beds, is an extensive, multi-layered regional aquifer system covering at least 200,000 km^2 that forms the principal water resource in the Beetaloo Sub-basin, (SREBA, 2022).

The CLA is a highly productive aquifer that has high regional connectivity due to the development of significant fracture and karstic secondary porosity (SREBA, 2022). Across parts of the Beetaloo Sub-Basin, undifferentiated Cretaceous deposits form the uppermost aquifer are targeted for stock use. Notably, a basal sandstone unit immediately overlying the CLA produces yields of at least 10 L/s (SREBA, 2023). Shallow, perched groundwater has also been recorded in the laterised zone within the permit area with groundwater levels recorded between 1 and 6 mBGL. These systems are dynamic with periodic saturation resulting from recharge during the wet season with no documented groundwater use. The CLA, comprising the Gum Ridge Formation and the Anthony Lagoon Formation, is an extensive regional aquifer system that forms the principal water resource in the Beetaloo Sub-Basin. Near the Kyalla 117 N2 site, for example, both aquifer units have a standing water level of approximately 114 m below top of casing. The limestone in the CLA is commonly fractured and cavernous; in the Katherine region, bore yields of up to 100 L/s have been recorded from this aquifer (SREBA, 2023). Such high yielding sections were encountered when drilling the Kyalla 117 N2-1 E&A well through the Anthony Lagoon and Gum Ridge Formation, with total losses of drilling fluid circulation at specific intervals.

Approximately 80% of groundwater bores drilled in the basin screen the CLA and the aquifer supplies water for the pastoral industry and local communities including Elliott, Daly Waters, Larrimah and Newcastle Waters. The CLA contains a significant but largely undeveloped groundwater resource with the sustainable yield from the Georgina Basin estimated to be in the order of 100,000 ML/year (NALWTF, 2009). Existing groundwater use in the Beetaloo Sub-basin is estimated at 6,000 ML/year, primarily used for agricultural production (Foulton and Knapton 2015).

The Antrim Plateau Volcanics conformably underlies the CLA in the north and central part of the Beetaloo Sub-basin. Across much of the Basin it consists of sequences of massive basalt flows with negligible primary porosity. In the north-west of the Basin, where the formation is shallow and fractured, it forms a marginal aquifer; however, reported use is primarily from a sandstone sequence at the contact with the Gum Ridge Formation. There is no reported use within the 3 petroleum EPs held by Tamboran.

The Bukalara Sandstone forms a fractured and weathered aquifer where it outcrops beyond the north-east margin of the Beetaloo Sub-basin. The formation consists of quartz sandstone with shale interbeds and probable enhanced permeability in these areas due to jointing within the sandstone. No use is reported from the formation away from the north-east margin of the Beetaloo Sub-basin where it is at considerable depth. This unit, if present, will be protected through intermediate casing and cement.

Table 27: Summary hydrostratigraphy based on encountered depths at Kyalla 117 N2 well site, adjacent to the SWP

Province	Period / age	Formation		Aquifer status	Encountered depths[16] (approx. top and bottom) (m)	Regional yield (L/s)	Average regional EC (µs/cm)
CARPENTARIA BASIN	CRETACEOUS 145 – 66 Ms	Undifferentiated		Local-scale aquifer	0 – 70.0	0.3 – 4.0	1,800
GEORGINA BASIN	CAMBRIAN 497 – 630 Ma	Cambrian Limestone Aquifer (CLA)	Anthony Lagoon Formation	Regional aquifer	70.0 – 191.4	1.0 – 10.0	1,600
			Gum Ridge Formation	Regional aquifer	191.4 – 399.5	>20.0	1,400
		Antrim Plateau Volcanics		Regional aquitard	399.5 – 499.0	<2.0	900
		Bukalara Sandstone		Local aquifer (not regionally connected)	499.0 – 506.7	0.3 – 5.0	1,000
BEETALOO SUB-BASIN (ROPER GROUP)	UNKNOWN	Hayfield formation		Regional aquifer	506.7 – 899.33	ID	32,000
		Jamison Sandstone		Local aquifer (not regionally connected)	891.33 – 988.97	ID	138,000
	MESO PROTEROZOIC 1,430-1,500 Ma	Kyalla Formation		Regional aquitard	988.97 – 1851.75	ID	ID
		Moroak Sandstone		Local aquifer (not regionally connected)	1851.75 – not determined	0.5 – 5.0	131,000
		Velkerri Formation		Regional aquitard	700 – 900	–	–
		Bessie Creek Sandstone		Local aquifer (not regionally connected)	450	0.5 – 5.0	–

[16] Based on encountered depths a the Kyalla 117 N2 well site.

The regional groundwater flow direction in the CLA is north-west toward Mataranka, where the aquifer discharges into the Roper River and supports significant groundwater dependent ecosystems (aquatic, riparian and floodplain) including the Roper River at Elsey National Park and Red Lily/57 Mile Waterhole. These discharge features occur around 100 km north-west of the Beetaloo Sub-basin. Dry season flow in the Roper River has been gauged at 95,000 – 126,000 ML/yr and provides an estimate of the magnitude groundwater discharge from the CLA. Large decadal changes in the discharge to the Roper River suggest that most recharge input occurs close to the discharge zone (i.e. beyond the Beetaloo Sub-basin region). Groundwater recharge mechanisms to the CLA are poorly characterised but are likely to be dominated by infiltration through sinkholes and preferential recharge through soil cavities.

Limited information exists on the hydrogeological characteristics of the deeper Roper Group and undefined Neoproterozoic group sequence is available as it occurs at depth within the Beetaloo Sub-basin. This unit lies below the Georgina Basin which contains the CLA and other important aquifers. The deeper sandstone dominated formations may behave as aquifers, however, drilling results suggest these formations have limited potential as groundwater resources due to their depth and very high salinity. Groundwater in the Roper Group and undefined Neoproterozoic group is highly saline (>100,000 mg/L chlorides) and contrasts with the shallower aquifers of the Georgina Basin sediments in which groundwater is generally of drinking water quality.

4.2 Biological environment

The following sections describe the flora and fauna identified through multiple historic and recent baseline land condition assessment surveys undertaken in the vicinity of the SWP site.

4.2.1 Bioregions

The SWP site falls within the Sturt Plateau Bioregion. The bioregion is characterised by undulating plains on sandstone with predominantly neutral sandy red and yellow earth soils. Dominant vegetation is eucalypt woodland, (dominated by variable-barked bloodwood *Eucalyptus dichromophloi*a) with spinifex understorey, as well as extensive areas of the Lancewood (*Acacia shirleyi*) - Bullwaddy (*Macropteranthes kekwickii*) vegetation association.

Fauna associated with this bioregion, includes the Spectacled Hare-Wallaby (*Lagorchestes conspicillatus*).

Land condition in the bioregion is moderate to good but is threatened by impacts from weeds, feral animals, pastoralism and changed fire regimes (Baker *et al*., 2005).

4.2.2 Vegetation communities

Recent surveys in the vicinity of the SWP site completed in 2022, 2023 and 204 have identified 11 vegetation communities from 50 vegetation sites (AECOM, 2024b) occur in the surrounding area. Data has also been used from previous baseline assessments completed in 2004, 2006 (HLA, 2006; 2006c), 2010, 2014, 2016 ,2018, 2021, 2023 and 2024 (AECOM, 2011; 2014; 2016; 2018; 2021, 2023a; 2023b; 2024a; 2024b; 2024c; 2024d; 2024e.

The SREBA Terrestrial Ecosystems Baseline Report identified 51 vegetation communities and 21 broad vegetation groups (BVG) comprising the final vegetation classification for the study area (Young *et al*, 2022). Significant vegetation communities identified by the SREBA Baseline Report were also identified in the SWP area. These include wetland, floodplains/drainage depressions and run-on areas which may be intersected by seismic lines (Figure 19).

The proposed SWP area has been evaluated through detailed vegetation and habitat assessments of the ~200 ha survey area (Figure 19). These assessments included the identification of vegetation community, dominant flora species at each strata, habitat condition, disturbance factors (fire, weeds, erosion, feral fauna species), and fauna attributes (e.g. tree hollows, logs, grass cover, mistletoe abundance).

A summary of the land condition assessment (LCA) for the SWP area is provided in Table 28 and Appendix A. Community 2a, covers 100% of the SWP survey area and is the dominant vegetation community in the broader landscape. Given the relatively small clearing footprint for the SWP (11.2 ha) and extensiveness of the Community 2a in the region, the potential of significant impact from the regulated activity is negligible.

Potential risks and impacts to the environment have been identified based on environmental conditions observed during the field survey. The overall disturbance footprint for the SWP is ~11.2 ha. During the LCA the SWP area was assessed to be in generally good condition with nil to minor evidence of weeds, erosion and disturbance from cattle. Figure 18 below demonstrates the sparse nature of the woody vegetation within the SWP site.

The vegetation community is considered regionally extensive and not subjected to extensive clearing. Further detail regarding the SWP area is provided in the LCA, Appendix A.

Figure 18: Typical vegetation within the SWP site

4.2.2.1 Flora

During the August 2018 survey of the Kyalla 117 N2 site, which lies immediately adjacent to the proposed SWP site, a total of 28 dominant flora species were identified.[17] During the field survey undertaken in May

[17] See Beetaloo Basin Kyalla, Civil Construction EMP (ORI1-1).

2024 of the surrounding Shenandoah South E&A area, 79 individual flora species were recorded; details of these species can be found in the TAM3-2 EMP.[18]

The SREBA Terrestrial Ecosystem Report (Young *et al*, 2022) indicated that flora surveys completed over 2021-2022 contributed 15,419 new plant records within the Beetaloo sub-basin. Disturbance was prevalent across all broad vegetation groups, despite efforts to select "best on offer" vegetation sites. Primary contributors to disturbance include fire, cattle, pigs and weeds.

A search of the NT Government flora atlas database was undertaken for the SWP area, with a 5 km buffer applied. This search generated records of 117 flora species, none of which are listed as threatened. Details of the land condition assessment for the site are presented in Appendix A.

4.2.2.2 Threatened Flora

A search of the DCCEEW Protected Matters database of nationally significant flora (PMST) and the NT Government flora atlas database was undertaken for the SWP area, with a 10 km and 50 km buffer applied. No threatened vegetation communities are listed as likely to occur within the SWP area, which is supported by the SREBA (DEPWS, 2022) surveys.

The desktop analysis of flora in the region did indicate two NT threatened flora species that may occur in the Shenandoah South E&A program area. *Carex fascicularis* (Tassel Sedge) a densely tufted perennial sedge (Vulnerable; TPWC Act) and *Spermacoce reticulata* an annual herb (restricted range species) which have both been recorded on Hayfield Station (SREBA 2022) approximately 20 km north-west of the SWP site. *Carex fascicularis* was recorded in a *Fimbristylis herbland* within an *Astrebla* spp. mixed tussock grassland on cracking clay soils, near a flowing creek, (Young *et al.,* 2022). This species is listed as Vulnerable under the TPWC Act but not listed under the EPBC Act.

Carex fascicularis is common in south-eastern Australia and was previously known from a single population in the West MacDonnell Ranges. The scarcity of *Carex fascicularis* in the NT is likely due to the absence of suitable habitat, which comprises swampy areas in mesic and sub-coastal regions throughout its range (DEPWS, 2021a). The species is unlikely to occur in the vicinity of the proposed SWP, due to a lack of suitable wet habitat.

[18] See Beetaloo Basin Shenandoah South 3D Seismic Program, EP98 and EP117 (TAM3-2) Appendix A.

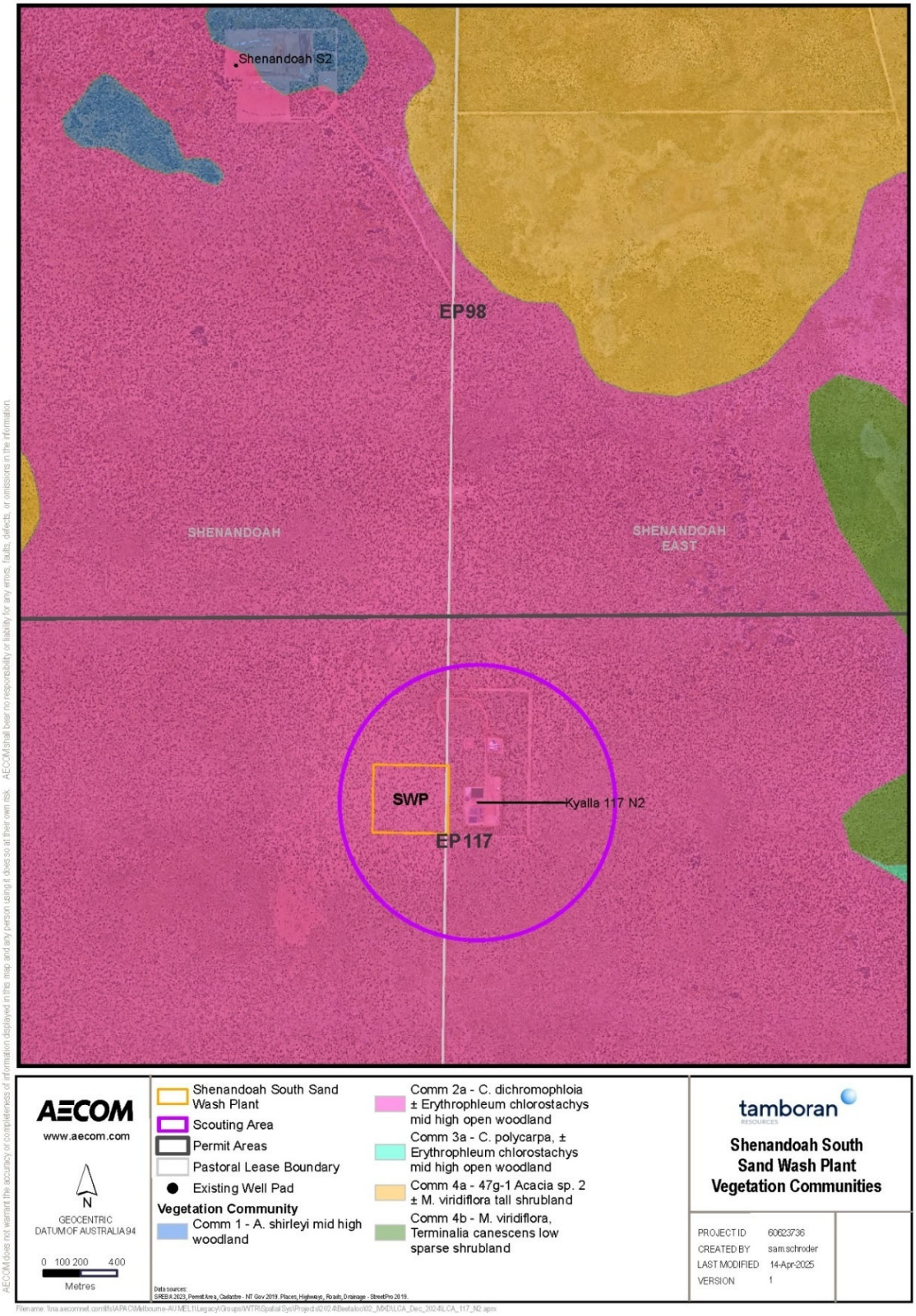
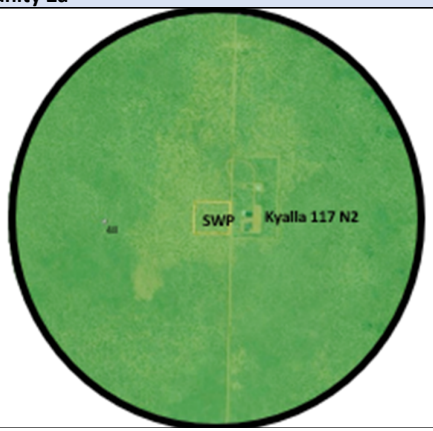


Figure 19: SWP area – SREBA significant vegetation communities and classifications

Table 28: Summary of existing environment and surrounds – vegetation community 2a

<table>
<tr><th colspan="2">SWP – Vegetation Community 2a</th><th colspan="2">Survey photos of the vegetation/habitat</th></tr>
<tr><td>Location</td><td colspan="2"> 
</td><td rowspan="3"> </td></tr>
<tr><td>Landform and soil</td><td colspan="2">Level plains of residual plateau surface. Sandy loam.</td></tr>
<tr><td>Vegetation community description</td><td colspan="2">2a: Corymbia dichromophloia ± Erythrophleum chlorostachys mid high open woodland, over Acacia difficilis, Terminalia canescens, 9g-1 Dodonea sp. 1 mid high open shrubland, over Triodia bitextura ± Chrysopogon fallax, Schizachyrium fragile mid high hummock grassland</td></tr>
<tr><td>Habitat condition</td><td colspan="2">Good – Scattered tree hollows and flowering plants common. Fallen logs common. Mistletoe absent. Shallow leaf litter. Fire damage low > 2 years ago. No erosion. Minor cattle impacts. Termite mounds sparse. Ground cover: 50% vegetation, 20% litter, 30% bare soil.</td></tr>
<tr><td>Dominant flora species</td><td>Upper stratum
Mid high open woodland dominated by Corymbia dichromophloia (fq 100%) ± Erythrophleum chlorostachys (fq 27.78%)</td><td>Mid stratum
Mid high open shrubland dominated by Acacia difficilis (fq 61.11%), Terminalia canescens (fq 38.89%), Dodonaea hispidula (fq 33.33%)</td><td>Ground stratum
Mid high hummock grassland dominated by Triodia bitextura (fq 83.33%) ± Chrysopogon fallax (fq 50%), Schizachyrium fragile (fq 44.44%)</td></tr>
<tr><td>Weeds</td><td colspan="3">No weeds of national significance or NT declared weeds present.</td></tr>
<tr><td>Potential listed threatened species (SREBA 2023)</td><td colspan="3">Gouldian Finch Chloebia gouldiae (Endangered EPBC Act, Vulnerable TPWC Act), Northern Shrike-tit Falcunculus whitei (Vulnerable EPBC Act), Painted Honeyeater Grantiella picta (Vulnerable EPBC Act and TPWC Act), Australian Painted Snipe Rostratula australis (Endangered EPBC Act and TPWC Act), Common Brushtail Possum (northern) Trichosurus vulpecula arnhemensis (Vulnerable EPBC Act), Northern Blue-tongue Skink Tiliqua scincoides intermedia (Critically Endangered EPBC Act), Yellow-spotted Monitor Varanus panoptes (Vulnerable TPWC Act).</td></tr>
</table>

4.2.2.3 Habitat fragmentation

As outlined in DEPWS (2022) "*…vegetation communities and habitats may vary in their sensitivity to degradation, fragmentation and loss as a result of onshore gas and other development*."

Impacts identified in SREBA (DEPWS, 2022a), include land clearing, inappropriate fire regimes, weed incursion and grazing by introduced herbivores, which can lead to long term loss of species abundance and richness. The cumulative impacts of clearing from a regional perspective have been discussed in section 3.3.2.1. Currently onshore gas develop represents ~0.03% of all clearing in the Barkly/Gulf Region (2003 – 2024).

Nevertheless, Tamboran continues to minimise its impacts and reduce the potential for habitat fragmentation, through key mitigations including tread lightly approach for the temporary construction of seismic lines, centralising sites; construction of multi well pads; using existing pastoral access tracks; active fire management; and active weed management.

4.2.2.4 Weeds

Previous surveys within the Tamboran EPs have recorded a low number and density of weed species, indicating that land condition is generally good. Three declared weed species, *Calotropis procera* (Rubber bush), *Parkinsonia aculeata* (Parkinsonia) and *Mesosphaerum suaveolens* (Hyptis), have been recorded during previous surveys. No weeds were detected within the Shenandoah South E&A program during the March-April 2023 or in May 2024 field surveys (AECOM, 2024b). However, Tamboran weed inspections following the end of the 2023-2024 wet season encountered a single Gamba Grass (*Andropogon gayanus*) plant on the Kyalla 117 N2 well site. This individual was removed immediately, noting it had not gone to seed (Mills, N. *pers comms*. July 2024).

High-risk weeds have been determined through consideration of the following criteria:

- Weed species that has been confirmed in the area within the relevant Regional Weed Strategies and Plans, or through field surveys.
- Weed species listed in a statutory plan that are near Tamboran tenure.
- Weed species that are at risk of introduction using machinery sourced from other regions in the NT or from other states.

Since the 8 July 2024, there are now five classes of weeds under the NT *Weed Management Act 2001*. The classes are described as:

a. it is necessary to eradicate the plant

b. it is necessary to prevent the growing and spreading of the plant

c. it is necessary to prevent the introduction of the plant into the Territory or a part of the Territory

d. it is necessary to prevent the plant being spread by the actions of persons

Unclassified. Declared but not classified as A, B, C or D.

Table 29 provides a list of weed species that are known to occur or likely to occur within the SWP area based on a desktop review of the following sources:

- Mapping data provided by the Weed Management Branch, DLPE.
- Guidelines for the Management of the Weeds of Beetaloo 2018 (DLRM & CDU, 2018).
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) EPBC Act Protected Matters Report database.
- Previous data collected by AECOM in the permit area.

Table 29: NT listed weeds known or likely to occur within SWP area

Scientific Name	Common Name	Category of priority	Status*
Alternanthera pungens	Khaki Weed	4	Declared, Class B and C
Andropogon gayanus	Gamba Grass	1	Declared, Class A and C, WoNS
Azadirachta indica	Neem	2	Declared, Class B and C
Calotropis procera	Rubber Bush	1	Declared, Class B and C (south of 16°30' S latitude)
Cenchrus ciliaris	Buffel Grass	3	Declared, Unclassified
Cenchrus echinatus	Mossman River Grass	3	Declared, Class B and C
Datura ferox	Fierce Thornapple	3	Declared, Class A and C
Mesosphaerum suaveolens	Hyptis	4	Declared, Class B and C
Jatropha gossypiifolia	Bellyache Bush	1	Declared, Class A/B and C, WoNS
Parkinsonia aculeata	Parkinsonia	2	Declared, Class B and C, WoNS
Sida acuta	Spinyhead Sida	4	Declared, Class B and C
Sida cordifolia	Flannel Weed	4	Declared, Class B and C
Sida rhombifolia	Paddy's Lucerne	4	Declared, Class B and C
Tamarix aphylla	Athel Pine	2	Declared, Class A/B and C, WoNS
Themeda quadrivalvis	Grader Grass	5	Declared, Class B and C, WoNS
Tribulus terrestris	Caltrop	4	Declared, Class B and C
Vachellia nilotica	Prickly Acacia	1	Declared, Class A and C, WoNS
* All Class A and B weeds are also Class C weeds.			

The 2024 annual weed report submitted to DLPE on 25 March 2025, recorded one occurrence of Gamba grass (*Andropogan gayanus*) and 9 occurrences of annual mission grass (*Cenchrus pedicellatus*) detected at the neighbouring Kyalla 117 N2 well site. These weeds were treated so that by end of June 2024 weeds were confirmed to have been controlled with no new occurrence. Additional follow-up surveys did not record any additional weeds for the remainder of the year These incursions indicate an extremely low presence of weeds due to Tamboran's continued implementation of the weed management plan and ongoing site inspections (i.e. 10 inspections Dec 23 – Jan 2025).

No weeds were identified in the SWP area during the May/June 2024 LCA scouting. The areas traversed during scouting / field surveys are displayed in Figure 20.

Additional information on the full list of weeds and control measures implemented across Tamboran's EPs is provided in the LCA (Appendix A) and WMP (Appendix D).

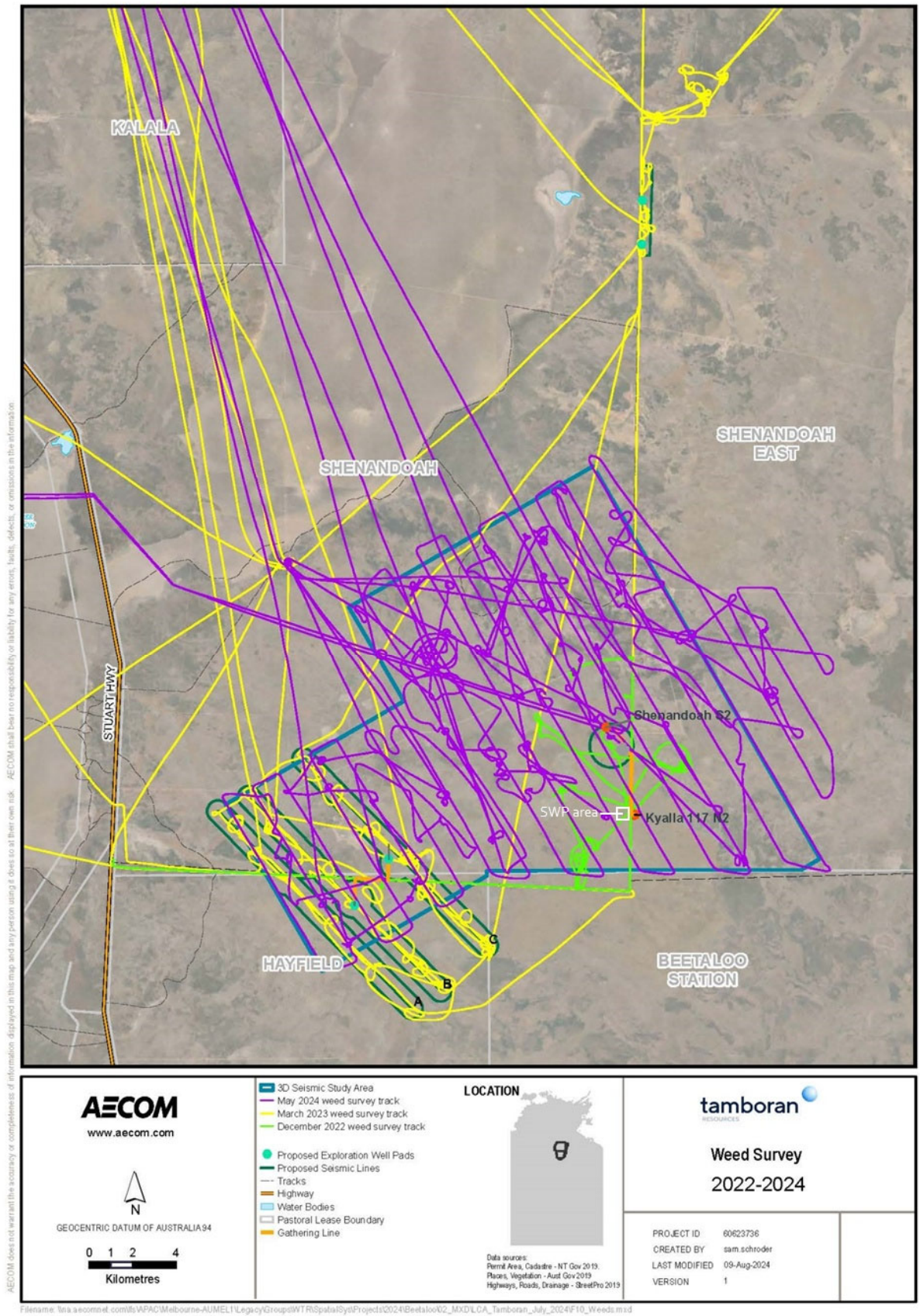


Figure 20: SWP area – 2022-2024 weed survey tracks

4.2.2.5 Fire regime

Fire is a natural occurrence in most Australian ecosystems and plays an important role in their ecology. Fire is generally excluded from Mitchell grasslands by pastoral management to maintain forage throughout the dry season (HLA, 2005), whereas fire is more frequent in the Stuart Plateau.

Historically most high intensity fires within EP 98 and 117 occur during the dry season (HLA, 2005). Wet season fires have occurred within the EPs; however, these fires are likely to be patchy and of lower intensity, depending on the state of curing of the fuel load.

Land condition assessments undertaken in the vicinity of the SWP area indicated low intensity fire events greater than 2 years at most assessed sites. Fire data was acquired from the North Australian Fire Information (NAFI) site and queried for the SWP area. Ten-year fire data (2015 to 2024) shows that most of the surrounding area has been burnt between one and four times in the past 10 years, with sections of the north remaining unburnt, and parts in the south-east burnt five times. Figure 21 shows the fire frequency within the exploration areas over the past 10 years (2015 to 2024).

A BMP has been developed to manage bushfire risks associated with the SWP area (Appendix C). The plan provides the hazard reduction strategies, resources and response to bushfire emergencies.

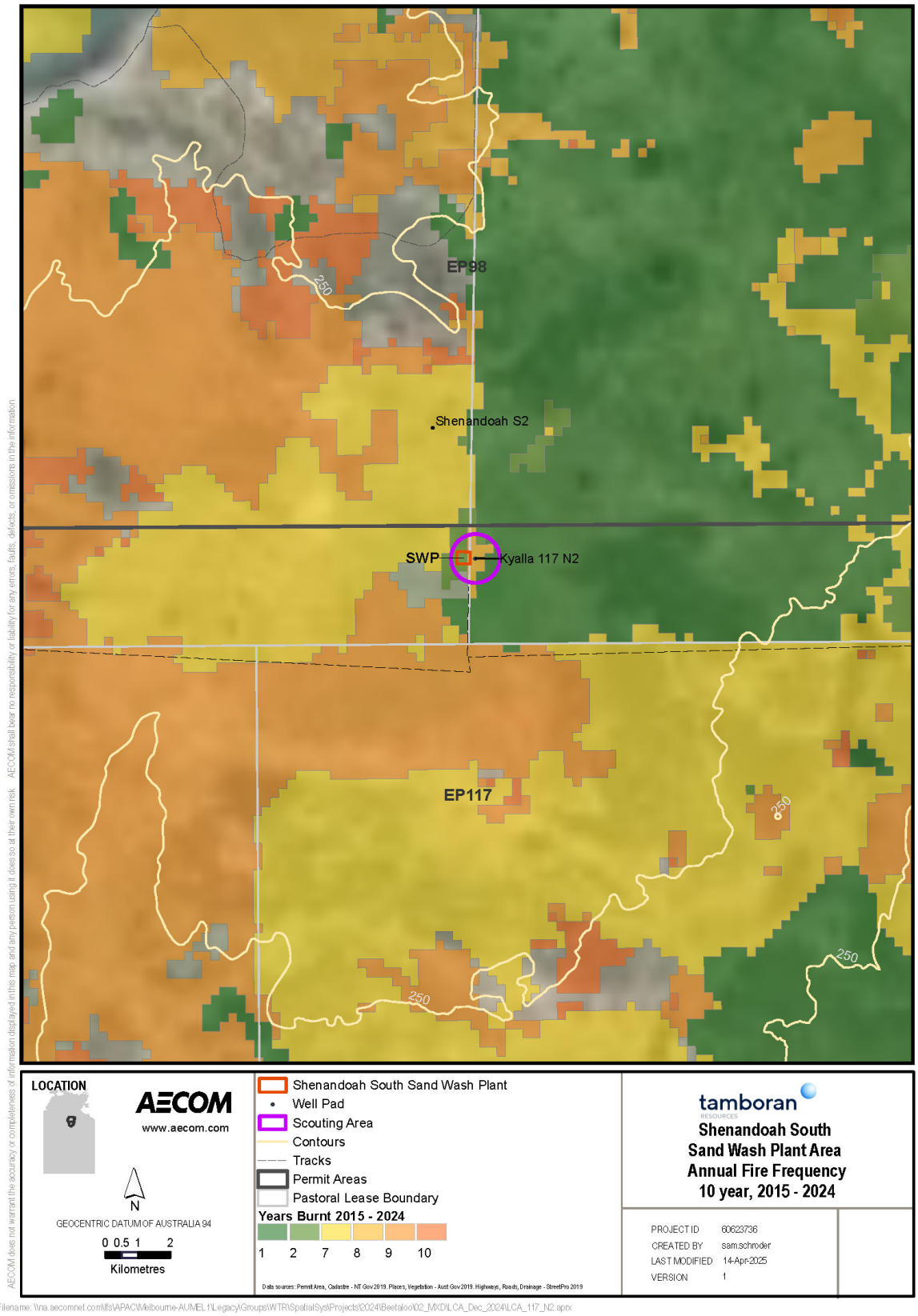


Figure 21: 10 year annual fire frequency mapping (2015 – 2024)

4.2.3 Fauna

A review of the SREBA (Young, 2022) reveals that a total of 354 vertebrate species were recorded from all surveys and incidental observations during the SREBA and GBA studies in the Beetaloo Sub-basin, indicating relatively high total vertebrate species richness but no species endemism within the SREBA study area. Species consisted of 202 bird, 99 reptiles, 39 mammals and 14 amphibians (Young, 2022).

The SWP area comprises open woodland consisting of mixed Eucalyptus/ Corymbia species with a mixed tussock grass understorey. Scattered stands of Bullwaddy/ Lancewood communities occur across the broader landscape; however, these communities do not occur within the footprint of the proposed SWP. In the wider landscape, additional vegetation types include those associated with drainage lines, grasslands/floodplains and Acacia sp. shrublands.

Eucalyptus/Corymbia sp. woodland provides habitat for a range of species. The proposed disturbance areas had high native grass cover and included numerous species suitable for granivorous birds (seed eaters). Dense leaf litter and numerous logs provide suitable refuge and foraging sites for fauna such as reptiles. Although most of the species found in this vegetation type are widespread in the tropical savannas of the Northern Territory, some such as the threatened Crested Shrike-tit (*Falcunculus frontatus whitei*) are rare and known to utilise this habitat (Ward, 2008). Many of the sites previously surveyed have a high density of hollow-bearing trees that provide important habitat for many fauna species. Avoiding clearing large hollow-bearing trees will reduce the impact to native wildlife within the EPs.

A fauna monitoring program undertaken from November 2019 to September 2022 at the Kyalla 117 N2 well site provides significant data on the fauna species that occur in the area. Six motion-activated cameras were installed around the perimeter of the well pad, with some cameras also aimed onto the well pad and sumps. Thirty-eight species were detected comprising 30 birds, five mammals, two reptiles and one amphibian (refer Table 12, Appendix A).

4.2.3.1 Listed threatened fauna

A search of the DCCEEW Protected Matters database of nationally significant fauna (PMST) and records from the NT Government Fauna Atlas database (NR Maps) was undertaken at 10 km and 50 km of the broader SS E&A program area. The search results indicate the potential presence of 14 fauna species listed as threatened under the EPBC Act and/or the TPWC Act at the 50 km. These included eight birds, two mammals, three reptiles and one shark. Of these species, four may occur within the proposed SWP area.

During the field survey in May 2024, which contained the SWP area, the Grey Falcon (*Falco hypoleucos*) was recorded, following an extended 2023-24 wet season (AECOM 2024b). However suitable breeding habitat does not occur within the SWP area.

The likelihood of occurrence assessment is based on the availability of suitable habitat within the permit area, records in the vicinity and distributional data. Therefore, many of the threatened and migratory fauna species indicated in databases as ‘occurring’ or ‘likely to occur’ have been assessed as unlikely to occur within the SWP area. As the intensity of surveys may vary due timing and weather access, and some species are very cryptic, a conservative approach has been taken to assess species presence. A full description of each species, their distribution and habitat associations are provided in Table 30.

No critical habitat for threatened fauna has been identified in the vicinity of the SWP area. [19] However, some species may occur and are known to occur in the wider landscape. Threatened species that potentially occur include:

- Gouldian Finch *Chloebia gouldiae* (Endangered EPBC Act, Vulnerable TPWC Act)
- Grey Falcon *Falco hypoleucos* (Vulnerable EPBC Act and TPWC Act)
- Northern Shrike-tit *Falcunculus whitei* (Vulnerable EPBC Act)
- Common Brushtail Possum (northern) *Trichosurus vulpecula arnhemensis* (Vulnerable EPBC Act)
- Plains Death Adder *Acanthopsis hawkei* (Vulnerable EPBC ACT and TPWC Act)
- Northern Blue-tongue Skink *Tiliqua scincoides* intermedia (Critically Endangered EPBC Act)
- Yellow-spotted Monitor *Varanus panoptes* (Vulnerable TPWC Act).

As records of species may be limited in remote areas the precautionary principle has been applied. There are some species that have been assessed as possibly occurring even though their primary habitat is not found within the proposed sites or access tracks. These include species that are associated with ephemeral wetlands, low lying areas that may be seasonally inundated and creeks. During the wet and early dry season these areas may sustain threated species such as wetland birds (including migratory species).

The SREBA study for significant terrestrial fauna (Young et al, 2022) included the development of species distribution models using covariates for climate, topography, fire soil, vegetation and hydrology. These models have been used to aide assessment of the likelihood of some threatened species (Northern Shrike-tit, Greater Bilby, Gouldian finch and Yellow-spotted monitor) occurring within the SWP area.

[19] Critical habitat': *"…habitat critical to the survival of a listed threatened species or ecological community."* https://www.aph.gov.au/Parliamentary_Business/Committees/Senate/Environment_and_Communications/Completed_inquiries/2010-13/threatenedspecies/report/c05

Table 30: Commonwealth EPBC and Territory TPWC listed threatened species and likelihood occurence assessment within the SWP area

Species	Status		Distribution	Habitat	Likelihood
	EPBC	TPWC			
Birds					
Sharp-tailed Sandpiper *Calidris acuminata*	VU	-	Most of the Sharp-tailed Sandpiper population migrates to Australia in the non-breeding season, with widespread records occurring both inland and in coastal locations. In the NT the species mostly occurs in the north coastal regions. Widely scattered inland records occur south to northern Tanami Desert, and in southern NT (Higgins & Davies 1996).	In Australia the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation (Higgins & Davies 1996).	Unlikely Suitable habitat does not occur within the SWP area. Recent (2021) records occur 45 km south of the SWP.
Curlew Sandpiper *Calidris ferruginea*	CE	VU	In the NT this species occurs around Darwin, north to Melville Island and Cobourg Peninsula, and east and south-east to Gove. It has been recorded inland from Victoria River Downs and around Alice Springs (Higgins & Davies, 1996).	Coastal habitats, inland it has been found around lakes, dams and ephemeral/permanent waterholes.	Unlikely Suitable habitat does not occur within the SWP area.
Red Goshawk *Erythrotriorchis radiatus*	EN	VU	Found across most of Northern Australia, in the NT most records are from the Top End but there are records from central Australia (Pizzey & Knight, 2012).	Red Goshawks occupy a range of habitats, often at ecotones, including coastal and sub-coastal tall open forest, tropical savannahs crossed by wooded or forested watercourses. In the NT, it inhabits tall open forest/woodland as well as tall riparian woodland (Aumann & Baker-Gabb, 1991).	Unlikely No records and no suitable breeding habitat occur within the SWP area.
Gouldian Finch *Chloebia gouldiae*	EN	VU	Formerly widespread across northern Australia. In the NT they are found in the Top End south past Daly Waters (Palmer *et al*., 2012).	Gouldian Finches occupy different habitat types in the breeding and non-breeding season. Breeding habitat consists of hillsides with suitable nesting trees. Outside of the breeding season they are found in lowland drainages to feed on suitable perennial grasses (Dostine & Franklin, 2002).	Possible Recent records occur within the Beetaloo Sub-basin and suitable foraging habitat is present within the SWP area.
Grey Falcon *Falco hypoleucos*	VU	VU	This species has a widespread distribution, and records occur throughout the NT. However, most records are from arid and semi-arid regions (Pizzey & Knight, 2012).	Grey Falcon is typically found on inland drainage systems in lightly treed lowland plains, pastoral lands, timbered watercourses and, occasionally, the driest deserts (DEPWS, 2021d).	Possible Recent records occur within the Beetaloo Sub-basin, however suitable breeding habitat does not occur within the SWP area.

Species	Status		Distribution	Habitat	Likelihood
	EPBC	TPWC			
Northern Shrike-tit *Falcunculus whitei*	VU	NT	This species has been recorded from widely scattered localities from near Timber Creek to the east Gulf Country, north to Kakadu National Park and in north-eastern Arnhem Land (DEPWS, 2021e).	Occupies wet and semi-arid melaleuca and eucalypt open woodlands. May be associated with bloodwoods with flaky bark and ironwood (Ward, 2008).	Possible No recent records occur in the vicinity of the SWP area, though suitable habitat is present.
Painted Honeyeater *Grantiella picta*	VU	VU	This species is migratory based on seasonal variation in occurrence. They breed on the inland slopes of the Great Dividing Range. After the breeding season they sometimes occur in the north-eastern NT, south of the Roper River (Garnett & Baker, 2021).	Painted Honeyeater inhabits woodlands dominated by Acacia and/or Eucalyptus species and open forests but prefers habitats with abundant mature trees that host mistletoes. The species specialises on the fruit of mistletoes and also forages on nectar and insects (Garnett *et al.*, 2011).	Possible No recent records occur close to the SWP area.
Night Parrot *Pezoporus occidentalis*	EN	EN	Night Parrot was once widespread across arid and semi-arid regions. Recent confirmed records of the species come from widely separated locations in western Queensland and Western Australia (DEPWS, 2021f).	This species occupies spinifex grasslands in stony or sandy areas, in ephemeral herblands, samphire and chenopod shrublands on floodplains (DEPWS, 2021f).	Unlikely No recent records occur within the area. Suitable habitat does not occur within the SWP area.
Princess Parrot, Alexandra's Parrot *Polytelis alexandrae*	VU	VU	This species irregularly occurs across the arid zone from near Oodnadatta in South Australia, west to near Coolgardie and the east Murchison River in Western Australia, and north to near the Fitzroy River in Western Australia and to Howell Ponds in the Northern Territory (Higgins 1999; Baxter & Henderson 2000)	Princess Parrot is usually recorded from shrubland in swales between sand dunes, with occupied sites typically having a variety of shrubs (including Grevillea, Hakea, Cassia and Eremophila species) among scattered emergent trees, with a groundcover of spinifex Triodia species. The species occurs less often in woodland. The princess parrot forages on the ground and in flowering shrubs and trees (Higgins 1999; Pavey *et al*. 2014)	Unlikely No recent records occur close to the SWP area.
Australian Painted Snipe *Rostratula australis*	EN	VU	Records of the species occur across the NT. More recent records come from McMinns Lagoon near Darwin, Yellow Waters in Kakadu, the Sturt Plateau, the Barkly and the Tanami (DEPWS, 2021g).	Australian Painted Snipe prefers a habitat of recently flooded temporary vegetated wetlands during the non-breeding period and brackish temporary freshwater wetlands with minimum vegetation during breeding periods. Birds usually forage in thick, low vegetated areas during the day (Curtis *et al*, 2012).	Unlikely Suitable habitat does not occur within the SWP area.
Masked Owl (northern)	VU	VU	The subspecies occurs in northern Australia, although its distribution is not well known. In the NT, occurs from Cobourg south to Katherine and	This species inhabits tall open eucalypt forest in the NT, especially those associated with *Eucalyptus miniata* and *E. tetrodonta (*Woinarski, 2007*)*. Also	Unlikely

Species	Status		Distribution	Habitat	Likelihood
	EPBC	TPWC			
Tyto novaehollandiae kimberli			the VRD and east to the McArthur River (DoE, 2014).	found in riparian and monsoonal forest and rainforest (DoE, 2014).	No recent records occur close to the SWP area and suitable habitat is not present.
Mammals					
Northern Quoll *Dasyurus hallucatus*	CE	EN	The species once occurred throughout most of Northern Australia although it is has declined across much of its range (Woinarski & Hill, 2012). In the NT it is found in the Top End as far southeast as Borroloola.	Northern Quolls do not have highly specific habitat requirements although the most suitable appear to be rocky habitats. They occur in a variety of habitats across their range, including open forest and woodland. Daytime den sites provide important shelter. Shelter sites include rocky outcrops, tree hollows, hollow logs, termite mounds, goanna burrows and human dwellings (Woinarski & Hill, 2012).	Unlikely No recent records, occur in the vicinity of the SWP area and habitat is sub-optimal.
Ghost Bat *Macroderma gigas*	VU	NT	The species' range in northern Australia is from relatively arid conditions in the Pilbara region of Western Australia to humid rainforests of northern Queensland. A large colony occurs in a series of gold mine workings at Pine Creek, NT. This species has also been recorded throughout the mainland Top End north of approximately 17° latitude (DEPWS, 2021h).	The distribution of Ghost Bats is influenced by the availability of suitable caves and mines for roost sites. The species often roosts in a deep crack or cave during the day (DEPWS, 2021h).	Unlikely No recent records occur close to the SWP area.
Greater Bilby *Macrotis lagotis*	VU	VU	This species occurs in south-western Queensland and in arid north-western Australia (Western Australia and Northern Territory). This species was previously widespread in arid and semi-arid Australia (Pavey, 2006). The most northern records are from Newcastle Waters and Wave Hill (Southgate & Paltridge, 1998).	In the NT, this species is found on sandy soils dominated by spinifex. It also occurs in hummock grassland associated with low lying drainage systems and alluvial areas (Pavey, 2006). Recent surveys in the Beetaloo region have recorded Greater Bilby in Eucalyptus and Corymbia woodlands mixed tussock and hummock grasses in sandy/loam soils (Davis *et al*., 2021).	Unlikely No recent records occur in the vicinity of the SWP area although potentially suitable habitat is present.
Bare-rumped Sheath-tailed Bat *Saccolaimus saccolaimus nudicluniatus*	VU	DD	Wide distribution from India through south-eastern Asia to the Solomon Islands, including north-eastern Queensland and the NT. Records of the species in the NT are sparsely scattered across the Top End (DEPWS, 2021i).	Previous specimens have been collected from Open *Pandanus* woodland fringing the sedgelands of the South Alligator River in Kakadu National Park, and from eucalypt woodlands and forests from coastal and adjacent inland areas (DEPWS, 2021i).	Unlikely No recent records, occur in the vicinity of the SWP area and habitat is not suitable.

Species	Status		Distribution	Habitat	Likelihood
	EPBC	TPWC			
Common Brushtail Possum *Trichosurus vulpecula arnhemensis*	VU	NT	The Common Brushtail Possum (northern subspecies) occurs discontinuously from the Gulf of Carpentaria hinterland near Borroloola, NT westward to the Kimberley, WA (TSSC, 2020b).	The species occurs mainly in tall eucalypt open forests with large hollow-bearing trees, particularly where the understorey includes some shrubs that bear fleshy fruits (TSSC, 2020b).	Possible Recent records of the species occur at nearby Kalala Station and suitable habitat occurs within the SWP area.
Pale Field-rat *Rattus tunneyi*	-	VU	Pale Field-rat inhabits higher rainfall areas of northern and eastern Australia, including the Top End of the NT (Menkhorst & Knight, 2011).	This species favours dense vegetation found along rivers where it occupies burrows in loose colonies (Cole & Woinarski, 2002). Pale Field-rat occurs within a variety of habitats including woodlands if a dense understorey of grasses is present (Menkhorst & Knight, 2011)	Unlikely No recent records occur close to the SWP area and suitable habitat is absent.
Reptiles					
Plains Death Adder *Acanthophis hawkei*	VU	VU	Fragmented populations of the Plains Death Adder are known to occur in the Mitchell Grass Downs of western Queensland, the Barkly Tableland on the Northern Territory / Queensland border and east of Darwin in the Northern Territory.	Suitable habitat for the Plains Death Adder consists of flat, treeless, cracking-soil riverine floodplains (Cogger, 2000).	Possible No recent record within the vicinity of the SWP area. Suitable habitat occurs in the region.
Gulf Snapping Turtle *Elseya lavarackorum*	-	EN	Gulf Snapping Turtle is restricted to rivers draining into the Gulf of Carpentaria, including the Calvert and Nicholson River systems (DEPWS, 2021j)	The species occurs in deep pools in the upper catchments of permanently flowing spring-fed river systems, particularly in areas with intact riparian vegetation (DEPWS, 2021j).	Unlikely Suitable habitat does not occur within the SWP area.
Northern Blue-tongue Skink *Tiliqua scincoides intermedia*	CE	-	The Northern Blue-tongue Skink occurs across northern Australia from Eighty Mile Beach in Western Australia (WA), across the southern Kimberley and Top End of the Northern Territory (NT), to approximately the Gregory Downs / Cloncurry area in western Queensland (DCCEEW, 2023).	The Northern Blue-tongue Skink occurs in a wide variety of ecosystems, including riparian forest, vine scrub, monsoon rainforest, pandanus-lined gorges, melaleuca forest, eucalypt woodland and savanna, sparse and dense shrubland, and spinifex and tussock grassland. GPS tracking has shown that northern blue-tongue skinks move widely across savanna landscapes in the wet-season, but they spend most (~ 95 %) of their time in small, fragmented patches of relatively dense vegetation that provide cool, shaded, and damp conditions (DCCEEW, 2023a).	Possible Recent records occur nearby, and suitable habitat occurs within the SWP area.

Species	Status		Distribution	Habitat	Likelihood
	EPBC	TPWC			
Mertens' Water Monitor *Varanus mertensi*	EN	VU	Mertens' Water Monitor has a broad distribution that encompasses coastal and inland waters across the far north of Australia. In the NT, the species has been recorded across most of the Top End and the Gulf region (DEPWS, 2021k).	Mertens' Water Monitor is highly aquatic and rarely ventures more than 5-10 m from the edge of water. The species has been recorded in the following habitat: • Perennial and semi-permanent pools, including springs, seeps, swamps, creeks and gorges, • The margins of permanent streams, rivers and lakes, • Floodplain billabongs, lagoons, swamps and soaks, • Perennial waterholes in woodlands, Man-made irrigation channels and the margins of dams (DCCEEW, 2023b).	Unlikely Suitable habitat does not occur within the SWP area.
Mitchell's Water Monitor *Varanus mitchelli*	CE	VU	Mitchell's water monitor occurs across the wet-dry tropics of northern Australia from the far west Kimberley of WA across the Top End of the NT to far northwest Queensland (DCCEEW, 2023).	Mitchell's water monitor inhabits freshwater and saline wetlands that range from seasonal gorges in upper catchments to large rivers and coastal floodplains. It is recorded from rivers, creeks, gorges, springs, lagoons, swamps, mangroves, and foreshores (DCCEEW, 2023c).	Unlikely No recent records occur at similar latitudes and the SWP area appears to be south of the species current distribution.
Yellow-spotted Monitor *Varanus panoptes*	-	VU	Occurs across a broad geographic range across northern Australia. In the NT most records are from the Top End but occurs as far south as Renner Springs (Ward *et al.*, 2012).	Occupies a variety of habitats including coastal beaches, floodplains, grasslands and woodlands (Ward *et al*., 2012).	Likely The species was recorded during the wildlife monitoring program at Kyalla 117 N2 during 2020. Suitable habitat is present.
Shark					
Largetooth Sawfish *Pristis pristis*	VU	VU	Largetooth Sawfish have been recorded in numerous drainage systems in northern Australia in fresh and saline water including the Fitzroy, Durack, Robinson and Ord rivers (Western Australia), the Adelaide, Victoria, Daly, East and South Alligator, Roper, McArthur, Wearyan and Robinson rivers (Northern Territory), and the	This species in northern Australia appears to be confined to freshwater drainages and the upper reaches of estuaries, occasionally being found as far as 400 km from the sea (Thorburn *et al.* 2007; Whitty *et al*. 2008).	Unlikely Suitable habitat does not occur within the SWP area.

Species	Status		Distribution	Habitat	Likelihood
	EPBC	TPWC			
			Gilbert, Mitchell, Normanby, Wenlock, Mission, Embley and Leichhardt rivers (Queensland) (DoE, 2015).		

The following provides summary of each threatened species that potentially occur within the SWP area.

Gouldian Finch

Research has shown that critical components of suitable habitat for the Gouldian Finch include suitable nesting trees during the breeding season (particularly *Eucalyptus tintinnans*, *E. brevifolia* or *E. leucophloia*), a water source and a diverse range of favoured annual and perennial grasses (Dostine & Franklin, 2002).

During the wet season, Gouldian Finches move from breeding habitat on hillsides with suitable trees down to lower lying areas where they forage on perennial grasses such as *Triodia sp.*, *Alloteropsis semialata*, and *Chrysopogon fallax* (Palmer *et al*. 2012). Some of these perennial grasses were recorded during recent surveys so potential foraging habitat is present; however, there are limited records in the vicinity.

Potentially suitable nesting trees, specifically *Corymbia dichromophloia* and *Eucalyptus leucophloia* as well as suitable perennial, foraging grasses have been observed within the SWP area. Although no Gouldian Finches were observed during the bird surveys habitat in the SWP area was moderately suitable for this species.

The SREBA species distribution model for Gouldian Finch indicates a low probability of the species occurring within the SWP area, as displayed in Figure 22.

Figure 22: Mean probability of presence of Gouldian Finch within the Shenandoah South E&A program area (Young et al., 2022)

Grey Falcon

The Grey Falcon (*Falco hypoleucos*) is a widespread species listed as Vulnerable in the NT and possibly occurs in the SWP area. The species occurs in low densities throughout arid and semi-arid areas of Australia (DEPWS, 2021d).

Grey Falcon is known to nest on repeater towers in the region, including one site located approximately 100 km south-west of SWP area where the species bred in 2014 (Jonny Schoenjahn, personal communication, 2022). The species also nests in the tallest trees along watercourses, such as Red River Gums (*Eucalyptus camaldulensis*) (TSSC, 2020a). The Grey Falcon may intermittently forage within the SWP area but is unlikely to breed.

Northern Shrike-tit

The Northern Shrike-tit lives in dry Eucalypt forests and woodlands where it feeds on insects from the canopy and under bark. It has been recorded in wet Melaleuca open woodlands and woodlands dominated by Nutwood (*Terminalia arostrata*) and Bloodwoods with flaky bark and ironwood (Ward, 2008). In the NT, nesting has been recorded from September through to January and nests are built in terminal branches at the top of trees (Ward *et al*., 2009). The stronghold of this species is north of the Shenandoah South E&A program area, with NR Maps showing only four records south of -16.25° latitude. Targeted surveys by the NT Government in the Beetaloo Basin failed to detect the species south of -16.0° latitude despite significant survey effort (>30 call playback surveys). Additionally, the SREBA distribution model suggests that the entire project has a low likelihood of the species occurring (Young *et al*., 2022).

Although it is possible the Northern Shrike-tit may be present in the area, it is unlikely to represent an important area for this species.

Common Brushtail Possum

Recent surveys have detected Common Brushtail Possum (*Trichosurus vulpecula arnhemensis*) on Kalala Station (Young, *et al*, 2022). Suitable woodland habitat is contiguous through the landscape; therefore, the species potentially occurs within the SWP area. Given the large amount of suitable habitat within the region comparative to the SWP area footprint, the risk to regional populations of the species is small.

Plains Death Adder

Suitable habitat for the Plains Death Adder consists of flat, treeless, cracking-soil riverine floodplains (Cogger, 2000). A population of the species occur in the Barkly Tableland from the Northern Territory to central-western Queensland. In the Beetaloo Basin Records of the species occur close to Lake Woods, Lake Sylvester and Lake Tarrabool. The species may occur within the SWP area, particularly following heavy wet season rainfall.

Northern Blue-tongue Skink

The Northern Blue-tongue Skink occurs in a wide variety of vegetation communities, eucalypt woodland and savanna, sparse and dense shrubland, and spinifex and tussock grassland. Areas of dense vegetation that provide cool and moist conditions within hot, dry, and flammable landscapes are critical habitat for the survival of the species, as such habitat provides the Northern Blue-tongue Skink with food, water and protection from environmental exposure and predation. Examples of such habitat includes rainforest and vine thicket, riparian forests, well-vegetated creeks and drainage lines, well-vegetated swamps and springs, and dense thickets within floodplains, grasslands, shrublands, savannas and woodlands (DCCEEW, 2023).

Several recent (2020-2022) records of the species occur within 100 km, and suitable habitat occurs within the SWP area. The species was recently listed as Critically Endangered under the EPBC Act in December 2023.

Yellow-spotted Monitor

The Yellow-spotted Monitor (*Varanus panoptes*) occurs across northern Australia where it occupies a variety of habitats, including grasslands and woodlands (Ward *et al*., 2012). Most records of this species are from the Top End, though it has been recorded in the Barkly Tablelands. The species was recorded along the perimeter of the Kyalla 117 N2 well pad in 2020 (Figure 23).

Figure 23: Yellow-spotted Monitor (Varanus panoptes) recorded at Kyalla 117 N2 well site in 2020

4.2.3.2 Migratory and Marine Species

The EPBC Protected Matters database indicated the potential presence of 13 migratory and 17 marine listed species within the SWP area (Table 31). Of these species, one is considered likely to occur, six possibly and 11 are unlikely to occur within the SWP area. The SWP area does not contain critical habitat for any migratory or marine listed species.

Table 31: Migratory listed species potentially occurring within the SWP area

Scientific Name	Common Name	EPBC Act	Likelihood of Occurrence
Actitis hypoleucos	Common Sandpiper	Migratory, Marine	Unlikely
Anseranas semipalmata	Magpie Goose	Marine	Unlikely
Apus pacificus	Fork-tailed Swift	Migratory, Marine	Possible/Overfly area
Bubulcus ibis (Ardea ibis)	Cattle Egret	Marine	Possible
Calidris acuminata	Sharp-tailed Sandpiper	Migratory, Marine	Unlikely
Calidris ferruginea	Curlew Sandpiper	Migratory, Marine	Unlikely
Calidris melanotos	Pectoral Sandpiper	Migratory, Marine	Unlikely
Cecropis daurica	Red-rumped Swallow	Migratory, Marine	Unlikely
Charadrius veredus	Oriental Plover	Migratory, Marine	Possible
Chalcites osculans (Chrysococcyx osculans)	Black-eared Cuckoo	Marine	Possible
Cuculus optatus	Oriental Cuckoo	Migratory	Possible
Glareola maldivarum	Oriental Pratincole	Migratory, Marine	Possible
Haliaeetus leucogaster	White-bellied Sea-eagle	Marine	Unlikely

Scientific Name	Common Name	EPBC Act	Likelihood of Occurrence
Hirundo rustica	Barn Swallow	Migratory, Marine	Unlikely
Merops ornatus	Rainbow Bee-eater	Marine	Likely
Motacilla cinerea	Grey Wagtail	Migratory, Marine	Unlikely
Motacilla flava	Yellow Wagtail	Migratory, Marine	Unlikely
Pristis pristis	Freshwater Sawfish	Migratory	Unlikely

4.2.3.3 Feral and pest animals

Feral animals known to occur within the region include pig (*Sus scrofa*), wild dog (*Canis lupus familiaris*), feral cat (*Felis catus*), cane toad (*Bufo marinus*), horse (*Equus caballus*), donkey (*Equus asinus*), water buffalo (*Bubalus bubalis*), camel (*Camelus dromedarius*), black rat (*Rattus rattus*), and domestic cattle (*Bos taurus*).

There is potential for pest species to be attracted to the SWP area due to an increase in human activities in the area. Pest species controls are included in the EMP to discourage attraction to the exploration areas, in particular camp operations where there is a high potential for food waste to be encountered.

The cane toad is known to be present in the SWP area and the Commonwealth DCCEEW recognises this species as a 'key threatening process' related to their impacts on biodiversity through predation, competition, land degradation and poisoning. In the NT, the cane toad has been implicated in the decline of several reptile species including the Plains Death Adder (*Acanthophis hawkei*), King Brown Snake (*Pseudechis australis*) and *Varanus* spp. (Smith & Phillips, 2006).

Pest predators such as cats likely occur within the SWP area, though their abundance is difficult to assess due to their cryptic nature. Introduced predators such as cats can impact many vertebrates (Dickman, 1996 & 2009). One of the primary concerns of introduced predators are the impacts on reptiles and ground-dwelling birds. Feral cats are also believed to be one of the factors that have led to the decline of the threatened ground-dwelling Partridge Pigeon (Woinarski *et al.* 2007).

4.2.3.4 Groundwater dependent ecosystems

A search of the National Groundwater Dependent Ecosystems (GDE) has been conducted previously, indicating the potential for groundwater interaction/use for river/spring/wetland ecosystems across Australia. It shows the ecosystems that rely on groundwater that has been discharged to the surface, such as baseflow or spring flow.

The Atlas identifies two aquatic GDEs within the exploration area, consisting of Newcastle Creek and Yaroo Creek. The SWP activities are not anticipated to impacts these GDEs.

Until recently, all known and moderate potential GDE locations occurred at distances >20 km from the vicinity of the proposed regulated activities. The impact on these units from Tamboran's total water extraction across the Beetaloo exploration area was assessed during the granting of WEL GRF10285.

Stygofauna are a form of GDE that inhabit the interstitial spaces of the cavities of alluvial, sedimentary and karstic aquifers. Data is available that can provide an indication of the likelihood of stygofauna presence, with Hose, *et al.,* (2015) outlining the following factors affecting the distribution of stygofauna:

- **Formation type:** Stygofauna are predominantly found in aquifers with large (mm or greater) pore spaces, which a more common for alluvial, karstic and some fractured rock aquifers.

- **Depth below ground level:** The abundance and diversity of stygofauna typically decreases with depth below ground, with fauna are rarely found more than 100 m below ground level (Hose, *et al.,* 2015).
- **Proximity of exchange and recharge:** Stygofauna are more abundant in areas of surface water-groundwater exchange, compared to deeper areas or those further along the groundwater flow path remote from areas of exchange or recharge

A characterisation of the stygofauna and microbiological assemblages of the Beetaloo Sub-basin was conducted as part of the Gas Industry Social and Environment Research Alliance (GISERA) (Rees *et al.,* 2020). The study collected data from 3 locations north of Elliott within the vicinity of the SWP area. The study found two stygofauna specimens (*Parisia unguis* and *Bathynellaceae Bresvisomabathynella* sp.) and stygofauna eDNA from the Carpentaria Highway Roadside Bore (RN00592) located over 50 km north of the SWP area, while there were no reported findings of stygofauna in the Hayfield homestead bore and the Sturt Plains homestead bore. However, the study did identify eDNA which may indicate stygofauna presence. The results are consistent with Hose *et al* (2015), which indicates stygofauna are likely to be present at lower abundance at the observed groundwater depth within the Shenandoah South sites (~106 m below ground level).

These results are supported by the extensive field surveys of aquatic groundwater fauna undertaken in October 2021 and May 2022, as part of the SREBA aquatic ecosystem studies (Humphreys *et al.*, 2022). A total of 66 groundwater bores were sampled, with the sites selected to obtain spatial coverage across the study area and to stratify sampling by the hydrogeological formations present (Humphreys *et al.*, 2022). Results of the surveys returned a total of 280 stygofauna specimens across 28 taxa, with the highest diversity of stygofauna detected in the Tindall limestone aquifer (Humphreys *et al.*, 2022), which lies approximately 100 km northwest of the SWP area.

The results of the aquatic ecosystem studies (Humphreys *et al.*, 2022) further indicate that total taxa richness across 8 taxa groups occur in riverine sites in northern-draining catchments; specifically, 8 of the top 10 sites occur in the Roper catchment, with the maximum number of species (80) recorded within a seasonally flowing channel of the Little Roper River, which is over 200 km NW of the SWP area.

Based on the outcomes of the studies above, the depth of the groundwater, likely low abundance of stygofauna and limited extraction draw down observed at the Kyalla extraction bores, impacts to stygofauna from activities associated with the SWP are considered highly unlikely.

This is supported by the NTG (2024) assessment Tamboran's WEL application, which is currently available for public comment. As stated in NTG (2024): *"The depth to the regional water table in the CLA aquifer ranges from 80 to 120 mbgl in the vicinities of the planned exploration sites, which indicates it is unlikely the aquifer is supporting any terrestrial or aquatic … GDEs. These groundwater depths are consistent with the findings of the … SREBA … Groundwater is considered unlikely to support terrestrial GDEs at water table depths exceeding 20 mbgl. The SREBA … identifies small, disparate areas of low to moderate confidence seasonal GDEs across the region, however these are likely to be associated with shallow, perched systems."*

4.3 Environmental and cultural sensitivities

4.3.1 Native Title

One native title determination (NTD21/2010) has been finalised where the SWP is proposed (refer to Table 32). Two others are located nearby on neighbouring pastoral properties.

Table 32: Native title determinations current for SWP area

Name	Summary
NTD21/2010 Shenandoah Pastoral Lease	Native title exists in parts of the determination area and is held by the Kinbininggu and Bamarrngganja groups, including persons who are members of the estate group in accordance with cl. 6 of the Determination and other Aboriginal people with rights and interests in respect of the Determination Area, in accordance with cl. 7 and cl. 8 of the Determination.
NTD26/2010 Hayfield pastoral lease	Native title exists in parts of the determination area and is held by the Kinbininggu, Warranangku and Marlinja groups, including persons who are members of the estate group in accordance with cl. 6 of the Determination and other Aboriginal people with rights and interests in respect of the Determination Area, in accordance with cl. 7 and cl. 8 of the Determination.
NTD27/2010 Beetaloo pastoral lease	Native title exists in parts of the determination area and is held by the Karranjinji, Bamarrnganja, Warranangku, Pinda (OT Downs) and Liga/Muwartpi groups, including persons who are members of the estate group in accordance with cl. 6 of the Determination and other Aboriginal people with rights and interests in respect of the Determination Area, in accordance with cl. 7 and cl. 8 of the Determination.

The Native Title Petroleum Exploration Agreement between Tamboran and the NLC includes clauses for the protection of sacred sites, objects and sensitive areas related to Aboriginal activities in the area, including cultural, hunting and foraging activities. The Native Title Agreement also includes clauses for the protection of the sacred sites, environment and site rehabilitation.

4.3.2 Archaeology assessment

Archaeological assessments have been completed by AECOM's heritage consultants over several surveys, with the most recent in April 2023 and May 2024. The assessment involved a desktop review of existing heritage data from the Australian Heritage Database, the NT Heritage Register (NTHR) and the Aboriginal Areas Protection Authority (AAPA) certifications, previous archaeological survey reports prepared for the local area, as well as consultation with traditional owners and a field inspection.

AECOM archaeologist undertook a detailed site inspection of the SWP area on 28 and 29 August 2017 as part of the wider survey of the Kyalla 117 N2 well site. This assessment was involved helicopter and pedestrian survey.

The results of the archaeology assessment confirmed no culturally sensitive landforms or archaeological sites within the SWP area, and no elements of Aboriginal heritage value. A copy of the archaeological assessment report and methods is provided in Appendix B.1.

Cultural heritage sites within the broader area are primarily in the proximity to the identified high priority areas (i.e. areas of water sources with standing or running water associated with a waterhole, soakage or channelised drainage lines).

Tamboran commits to avoid areas of high sensitivity. In addition, an unexpected finds procedure which has been developed over the Tamboran's exploration program in the area will be used to respond to any potential additional artifact or sacred site finds during clearing and grubbing of the proposed SWP location. A copy of the finds procedure is presented as Appendix B.2.

4.3.3 Areas of cultural significance

Sacred sites in the study area are primarily associated with drainage lines; natural landform features and stock routes, but there are also concentrations of sites nearby to old homesteads. The distribution of these sites may reflect historical patterns of Indigenous movements along drainage lines and subsequent development of stock routes on old Indigenous walking trails, or they may merely be indicative of the site clearance work undertaken along roads and tracks in the area. It is suspected that there will be a range of other sites also within the area, either not yet recorded, or known but not reported for cultural reasons.

A separate anthropological survey was conducted by NLC and Traditional Owners and results provided to AAPA for issuing of an authority certificate. AAPA certificate C2024/065 covers the entire Shenandoah South E&A program area, which includes the SWP area. AAPA certificate C2024/065 does not, however, include the specific sand processing activity proposed within the SWP site. As such, a variation to the AAPA certificate was submitted to AAPA in May 2025. No Restricted Work Areas (RWA) are identified within proximity to the SWP area.

4.3.4 Non-indigenous heritage

In 1860, explorer John McDougall Stuart was the first European to penetrate the area now known as the 'Centre'. The first written descriptions of the area come from Stuart during his second attempt to cross the continent from south to north (HLA, 2005).

Development in the area began as pastoral lands with an increased interest in land settlement following the completion of the Overland Telegraph Line in 1873. Most attempts were unsuccessful with the Lancewood-Bullwaddy vegetation found to be impenetrable and the lack of surface water making the land unsuitable for cattle. Daly Waters was thus recognised as one of the last watering stops on the Murranji Stock Route.

It wasn't until the 1930s to 1950s, that the area saw regional economic growth with Daly Waters becoming a significant hub of air and mail services into the Northern Territory. The wartime years saw this role increase with Daly Waters again playing a major role in cross country transport and communication. This role continued until the early 1970s when the airport was closed to commercial traffic. The town and surrounding areas subsequently reverted to a primarily agriculture-based existence following the decline of air travel, but in recent times has seen commercial interest from the exploration for gas in the Beetaloo Sub-basin and the growth of the 'grey nomad' tourism market.

There are no registered historical heritage sites in or adjacent to the SWP area, and the previous survey of the area identified no elements of historical heritage value.

4.3.5 Heritage assessment

A search of the Australia Heritage Database identified that no statutory listed heritage places were present within SWP area.

Frew Ponds, a reserve paying tribute to the building and joining of the Overland Telegraph Line is located greater than 20 km west south-west of the SWP area and approximately 16 km south of the existing access track turn-in from the Stuart Highway.

No heritage places or artefacts are registered within the SWP area. Figure 21 presents the cultural heritage and sensitive landforms for the SWP area.

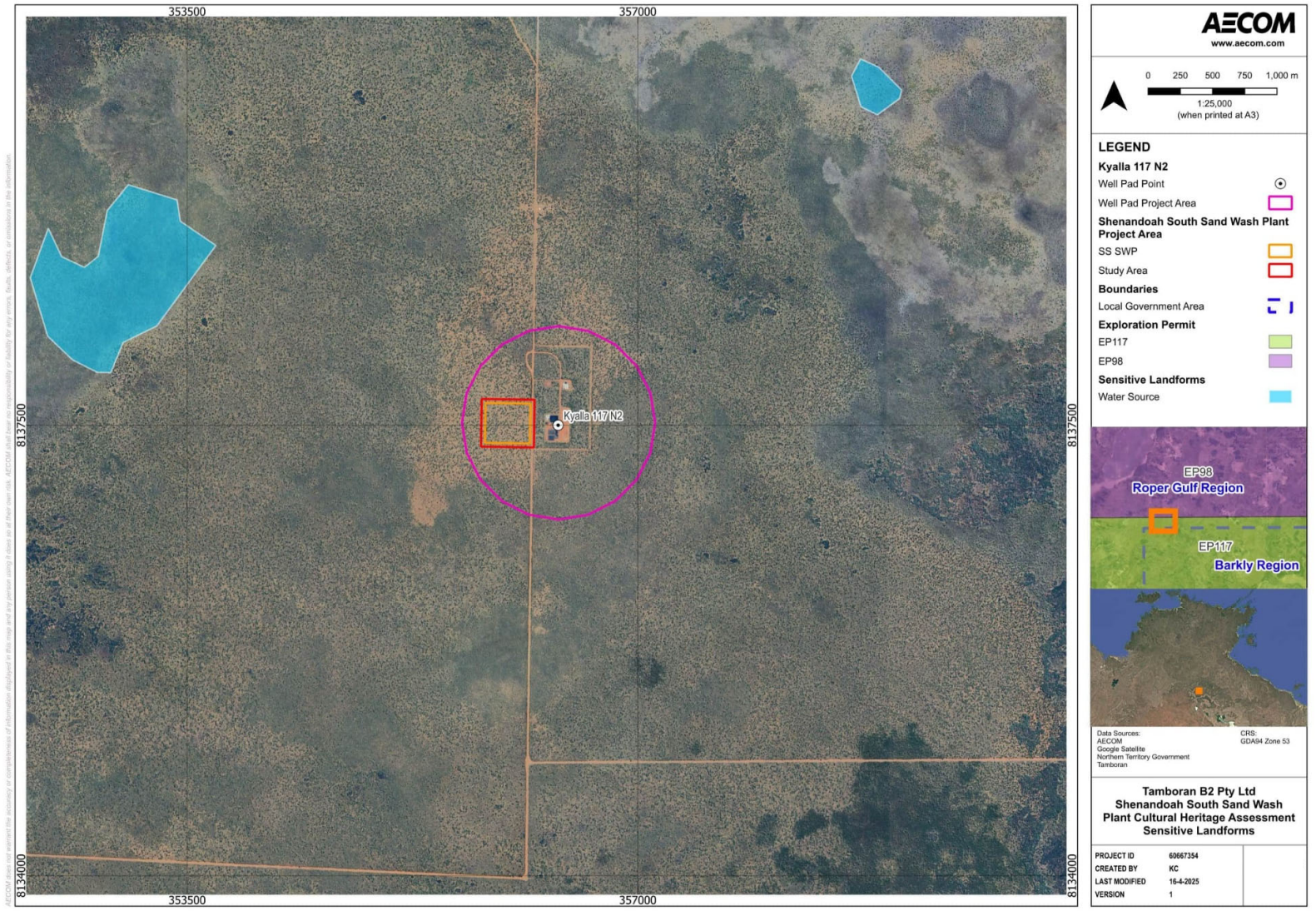


Figure 24: Cultural heritage and sensitive landforms for the SWP area

4.3.6 Protected or conservation areas

There are no conservation reserves, national parks, world heritage places, Commonwealth land, heritage places or critical habitat areas listed under the EPBC Act located within or adjacent to the SWP area.

The Bullwaddy Conservation Reserve lies ~70 km to the north-east of the SWP area. The EPBC Listed Lake Woods is located approximately 100 km south of the SWP area and is listed on the National directory of important Wetlands.

The risks to Lake Woods through aquifer contamination, spills, sediment release, habitat destruction have been addressed in the risk assessment presented in Appendix I. The main mitigation measures/ factors include:

- As the proposed site is 100 km (direct) from Lake Woods, contamination is not likely to reach the area at any undiluted impactable state.
- Surface water flow is to the south into a tributary of Newcastle Creek which flows into Lake Woods via Newcastle Waters. Any spill would need to travel well over 100 km to reach Lake Woods which is extremely unlikely given the limited chemical storage volumes required at the SWP site.
- Groundwater depth in the SWP area is expected to be greater than 70 m deep with vegetation not being able to access groundwater at this depth. The flow path (north-west) is not in alignment with the conservation area, meaning a valid contamination pathway does not exist.

4.4 Social environment

4.4.1 Social context

The proposed SWP activities will occur within the Roper Gulf Regional Council area, which covers 201,000 km^2. The approximate population of the Roper Gulf region is estimated to be 5,592 people (Roper Gulf Council Regional Plan 2022-23).

The potential social and economic effects associated with the proposed exploration activities are minor and predominantly positive.

The closest neighbouring regional towns and communities identified as being within proximity to these regulated activities include:

- Dunmarra (~30 km)
- Elliott (~80 km)
- Daly Waters (~70 km)
- Newcastle Waters (~65 km).

There are two small areas of Aboriginal freehold land known as Jingaloo and Lily Hole community on EP 117, which are located approximately 30 km and 46 km, respectively, from the SWP site.

4.4.2 Pastoral activity

The SWP area is located on the Hayfield / Shenandoah / Shenandoah East pastoral station. The main access to the site from the Stuart Highway traverses the Hayfield and Shenandoah Stations. Within the Tamboran's broader Beetaloo exploration permit area there are nine pastoral properties (Table 33). All land within the permit area is a perpetual pastoral lease.

Table 33: Pastoral properties in the permit area

Pastoral property	Permit areas			Contacts
	EP 76	EP 98	EP 117	
Amungee Mungee	✓	✓	✓	N/A
Hayfield / Shenandoah / Gum Ridge		✓	✓	Val Dyer [redacted]
Kalala		✓	✓	N/A
Tanumbirini	✓	✓		
Beetaloo[20]	✓		✓	N/A
Ucharonidge	✓		✓	N/A
Tandyidgee	✓	✓		
Nutwood Downs		✓		
Newcastle Waters			✓	

4.4.3 Other land uses in the area

A range of other land uses exist in the permit area or in the larger region, including a range of public utilities and facilities. These include the following:

- Tourism – Tourism is an important regional industry with the Stuart Highway being a major thoroughfare for tourists travelling in the area during the dry season. The local townships of Daily Waters, Dunmarra and Elliott provide consumables (food, fuel etc.) and accommodation. Several heritage areas of importance to regional tourism are in the broader region, including Elliott, Newcastle Waters and other heritage listed homesteads.
- Road networks – The Stuart Highway will be used to access the sites. In addition, there are numerous gravel roads connecting properties, and internal property tracks. All properties also have firebreaks on their boundaries and internally.
- Gas pipeline – A gas pipeline runs to the west of the Stuart Highway, along the eastern boundary of EP 117 and crosses the boundary of one part of EP 98. It also runs parallel with the Carpentaria Highway to the Gulf of Carpentaria, through EP 98 and EP 76.
- Alice Springs to Darwin Railway – The railway line runs to the west of the gas pipeline and Stuart Highway and does not cross into any of the permit areas.
- Townships – The townships of Daly Waters and Dunmarra neighbour EP 98 to the west.
- Conservation areas – including the Bullwaddy Conservation Reserve, which lies within EP 98 approximately 65 km north-east, and Lake Woods and the Junction Stock Reserve outside EP 117, approximately 100 km south.

[20] As per previous engagement covering approved Beetaloo W regulated activities and EMPs.

- Heritage – There are 7 heritage sites within the exploration permit area and several heritage areas of importance to regional tourism located in the broader region, including Elliott, Newcastle Waters and heritage-listed homesteads.
- Archaeological sites – The permit areas have a long history of Aboriginal association, and a number of archaeological sites have previously been recorded within the permit areas, as well as registered sacred sites and areas of significance.

The proposed activities covered under this plan have been specifically designed to avoid impacts to these receptors.

4.5 Matters of National Environmental Significance

4.5.1 Potential EPBC Act Controlling Provisions

Actions such as the proposed SWP area may require approval by the Commonwealth Minister for the Environment, under the EPBC Act. Approval is only required if the action is likely to result in significant impacts on Matters of National Environmental Significance (MNES) or if the action will have or is likely to have a significant impact on Water resources.

Potential triggers under the EPBC Act for onshore gas exploration include a significant impact on:

- The world heritage values of a declared World Heritage Property
- The national heritage values of a listed National Heritage Place
- The ecological character of a declared Ramsar wetland
- A listed Threatened Ecological Community, or its habitat
- The members of a listed threatened species
- The members of a listed migratory species or their habitat
- A water resource, in relation to an unconventional gas development and large coal mining development.

4.5.2 Protected Matters Search

An updated EPBC Protected Matters Search was generated on the 29 April 2025 to identify whether MNES or other matters protected by the EPBC Act are likely to occur on or in the near vicinity of the SWP area. Results of the search are provided below in Table 34.

Table 34: Summary of EPBC Aspects for SWP area and immediate surrounds (10 km buffer)

Aspect	Located within the SWP buffer area
Matters of National Environmental Significance	
World Heritage Properties	None
National Heritage Places	None
Wetlands of International Significance	None
Great Barrier Marine Park	None
Commonwealth Marine Area	None
Listed Threatened Ecological communities	None
Listed Threatened Species	13
Listed Migratory Species	13

Aspect	Located within the SWP buffer area
Other Matters Protected by the EPBC Act	
Commonwealth Land	None
Commonwealth Heritage Places	None
Listed Marine Species	17
Whales and other Cetaceans	None
Critical Habitat	None
Commonwealth Reserves Terrestrial	None
Australian Marine Parks	None
Habitat Critical to the Survival of Marine Turtles	None
Extra Information (Information that may also be relevant to the Exploration sites)	
State and Territory Reserves	None
Regional Forest Agreement	None
Nationally Important Wetlands	None
EPBC Act Referrals	1 – Sturt Plateau Pipeline (EPBC 2024/10027) Proposed action not a controlled action Decision date 1 April 2025.
Key Ecological Features (Marine)	None
Biologically Important Areas	None
Bioregional Assessments	None
Geological and Bioregional Assessments	1 - Beetaloo GBA region

Section 4.2.2 and section 4.2.3 provides details on threatened species that potentially occur within the SWP area. The threatened and migratory species that potentially occur within the SWP area are unlikely to be significantly impacted by the exploration activities.

5 Stakeholder engagement

5.1 Purpose and objectives

Tamboran's stakeholder engagement is focused on building respectful relationships with key stakeholders and developing a positive reputation founded on Tamboran's core values. Tamboran's consistent approach to stakeholder engagement has been to ensure that those persons and/or groups directly impacted/ affected and/or influenced by permit commitments have received Tamboran's full attention. Tamboran views the social acceptance and informed consent of these primary stakeholders of critical importance and relevance during this stage of low impact and small-scale exploration activities.

A stakeholder engagement plan has been implemented, which guides the way Tamboran undertakes stakeholder engagement above and beyond the requirements outlined in the Regulations.

Stakeholder engagement records for the new activities are provided in Appendix J (the Stakeholder Engagement Logs Part A and Part B); Appendix J.1.1 (pastoral) and Appendix J.1.2 (NLC).

5.2 Identification of stakeholders

The Regulations define stakeholder as meaning:

a) a person or body whose rights or activities may be directly affected by the environmental impacts or environmental risks of the regulated activity proposed to be carried out; or

b) an agent or representative of a person or body mentioned in paragraph (a).[21]

Tamboran's directly affected stakeholders have been, and will continue to be, consulted in a respectful, open and consistent manner. This has been the case since 2014, when the previous operator, Origin, assumed operatorship of EP 98, EP 117 and EP 76 and again in November 2022 when Tamboran assumed operatorship of EPs 98, 117 and 76.

For this EMP, Tamboran identifies its stakeholders, in compliance with the regulations as:

- **Host traditional owners** recognised as the native title holders and/or claimants and their representative, the NLC, as described in Exploration Agreements between the parties for EP 98, EP 117 and EP 76; and
- **Host pastoralists** recognised as the landholders of the nine pastoral stations (Table 33). For the SWP construction and operation described in this EMP, the owners of the pastoral leases for the Shenandoah, pastoral station are recognised as the pastoralist stakeholders directly impacted.

Stakeholder and community engagement for the proposed work program has been held with host pastoralists and traditional owners directly affected by the proposed activities. Activities performed on EPs will be conducted in a manner consistent with the Code, which Tamboran considers an appropriate regulatory instrument for ensuring Tamboran's activities are in line with community expectations and legislative requirements.

Where appropriate, Tamboran also recognises and engages, with other interested parties that are not classified as directly affected under the Regulations. These include government agencies, land councils, local and regional suppliers, non-government organisations, councils and peak industry bodies.

[21] Refer section 7(3) of the Regulations.

5.3 Pastoralist stakeholder engagement

Tamboran has engaged with the pastoral stakeholders identified previously (Table 33) on an ongoing basis, including engagement with the leaseholders and/or representatives of the Hayfield / Shenandoah / Shenandoah East Stations, regarding the full range of exploration activities within the Shenandoah E&A area outlined in this EMP. Key engagement efforts Tamboran has undertaken include:

- Ongoing regular engagement with pastoralist about Tamboran's general activities.
- Providing the landholder with copies of a Stakeholder Engagement Pack (SEP) covering exploration activities and providing opportunity for the landholder to comment.

The Stakeholder Engagement Logs Part A and Part B (Appendix J) summarise Tamboran's engagement with the leaseholders of Shenandoah, Shenandoah East and Hayfield pastoral stations as a relevant stakeholder and provide information in accordance with section 7(2)(a) of the Regulations.

Appendix J.1.1 provides the detailed records of communication between Tamboran and the pastoralist regarding the proposed activities.

5.4 Host traditional owner(s) engagement

Tamboran has undertaken detailed engagement with the host traditional owners through the NLC to facilitate an ongoing relationship between Tamboran and their host traditional owners. Engagement efforts undertaken by Tamboran include:

- Execution of Exploration Agreement(s) between Tamboran and native title holders for all EPs. This includes a range of additional reporting and environmental protection measures, in addition to the minimum statutory requirements outlined in the NT Petroleum (Environment) regulations.
- Provision of annual work program updates and sacred site clearances providing detailed information on the proposed regulated activities, including description, location, impacts, risks and controls.
- Execution of Sacred Site clearance and avoidance surveys on the specific areas of land. A formal NLC Sacred Site Avoidance and Anthropological Report is generated by the NLC and submitted to the AAPA to assist with the issuing of an Authority Certificate in compliance with the NT's *Aboriginal Sacred Sites Act*.
- In person consultation between Tamboran, host traditional owners and their statutory representative body, the NLC regarding Tamboran's proposed exploration activities as a part of annual work program update meetings.
- On country meetings held with NLC and traditional owners to discuss proposed activities, schedule and address any questions. The on-country meetings conclude the engagement and consultation necessary with traditional owners prior to commencement of each years' activities.
- Ongoing consultation regarding Tamboran work programs and proposed exploration activities, including the location(s) of all areas of disturbance and answering any questions or comments on the activity and its related impacts.
- Regular site visits to walk through activities underway (including vegetation clearing activities, drilling and stimulation) and answer any questions regarding any of Tamboran's E&A activities that are underway.

The traditional owner stakeholder engagement is summarised in Appendix J, Part A & B. Detailed records of communication between Tamboran and the host traditional owners (via NLC), regarding the proposed activities is provided in Appendix J.1.2.

The NLC is the contact point for all native title holders:

Northern Land Council
[redacted]

5.5 Stakeholder activities

Key considerations when understanding the consequences to pastoral operations and traditional owners include:

- Understanding pastoralist operations and determined native title holder custodianship of the proposed area to ensure petroleum activities can sustainably co-exist.
- Provision of payments and/or benefits to the pastoral lessee(s) and native title holders for the impact of regulated activities on the proposed activity area in accordance with the relevant agreements.

A summary of the potential consequences of the activity on stakeholders' activities and mitigation controls is provided in Table 35.

Table 35: Potential consequences of Tamboran's activities on stakeholders' activities and control measures which are outlined in the SEPs

Activity	Potential consequence to activities	Mitigations
Pastoralists		
Pastoral time	• Impact to pastoralist time as they are required to engage with Tamboran as a part of the planning and approval for the proposed activity.	• Tamboran undertakes engagement in good faith, with information provided in a variety of formats to reduce time pressures as far as reasonably practicable
Pastoralist site access	• Exploration vehicles along access track may interact with pastoralist activities- mustering and pastoralist vehicles. • Restricted access to exploration wells and fenced SWP area during the length of proposed activities. • Restricted access during seismic surveys.	• Pastoralist engaged throughout exploration activity planning to incorporate pastoralist feedback into activity to reduce impacts. • Camps with workers bussed to site (where possible) to minimise vehicle movements. • Hazardous areas to be fenced and signed to communicate potential safety hazards. • Compensation to be paid for loss of available grazing land and disturbance.
Pastoral activities grazing and mustering	• Minor elevated levels of noise in the immediate vicinity of the well pad during exploration activities (limited noise at all other times). • Minor elevated levels of noise in the immediate vicinity of the SWP site during SWP operation (limited noise at all other times). • Potential elevated noise and vibration within vicinity of seismic shoot (typically within 200-500 m of activity).	• Pastoralist engaged throughout exploration activity planning to minimise impact on cattle and pastoral activities. • Compensation to be paid for loss of available grazing land and disturbance. • Full fencing of wash plant area to restrict cattle. • Speed limits restricted to 60 km/hr, unless otherwise agreed. • Dust control utilised to reduce dust emissions. • Site to be rehabilitated back to pre-existing state, with security bond in place if company fails to rehabilitate.

Activity	Potential consequence to activities	Mitigations
	• Disturbance of cattle in the immediate vicinity of the activity when works are undertaken. • Dust impacts on immediate adjacent vegetation has the potential to temporarily reduce yield, similar to existing pastoral tracks. • Reduction in pastoral productivity through poor rehabilitation. • Potential introduction or spread of weeds. • Helicopter movements in vicinity of pastoral activities may disturb cattle/ mustering operations. • Potential impacts on cattle and pastoral business where gates are left open.	• Weed management plan implemented, including requirements for weed hygiene inspections and certificates on all equipment and vehicles. • 6 monthly weed monitoring and spraying of weeds using a NT Government approved treatment. • Pastoralist to notified and engaged prior to commencing helicopter movements to mitigate interference. • Induction with all exploration contractors and staff in relation to pastoral operations. This induction to be developed with input from pastoralist. • Use of grids, gate signage, inductions and regular gate monitoring and reporting to pastoralist to minimise occurrence of gates being left open. • On-going liaising with pastoralist throughout on ground operations
Pastoralists ongoing productivity of area post rehabilitation	• Reduction in productivity due to erosion and sediment releases. • Reduction in productivity due to wastewater, chemical/fuel spills. • Reduction in pastoral productivity through poor rehabilitation. • Potential introduction or spread of weeds.	• Routine site maintenance completed to ensure functioning of erosion and sediment control. • All fuels and chemicals to be stored within secondary containment. • All spills remediated as required in the EMP/spill management plan. • End of life rehabilitation to return land back to pre-existing state or as agreed to with pastoralist. • Rehabilitation security with NTG retained. • Weed management plan implemented, including requirements for weed hygiene inspections and certificates on all equipment and vehicles. • 6 monthly weed monitoring and spraying of weeds using a NT Government approved treatment.
Pastoral access to groundwater	• No anticipated impacts as proposed groundwater take is to be covered under a WEL.	• All groundwater take to be authorised under a WEL. • Water extraction from pastoralist bores not proposed, unless specifically approved by pastoralist through an agreement
Pastoral access to surface water	• No anticipated impacts as no surface water take or wastewater discharges proposed. • No anticipated impacts on surface water bodies through interference with a waterway.	• No surface water proposed to be taken. • No generation of wastewater to occur as part of the SWP activity. • The SWP area will not cause a material change or alteration to any waterway.
Pastoralist's amenity	• Visual presence of infrastructure within pastoralist lease.	• Site to be located away from main pastoralist entry points and homestead.

Activity	Potential consequence to activities	Mitigations
Native Title Holder		
Native Title Holder time	• Impact to Native title holder time as they are required to engage with Tamboran as a part of the planning and approval for the proposed activity.	• Exploration agreements are in place outlining how engagement with Native Title holders is to occur. • Royalties paid in accordance with Exploration agreements. • Tamboran works closely with the NLC to provide information in a manner to reduce time pressures as far as reasonably practicable. • For scouting and/or activities requiring cultural managers, compensation for time is provided.
Native Title Holder site access	• Restricted access during seismic surveys.	• Native Title Holders are provided updates on proposed activities annually via the NLC. • Royalties paid in accordance with Exploration agreements. • Operational staff are in direct contact with Native Title Holders who may request access to any site. Tamboran will facilitate each access request. • Cultural Managers used for scouting to identify and avoid culturally significant areas - including areas regularly used for hunting, gathering or for cultural purposes. • Camps with workers bussed to site (where possible) to minimise vehicle movements. • Hazardous areas to be fenced and signed to communicate potential safety hazards.
Native Title Holder amenity and enjoyment	• Disturbance of wildlife in the immediate vicinity of the activity when works are undertaken. • Dust impacts on immediate adjacent vegetation has the potential to temporarily reduce yield, similar to existing pastoral tracks. • Reduction in productivity through poor rehabilitation. • Potential introduction or spread of weeds. • Helicopter movements in vicinity of activities may disturb wildlife/ access/ hunting.	• Exploration agreements are in place outlining how engagement with Native Title Holders is to occur. • Royalties paid in accordance with Exploration agreements. • Speed limits restricted to 60 km/hr, unless otherwise agreed. • Dust control utilised to reduce dust emissions. • Site to be rehabilitated back to pre-existing state, with security bond in place if company fails to rehabilitate. • Weed management plan implemented, including requirements for weed hygiene inspections and certificates on all equipment and vehicles. • 6 monthly weed monitoring and spraying of weeds using a NT Government approved treatment. • Annual work program meetings and reports provided to native title holder outlining the proposed activities and locations. • Induction with all exploration contractors and staff in relation to native title holders and sacred sites. This induction to be developed with input from pastoralist.

Activity	Potential consequence to activities	Mitigations
		• Operational staff are in direct contact with Native Title holders who may request access to any site. Tamboran will facilitate each access request
Native Title Holder's ongoing productivity of area post rehabilitation	• Reduction in productivity of country due to erosion and sediment releases. • Impact to country from wastewater, chemical/fuel spills. • Impact to country from poor rehabilitation. • Potential introduction or spread of weeds.	• No discharge of wastewater is planned as part of the SWP activities. • Routine site maintenance completed to ensure functioning of erosion and sediment control. • All fuels and chemicals to be stored within secondary containment. • All spills remediated as required in the EMP/spill management plan. • End of life rehabilitation to return land back to pre-existing state. • Rehabilitation security with NTG retained. • Weed management plan implemented, including requirements for weed hygiene inspections and certificates on all equipment and vehicles. • 6 monthly weed monitoring and spraying of weeds using a NT Government approved treatment.
Native Title Holder access to groundwater	• No anticipated impacts as proposed groundwater take is to be covered under a WEL. • No anticipated impact to sacred sites from groundwater take.	• All groundwater take to be authorised under a WEL. • No long-term groundwater reductions anticipated. • No sacred sites in area that are groundwater dependent.
Native Title Holder access to surface water	• No anticipated impacts as no surface water take or wastewater discharges proposed. • No anticipated impacts on surface water bodies through interference with a waterway.	• No surface water is proposed to be taken. • No discharge of wastewater is planned as part of the SWP activities. • The SWP site is positioned within the landscape to not cause a material change or alteration to any waterway.
Native Title Holder sacred sites/ protected features	• Access and/or damage to sacred sites.	• No access to sacred sites proposed. • All activities to occur in areas cleared by Native Title holders of Sacred Sites. • AAPA certificates to be granted covering proposed activities

5.6 Northern Territory business engagement

Broader engagement has occurred with local and regional business within the local communities of Daly Waters, Elliott, Katherine and the broader Northern Territory region.

Northern Territory businesses have been engaged on the scope of Tamboran's activities through information sessions and tender opportunities covering a range of material supply and support services, such as:

- people transport and logistics
- accommodation and food

- provision of temporary camps and camp services
- civil construction work
- freight and transport
- water bore drilling
- water carting and waste management
- site maintenance and inspections
- weed management and control
- equipment and materials storage
- oil country tubular goods
- environmental and civil consulting
- surveying and geotechnical assessments
- general provisions of goods and services (such as personal protective equipment and hire cars)
- third-party supply of sand
- contract extraction and washing of sand.

5.7 Ongoing stakeholder and community engagement

Tamboran is committed to continuing to engage with stakeholders regarding its petroleum activities within the Beetaloo sub-basin, and any associated environmental outcomes prior to, during and after completion of those activities.

Tamboran recognises the growing community interest in ensuring onshore natural gas development takes place in a safe and environmentally sound way and are committed to delivering operational excellence (which encapsulates our health, safety and environmental performance standards).

Tamboran has further committed to ongoing engagement with the relevant traditional owners, including annual work plan meetings and provision of draft work programs for future years of activity.

Detailed community and stakeholder engagement are underway, covering future exploration activities. This includes the following engagement activities:

Pastoralists:

- Weekly-monthly engagement with host pastoralists where activity is proposed within the immediate timeframe, with the engagement frequency agreed to with each pastoralist.
- Quarterly engagement with future host pastoralists where activity is proposed within 12 months.
- Annual consultation with all pastoralists, including surrounding pastoralists with no immediate proposed activities.

Native title holders of the area in which the activity is occurring:

- Ad hoc updates for the NLC as required, informing them of progress of E&A activities underway.
- Quarterly project status updates to the NLC informing them of progress of E&A activities underway.
- Site visits by traditional owners during E&A activities so that traditional owners can have first-hand observation of key activities.
- Work program surveys conducted by traditional owners, with the support of the NLC, to review work programs and ensure protection of sacred sites and objects.

- Annual on country meetings with native title holders to discuss current work program status and future E&A activities.
- Broader community engagement that is in addition to the requirements outlined in Reg 7 of the Regulations will continue.

6 Environmental risk assessment

6.1 Tamboran's risk management approach

Tamboran uses a robust risk management process for all its activities to achieve the following key outcomes:

- Risks are understood, eliminated or reduced and controlled to an acceptable level
- Controls are owned, assured and continuously reviewed for effectiveness
- All activities are compliant with regulatory standards and are guided by best practice
- Tamboran and its stakeholders are confident in the way activities are conducted to manage risks
- The approach aligns with the findings of the NT Inquiry Final Report and associated recommendations (as implemented via the Code or legislation).

Tamboran's risk assessment process is undertaken in accordance with section 5.4.3 of ISO 31000. Assessment of risk is completed using Tamboran's risk matrix (Figure 25) to assess and rate risks by assessing the combination of frequency of occurrence and the severity of the outcome of a potential event, including a worst-case scenario event. This allows quantification of a risk and determination can then be made about whether the risk can be accepted, or whether further mitigation is required.

Tamboran risk management processes require regular assessment of all risks once controls are applied, the effectiveness of controls (Table 36) and the likelihood and consequence of a risk event.[22] A residual risk is either accepted in accordance with strict delegations of authority or the activity does not proceed.

Tamboran also includes site specific controls for each identified risk, which further demonstrates how it achieves a residual risk that meets its ALARP and acceptable criteria. When applying the existing controls during the risk analysis (as per ISO 31000), there is very often little material change to most risk profiles identified in the risk register (Appendix I). This is a function of the comprehensive nature of the Code, which was designed to mandate a high level of environmental performance and minimise environmental risk.

Table 36: Risk assessment ratings

Rating	Explanation
Effective	• All controls are well designed and address the cause/s of the risk. • All controls operate to the required level. • Ongoing monitoring required.
Can be improved	• Majority of controls are well designed and address the cause/s of the risk. • Majority of controls operate to the required level. • Certain controls can be improved. • Ongoing monitoring required.
Must be improved	• Majority of controls are not well designed and do not address the root cause/s of the risk. • Majority of controls do not operate to the required level. • All the controls require improvement.

[22] Includes applying existing controls, such as compliance with regulatory requirements which are mandatory (e.g. the Code, Regulations Schedule 1, etc),

RISK MATRIX

CONSEQUENCES	IMPACT ON TAMBORAN			EXTERNAL RESPONSE		LIKELIHOOD					
		PEOPLE	ENVIRONMENT, HERITAGE & COMMUNITY	FINANCIAL ($A)	STAKEHOLDER	LAWS, REGULATION AND CIVIL ACTIONS		1 REMOTE	2 HIGHLY UNLIKELY	3 UNLIKELY	4 POSSIBLE	5 LIKELY	6 HIGHLY LIKELY
								<1% chance of occurring within the next year. Occurs as a '100-year event' or less frequent.	<10% chance of occurring within the next year. Could occur within decades.	<30% chance of occurring within the next year. Could occur within the next few years.	<60% chance of occurring within the next year. Could occur within months to years.	<90% chance of occurring within the next year. Could occur within weeks to months.	Likely to happen multiple times a year
	6 CATASTROPIC	Multiple fatalities >4 or life-threatening illness or total permanent disability to a large, exposed group (≥10 people).	Extensive, permanent damage to the environment, including species, habitats, ecosystems or area/s of cultural significance. Long- term social unrest and outrage within community.	>$100m	Multiple stakeholder groups taking coordinated action, as reflected in media channels with significant reach and influence (e.g. blockade/boycott negatively impacts substantial aspects of operations and are covered in media for more than 1 week).	Criminal charges against any director or senior executive involving jail or loss of right to manage the company. Public inquiry – requiring considerable resources and Executive Leadership time. Loss of licence to operate.	6 CATASTROPIC	HIGH	HIGH	VERY HIGH	VERY HIGH	VERY HIGH	VERY HIGH
	5 CRITICAL	1 – 3 fatalities or life-threatening illness or total permanent disability to a small, exposed group (<10 people).	Extensive, long-term, partially reversible damage to the environment, including species, habitats, ecosystems or area/s of cultural significance. Prolonged community outrage.	>$25-100m	Multiple stakeholder groups mobilising and encouraging others to act, as reflected in media channels with significant reach and influence with substantial negative influence (e.g. social media campaign calling for protest, escalating over several days).	Criminal charges against any director, senior executive or senior manager not involving jail or loss of right to manage the company. Prolonged major litigation – exposure to significant damages / fines / costs. Suspension / restriction to operate an asset.	5 CRITICAL	MEDIUM	MEDIUM	HIGH	VERY HIGH	VERY HIGH	VERY HIGH
	4 MAJOR	Injury or illness to one or more persons, resulting in permanent partial disability.	Long-term, reversible damage to the environment, including species, habitats, ecosystems or area/s of cultural significance. High levels of tension within the community.	>$10-25m	More than one stakeholder group's opinion or view influencing other stakeholders, reported through media channels with some reach and influence (e.g. government comments in national media or in Parliament).	Criminal charges against any employee (not described above) Major litigation – exposure to damages / fines / costs.	4 MAJOR	MEDIUM	MEDIUM	MEDIUM	HIGH	VERY HIGH	VERY HIGH
	3 SERIOUS*	Injury or illness that requires treatment as an in-patient in a hospital OR immediate treatment for a serious injury OR medical treatment within 48 hours of exposure to a substance.	Serious, medium –term, reversible impacts to the environment, including species, habitats, ecosystems or area/s of cultural significance. Moderate levels of community tension.	>$1-10m	More than one group offering an opinion or view, reported through media channels with reach and influence (commentary lasting one 24-hour media cycle across internet, print, television, radio).	Non-compliance with conditions of licence to operate an asset or to conduct an activity. Litigation and exposure to damages / fines / costs.	3 SERIOUS	LOW	MEDIUM	MEDIUM	MEDIUM	HIGH	HIGH
	2 MODERATE	Injury or illness to 1 or more persons resulting in medical treatment, up to 5 days lost time or alternative / restricted duties for up to 1 month.	Moderate short-term impacts to the environment, including species, habitat, ecosystems or area of cultural significance. Isolated examples of community tension.	>$250k-$1m	A single stakeholder group drawing attention to an incident, issue or approach, conveyed though media channels with potential reach and influence (e.g. some social media complaints or local media reports).	Moderate non-compliance with external mandatory obligations or breach of contractual or other legal obligations (not described above).	2 MODERATE	LOW	LOW	MEDIUM	MEDIUM	MEDIUM	MEDIUM
	1 MINOR	Injury or illness requiring first aid to 1 or more persons, or a no treatment case.	Limited environmental or cultural heritage impact- readily dealt with and contained on site. Individual community member voicing concern.	<$100k	A person or organisation signalling interest in an incident or event using channels with limited reach or influence (e.g. letter of complaint).	Minor non-compliance with external mandatory obligations or breach of contractual or other legal obligations.	1 LOW	LOW	LOW	LOW	MEDIUM	MEDIUM	MEDIUM

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Figure 25: Tamboran's risk matrix

6.2 ALARP

The risk management process requires risks to be managed to ALARP. A risk can be considered to have been reduced to ALARP when all reasonably practicable control measures (both preventative and mitigative) have been identified and implemented to reduce the risk of identified events. A key element of demonstrating ALARP is that good practice is followed, where good practice is defined as the recognised risk management practices and measures that are used by competent organisations to manage well understood hazards arising from their activities. This definition incorporates good practice as defined in codes and standards, and a consensus of good practice within the industry. ALARP is not a final position over the life of an asset or project.

The practicability and the reasonability of control measures can change over time due to changes in technology (that can make measures more readily available), industry standards (that can commoditise once-cutting-edge technology) and the socio-technical landscape (that can modify societal expectations).

In the NT context, ALARP and the definition of acceptable risk levels was a key feature of the NT Inquiry Final Report. For each aspect, acceptability criteria were defined, with recommendations outlined to reduce the potential risk to below the acceptable level. With the adoption of all recommendations by the NTG, the Code and associated regulatory changes provides a high level of inherent protection to ensure activities are undertaken in a safe and consistent manner.

Tamboran considers ALARP to be achieved where the residual risk is low, whereby any additional control measures applied will not reduce the risk any further.

If the residual risk of low is not achieved, Tamboran considers ALARP to be achieved where the following criteria have been met:

- the requirements of the Code have been met
- all reasonably practicable site-specific controls have been identified and implemented and
- the cost of further reducing the risk is unreasonable compared to the environmental benefit gained from implementing the control measure.

6.3 Risk acceptability

Tamboran uses a series of criteria (Table 37) to determine the acceptability of a risk once all controls are identified / implemented. Each risk event and final risk rating outlined in Appendix I is assessed against these criteria to determine whether Tamboran believes it is acceptable.

Table 37: Risk acceptability criteria

#	Criteria	Tamboran's acceptance threshold
1	Risk level after treatments / controls are applied	Consistent with Tamboran's risk acceptance criteria: **Very high risk** – Not acceptable **High risk** – Residual risk may be conditionally accepted where the residual risk is ALARP and the risk is signed off by a General Manager with risk treatment applied to improve, control or further modify risk. Risk reviews are to occur annually with the intent to reduce the risk severity lower. **Medium-low risk** – Residual risk is accepted when ALARP is demonstrated
2	Legislative requirements and regional strategies and conservation plans	1. Consistent with legislative requirements, including Code 2. Consistent with regional strategies and conservation/threat abatement plans

#	Criteria	Tamboran's acceptance threshold
3	Stakeholder expectations	Consistent with the commitments made in stakeholder engagement and/or agreements
4	Industry guidelines and best practice	Is consistent with petroleum standards (such as API and the Oil and Gas UK standards), best practice and controls used in other NT industries
5	Scientific uncertainty in the data used to determine the environmental impact or risk	**Low uncertainty:** Accepted risks are well understood, and uncertainty is minimal. **Moderate uncertainty:** Accepted using well-established data and assessment methods. Some uncertainty exists, with routine monitoring and performance criteria in place to detect and respond to any impacts arising from a risk. **High:** Conditional acceptance – Significant uncertainty exists with data and assessment methodologies unproven. A precautionary approach will mean that uncertainty is replaced by conservative assumptions that will require additional control measures being implemented to prevent, detect and respond to any impacts arising from a risk.
6	ESD Principles	Risk is consistent with the principles of ESD as defined in section 2.1. This also includes weighting to consider the social and economic benefits of the project.

6.4 Assessment of scientific uncertainty

The Regulations require an assessment of uncertainty as a part of the risk assessment process. The assessment of potential impacts and effectiveness of controls must demonstrate that the activities are carried out in a manner consistent with the principles of ESD and the precautionary principle.

Impact and risk identification must include consideration of uncertainty regarding impacts and risks for the activity where a precautionary approach is appropriate. Uncertainty is high where confidence in the available information is low in identifying risk or the effectiveness of a management control. Additional baseline studies or other safeguards may be required to increase the accuracy of an assessment to determine the acceptability of a risk.

As per the EMP Guidelines, scientific certainty is qualitatively assessed using a generic means of ranking the data available in accordance with Table 38. Considerations of uncertainty have been included in the risk assessment discussed in section 6.5.

Table 38: Scoring system and ranking for scientific uncertainty (DEFRA, 2013)

Score	Description
Low (1)	• Comprehensive data with strong evidence in multiple peer reviewed data • Little disagreement between authors or experts • Considerable and consistent on-ground experience and/or monitoring
Medium (2)	• Some or incomplete data available • Evidence provided based on a small number of references • Authors or experts' conclusions vary • Limited on-ground experience and/or monitoring

Score	Description
High (3)	• Scarce or no data available; evidence provided in unpublished reports • Few on-ground observations • Authors and experts' conclusions vary considerably

6.5 Risk assessment outcomes

The environmental, heritage and social risks associated with the activities covered under this EMP have been assessed using the Tamboran risk assessment framework described in section 6.1. The risk assessment presents the range of potential impact-causing activities, corresponding mitigation measures and residual risk ratings based on their assessed worst-case consequence and likelihood of occurrence. The assessment also cross-references the various risk assessment outcomes in the NT Inquiry Final Report, to ensure consistency.

Site specific conditions and cumulative impacts have also been considered during the assessment. Cumulative impacts include the following:

- Activities covering 16 future E&A wells (15 new horizontals and 1 vertical wells) and 3 existing E&A wells (Beetaloo W-1, Kyalla 117 N2-1H and Shenandoah S- 1H) for the 2023 - 2028 period, as per the current approved tenure work plan.
- 2D and 3D seismic acquisition.
- Construction and operation of the SPCF.
- Construction and operations associated with the SWP (i.e. the subject of this EMP).
- Existing land users (predominately pastoralists).

There were no residual risks above a 'Medium' risk ranking, with 29 risk scenarios and sources which may potentially result in a risk occurring. Of the 29 risk sources, 3 were ranked as 'Moderate' with the remaining 26 ranked as 'Low'. The residual risks sources identified through the risk assessment include:

- Disturbance of sacred site or culturally sensitive areas and the decline in environmental value of area used for cultural purposes through the construction and operation of the SWP and the accidental ignition of fire by the regulated activity – risk ID 12, risk ID 13 and risk ID 14
- Loss of long-term soil productivity and viability due to soil compaction and erosion in the SWP area – risk ID 5
- Soil, groundwater and surface water contamination due to spills and leaks of chemicals (fuels, oils and lubricants) – risk ID 1, risk ID 2, risk ID 3, risk ID 4 and risk ID 28
- Impact to listed threatened habitats and listed threatened flora and fauna, including non-listed fauna and livestock during SWP activities –risk ID 6, risk ID 7, risk ID 8, risk ID 9, risk ID 10, risk ID 11, and risk ID 26
- Reduction in agriculture productivity through the introduction and spread of weeds in the area or accidental ignition (bushfire) from surface activities – risk ID 16, risk ID 17, risk ID 18, risk ID 19 and risk ID 20
- Increased nuisance/loss of amenity from dust, noise, vibration and greenhouse gas emissions associated with the activities – risk ID 16, risk ID 22, risk ID 23, risk ID 24, risk ID 27 and risk ID 29.

The environmental risk assessment demonstrates that the risks associated with the SWP, have been determined to be "low to moderate consequence, low likelihood" risks. The rating is achieved through the application of multiple controls[23], which reduces the risk rating to as low as reasonably practicable (ALARP) and acceptable.

The environmental outcomes to be achieved during the proposed activities include no significant impacts to the following aspects:

- The protection and enhancement of community and cultural values, places and amenity.
- Ecological function and productivity of soils.
- Ecological function of surface water bodies and associated sensitive vegetation communities (as described by the SREBA Terrestrial Ecosystems Baseline Report (2022)).
- The protection of high valued habitats and threatened flora and fauna.
- The maintenance of air quality.

At completion of SWP activities, the area will be returned to a safe, stable and non-polluting form consistent with pre-disturbed conditions.

The 'Low' and 'Medium' risks identified were consistent with standard industry surface activities and/or pastoralist activities carried out across the NT, being the potential interference with culturally sensitive areas, spread of weeds, erosion and sediment control, and ignition of bushfires from the proposed activities. The reduced risk profile associated with the SWP activities is reflective of the stringent regulatory requirements in the Code.

The level of uncertainty for each risk was also assessed. There was no uncertainty level above 'Low', which is consistent with the scale of the activity and the knowledge of impacts associated with gas exploration activities demonstrated in the Inquiry Final Report and through the various reports published by the US EPA (such as USEPA 2016- U.S. EPA. Hydraulic Fracturing for Oil and Gas: Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resources in the United States (Final Report)).

A count of the post-treatment environmental risks associated with this EMP is provided in Table 39. A copy of the risk assessment is provided in Appendix I.

Table 39: Count of environmental risks for the Shenandoah South wash plant activities

	Environmental risk rating with applied controls			
	Low	**Medium**	**High**	**Very high**
Total - 26	26	3	0	0

6.6 Environmental outcomes, performance standards and measurement criteria

The following section provides the environmental outcomes, performance standards and measurement criteria of each environmental aspect, based on the risk assessment presented in Appendix I. Table 40 to Table 45 provide the environmental outcomes, performance standards and measurement criteria, based on the NT EPA's environmental factors and objectives, to demonstrate whether controls have been effective during the activity and that the stated environmental outcomes have been achieved.

[23] Mandatory standards and processes applied to the regulated activities are described in the Code, which is designed to ensure that the risk to public, workers and the environment are reduced to a level that is ALARP and acceptable (Cl 1).

6.6.1 Land

Table 40: Environmental outcomes, performance standards and measurement criteria – landforms and terrestrial environmental quality

Environmental performance measures – landforms and terrestrial environmental quality				
Environmental outcome	**Environmental performance standards**		**Measurement criteria**	**Records**
No adverse impact to the ecological function and productivity of surrounding soils or distinctive physical landforms resulting from Tamboran's exploration activities.	L-1	No loss in long-term soil productivity and viability through soil destabilisation, increased risk of erosion and sedimentation, compaction and dust	Post construction stabilisation and at completion rehabilitation confirms retention of soil productivity	Weekly records of site inspections retained during vegetation clearing and site construction. Incidents of site releases retained.
	L-2	No spills that result in potential residual contamination of soils	No recorded spills of level 1 or greater during the activity as per the Spill Management Plan (Appendix F)	Records of all incidents relating to spills retained in Tamboran's incident management system, including but not limited to volumes of spilled material/substances. Evidence of spill clean-up time retained within incident records.
	L-3	No reportable incidents involving erosion or sediment release beyond the site boundary	Civil contractor reports demonstrate erosion and sediment controls implemented Daily civil construction reports show visual inspection of civil construction activities completed after 20mm rainfall event 6 monthly erosion and sediment control inspection of disturbed areas completed identifying defects requiring immediate repair, repair prior to wet season or defects that should be monitored	Civil construction daily reports Civil maintenance records of ESCP retained 6 monthly erosion and sediment control inspections
	L-4		Maintenance results confirm all defects flagged as requiring immediate rectification, including reportable incidents, are rectified as soon as possible	ESC maintenance records retained

Environmental performance measures – landforms and terrestrial environmental quality				
Environmental outcome	**Environmental performance standards**		**Measurement criteria**	**Records**
	L-5		Evidence of maintenance completed on demonstrating pre-wet season maintenance on erosion and sediment controls	
	L-6		Any extenuating circumstance (such as access to location) are to be document where maintenance cannot be practicably performed (i.e. impact to gain access is greater than value of maintenance).	
	L-5	Rehabilitation provides a stable landform, which supports: a) the rights and interests of the Native Title Holders in the land and water, and b) a resilient self-sustaining vegetation community that can withstand impacts including fire and cattle grazing and is safe to humans and wildlife.	Annual rehabilitation report confirms returned to a stable landform in accordance with the final success criteria detailed in the Rehabilitation Plan (Appendix G).	Annual rehabilitation report. Spatial data confirm stayed within clearing limits of 11.2 ha.
	L-6	Disturbed exploration infrastructure no longer required are rehabilitated back to the pre-existing state	Rehabilitation of SWP to occur within 6 months of activity completion	Annual rehabilitation monitoring report at completion of activities
Risk sources	• Soil compaction of the SWP pad (Risk ID 5). • Soil erosion from cleared areas (Risk ID 5). • Introduction and spread of weeds from the SWP site (Risk ID 7). • Poor rehabilitation of the site reduces regional habitat and promotes weeds (Risk ID 7). • Accidental ignition of fire during civil construction (Risk ID 8). • Contaminants in water and soil pass through the food chain and bioaccumulate in fauna causing detrimental impacts to local species and communities (Risk ID 9).			

Table 41: Environmental outcomes, performance standards and measurement criteria –terrestrial ecosystems

Environmental performance measures – terrestrial ecosystems				
Environmental outcome	**Environmental performance standards**		**Measurement criteria**	**Records**
No significant impact to high valued habitats and listed threatened flora and fauna from Tamboran's exploration activities.	TE-1	Weeds are not spread or introduced due to Tamboran's activities and weeds identified are controlled as soon as possible	6-monthly pre- and post-wet season weed surveys completed on all Tamboran controlled disturbed areas Weed monitoring does not identify any newly introduced Class A and Class C WONS Weed control applied as per the Weed Management Plan (Appendix D)	Annual weed monitoring and management report Weed mate record
	TE-2	Year-on-year decline in the size and density of all weed infestations introduced because of Tamboran's activities	Annual report demonstrates weed infestation size and density of weed outbreaks introduced by Tamboran's activities are reducing each year	Annual weed monitoring and management report
	TE-3	Disturbed area of wash plant reinstated promptly following completion of activities to promote revegetation	Reinstatement commences within 6 months upon completion of activities	Daily activity reports during clearing and grubbing
	TE-4			Spatial data confirm stayed within survey parameters Annual rehabilitation report
	TE-5	Impacts to large trees (>25cm trunk @ 1.3 m) to be avoided	Where possible, large trees cleared to be avoided.	Large tree clearing log to be retained including trees cleared and trees avoided Where unable to avoid, retain record
	TE-6	No disturbance to Grey Falcon active nesting sites	Cultural managers engaged to identify active Grey Falcon nesting sites, with any nests encountered documented. These native title holders are adequately qualified and experienced to identify threats to native fauna, including the identification of grey falcon nests.	Records of pre-clearance surveys retained documenting evidence of Grey Falcon active nesting sites.

Environmental performance measures – terrestrial ecosystems				
Environmental outcome	**Environmental performance standards**		**Measurement criteria**	**Records**
			No clearing of Grey Falcon nest or suspected nest trees. No activities to occur within 300 m buffer from Grey Falcon nesting.	
	TE-7	No unauthorised clearing	No clearing outside parameters described in this EMP (refer section 3.3.2)	Survey and spatial data collected confirms disturbance levels within approved limits and areas
	TE-8	No uncontrolled bushfires caused by Tamboran's wash plant activities	Zero reported incidents of uncontrolled bushfire caused by Tamboran's activities	Fire incident data to be retained for all Tamboran unplanned fires on Tamboran's incident management system
Risk sources	• Activity (vehicle and machinery) noise and lighting (Risk ID 6). • Introduction and spread of weeds from the SWP site (Risk ID 7). • Poor rehabilitation of the site reduces regional habitat and promotes weed invasions (Risk ID 7). • Accidental ignition of fire during civil construction (Risk ID 8). • Contaminants in water and soil pass through the food chain and bioaccumulate in fauna causing detrimental impacts to local species and communities (Risk ID 9). • Vehicle and machinery collisions with fauna – fauna mortality results in a localised impact to listed threatened species (Risk ID 10). • Encouragement of feral animals and other pest species increases, leading to competition with native species. This includes the introduction of cane toads (Risk ID 11). • Cumulative risk from SWP activities (including use of ancillary access tracks etc), and other approved E&A activities in addition to existing agricultural activities results in impacts to vegetation communities, fragmentation and poses a threat to protected flora and fauna (Risk ID 26).			

6.6.2 Water

Table 42: Environmental outcomes, performance standards and measurement criteria – hydrological processes, Inland water environmental quality and aquatic ecosystems

Environmental performance measure – hydrological processes				
Environmental outcome	**Environmental performance standards**		**Measurement criteria**	**Records**
Tamboran's exploration activities do not reduce the environmental values of the underlying groundwater resources.	GW-1	All groundwater take within the sustainable yield of the aquifer	Total groundwater extraction volume below the approved water extraction licence take	Groundwater take records retained for duration of wash plant activities and initial rehabilitation activities
Protect the quality of surface water and aquatic ecosystems from any adverse impacts from Tamboran's exploration activities.	SW-1	No spills that result in potential residual contamination of surface water and/or aquatic ecosystems	No recorded spills of level 1 or greater during the activity as per the Spill Management Plan (Appendix F)	Records of all incidents relating to spills during SWP operations are retained in Tamboran's incident management system, including but not limited to volumes of spilled material/ substances. Evidence of spill clean-up time retained within incident records
	SW-2	Stormwater released within the EMP limits with no evidence of contamination (including hydrocarbons, chemicals and wastes)	Monitoring results of stormwater releases demonstrates releases were within the EMP limits	Stormwater release spreadsheet
	SW-3	Erosion and sediment control in place and working effectively	Civil contractor reports demonstrate erosion and sediment controls implemented Daily civil construction reports show visual inspection of civil construction activities completed after 20mm rainfall event 6 monthly erosion and sediment control inspection of disturbed areas completed identifying defects requiring immediate repair, repair prior to wet season or defects that should be monitored Maintenance results confirm all defects flagged as requiring immediate rectification, including	Civil construction daily reports 6 monthly erosion and sediment control inspections Civil maintenance records of ESCP retained

Environmental performance measure – hydrological processes				
Environmental outcome	**Environmental performance standards**		**Measurement criteria**	**Records**
			reportable incidents, are rectified as soon as possible Evidence of maintenance completed on demonstrating pre-wet season maintenance on erosion and sediment controls completed	
Risk sources	• Storage, handling and transportation of chemicals, hydrocarbons and wastes, including during the wet season (Risk ID 1). • Surface spills from the handling and transferring of process water (Risk ID 1). • Storage and management of oily waste (Risk ID 1). • Chemical and waste transportation accident (Risk ID 2). • Release of contaminated stormwater from activities to surface water, including during flooding (Risk ID 3). • Land clearing and access track sediment releases (Risk ID 3). • Uncontrolled release of waste oily water, chemicals or fuel from site due to regional flooding (Risk ID 4). • Impact to surface hydrology changes water flows impacting the land use/productivity (Risk ID 17). • Cumulative risk from groundwater take from surrounding land users exceeds the natural recharge rate of the Basin (Risk ID 25). • Cumulative impact from SWP activities (including use of ancillary access tracks etc), and other approved E&A activities in addition to existing surrounding land use (agriculture) reduces surface water quality (Risk ID 28).			
Instrument calibration	Groundwater volume: approved DLPE meter used (calibration not required). Surface water quality: pH and EC instrument calibrated before use. Management of storm water: Instrument calibrated before use. pH probe calibrated with a two-point calibration using a pH buffer of 7 and 10. EC meter calibrated with a 1413 µs/cm (or similar) standard.			

6.6.3 Air

Table 43: Environmental outcomes, performance standards and measurement criteria – air quality and atmospheric processes

Environmental performance measures – air quality and atmospheric processes				
Environmental outcome	**Environmental performance standards**		**Measurement criteria**	**Records**
No significant impact on air quality and no excess greenhouse gas emissions resulting from Tamboran's exploration activities.	AQ-1	No significant impact to air quality at sensitive receptors because of the SWP.	No nuisance-related complaints regarding dust / air quality resulting from SWP activities All complaints responded to and corrective actions taken	All complaints and subsequent actions are to be recorded in the Tamboran's incident management system.
	AQ-2	All greenhouse gases reporting in accordance with NGERS requirements.	NGER emissions reporting completed including fuel usage data and submitted to DLPE annually	Emission related data (fuel use, clearing extent) retained for SWP construction, operations, and rehabilitation activities and included in Tamboran's annual emissions report for EP76, EP98 and EP117.
Risk sources	• Emissions from the combustion of diesel engines and generators (Risk ID 22). • Air emissions from chemical releases during SWP activities (Risk ID 22). • Traffic movement (Risk ID 23). • Bushfire from accidental ignition source (Risk ID 23). • Combustion of diesel for SWP (Risk ID 24). • Cumulative impact from the release of GHG emissions during the E&A activities materially increases the NT's and Australia's Greenhouse Gas emissions, and increasing climate change impacts on the environment (Risk ID 29).			

6.6.4 People

Table 44: Environmental outcomes, performance standards and measurement criteria – community and economy, and human health

Environmental performance measures – community and economy, and human health				
Environmental outcome	**Environmental performance standards**		**Measurement criteria**	**Records**
No adverse impacts to the community resulting from Tamboran's exploration activities.	CO-1	All valid community complaints of nuisance investigated and resolved.	All community complaints responded to within 24 hours with actions to remedy any confirmed nuisance implemented as soon as practicable (depending on the nature of the complaint).	Records of community complaints and actions completed.
	CO-2	>60% of addressable spend[24] to be from NT businesses.	Project expenditure data confirms the NT business spend on the Beetaloo exploration project exceeds >60% of addressable spend[24] of the project.	Data on NT business spend retained.
	CO-3	All vehicle accidents investigated and reported in accordance with NT Police, Fire and Emergency Services requirements.	Zero incidents requiring an external emergency response.	Records retained in the Tamboran's TRACS incident register.
Risk sources	• Industrialisation of landscape (Risk ID 15). • Increased traffic (Risk ID 15). • Light emissions impact on community receptor (e.g. pastoralist) (Risk ID 15). • Influx of workers to region (Risk ID 15). • Noise emissions from activities (Risk ID 15). • Introduction and spread of weeds in the area (Risk ID 16). • Impact to surface hydrology changes water flows impacting the land use/productivity (Risk ID 17). • Loss of sense of place and connection to land and country (Risk ID 18). • Reduction in foraging and support of traditional lifestyle (Risk ID 18). • Poor rehabilitation/ reinstatement of exploration infrastructure (Risk ID 18). • Disruption of agricultural operations due to ongoing access, traffic, helicopter movements, etc. (Risk ID 19).			

[24] Addressable spend: a service or material that can be reasonably provided by an NT business at similar quality, timeliness and cost.

Environmental performance measures – community and economy, and human health			
Environmental outcome	**Environmental performance standards**	**Measurement criteria**	**Records**
	• Increased risk of vehicle accident (Risk ID 20). • E&A activities compete with agricultural industry for resources (Risk ID 21). • Cumulative impacts on amenity (Risk ID 27).		

Table 45: Environmental outcomes, performance standards and measurement criteria – cultural heritage

Environmental performance measures – cultural heritage				
Environmental outcome	**Environmental performance standards**		**Measurement criteria**	**Records**
No significant impact on sacred sites and cultural heritage values because of Tamboran's exploration activities.	CH-1	No non-compliances with Native Title Holder Exploration Agreements and AAPA certificate conditions	No non-compliances with AAPA certificate conditions including unauthorised work within Restricted Work Areas (RWA).	Incidents retained where unauthorised activities are identified.
	CH -2		No breaches of native title holders' exploration agreements.	Incidents retained where unauthorised activities are identified.
Protection of culture and heritage.	CH -3	Native title holders are actively engaged on Tamboran's work program, including understanding of Tamboran's current and future exploration activities	Annual work program update report completed and submitted as per Exploration Agreement	Records of annual work program update report retained.
	CH -4		On country meetings completed providing status of work program and future activities- including ongoing presentation of story boards and other activity information	Records of on country meetings retained.
	CH -5		Engagement and presence of local cultural managers during vegetation clearing activities. The cultural managers referenced are the native title holders for the Shendandoah South area and are therefore inherently suitable to undertake heritage checks.	Records of native title holders attending disturbance activities. All occurrences of archaeological sites identified to be recorded and provided to relevant agencies required by law and/or agreement.
	CH-6		Indigenous business involved in at least 3 environmental monitoring programs, such as weed monitoring, cultural heritage monitoring and site stability monitoring	Records of environmental programs completed by indigenous contractors retained.
Risk sources	• Sites disturbed directly by SWP activities (Risk ID 12). • Personnel unauthorised access to sacred site (Risk ID 12). • Accidental ignition (fire) by site activities (Risk ID 13). • Contaminants in water and soil pass through the food chain and bioaccumulate in fauna (livestock and native animals) causing detrimental impacts to local species and communities that rely on the animals for food/ livelihood / spiritual connection (Risk ID 14).			

Environmental performance measures – cultural heritage			
Environmental outcome	**Environmental performance standards**	**Measurement criteria**	**Records**
	• Cumulative impact on amenity (Risk ID 27).		

7 Management plans

The following section provides a high-level summary of the various management plans required to be implemented in accordance with the Code.

7.1 Heritage finds procedure

A heritage finds procedure has been developed for Tamboran's activities, which includes those within EP 117 (Appendix B.2). It provides the actions to be taken by Tamboran staff and subcontractors where encounter a suspected Aboriginal and non-Aboriginal cultural heritage find.

7.2 Bushfire management plan

A Bushfire Management Plan (BMP) has been developed for the SWP (Appendix C). The BMP outlines the controls to prevent, detect and respond to fires associated with Tamboran's activities. Controls implemented include:

- Monitoring during periods of high fire danger.
- Fire response and reporting.

7.3 Weed management plan

All exploration and appraisal activities are undertaken in accordance with Tamboran's Beetaloo Weed Management Plan (Appendix D). This plan has been developed in accordance with the *Weed Management Planning Guide: Onshore Shale Gas Developments Project.*

Weed surveys have confirmed the proposed area of activity has an extremely low presence of weeds. Efforts will therefore focus on both eliminating the potential introduction of weeds into the region and preventing the spread of existing weeds.

From a cumulative impact perspective, the risk of increasing weed pressure in the area is reduced through the mandated use of weed hygiene inspections/certification for all equipment and vehicles and routine weed monitoring and maintenance. Any weeds that are introduced into the activity areas will be promptly identified and managed both during the operational period and during the rehabilitation monitoring and maintenance period, reducing the potential additional stress to the region.

7.4 Erosion and sediment control plan

Tamboran Beetaloo Sub-basin Erosion and Sediment Control Plan (ESCP) has been updated to include the SWP and how the activities will be completed to minimise the risk of erosion and sediment releases to the surrounding environment (Appendix E).

The ESCP has been developed by suitably qualified persons including:

- **Senior Environmental Manager** – BEnvSci, PGDipEnvMgt. Environmental Scientist, Manager and Auditor with over 24 years' experience. Completing the IECA erosion and sediment control training in 2013 and has extensive experience advising on managing the environment in the Beetaloo Sub-basin including erosion and sediment control.
- **Senior Environmental Manager** – BSc (Ecology & Environmental Biology), Master of Environmental Law with over 20 years' experience working in the mining and onshore petroleum industries, drafting environment management plans, reports and environmental impact statements across these industries.
- **AECOM Team Leader – Civil -** BEng, RPEQ, CPEng. Civil Engineer with over 30 years' experience in the design and documentation of civil engineering projects.

The ESCP has been reviewed by a Certified Professional in Erosion and Sediment Control (CPESC) with a MAgrSc, BAgrSc (Hons), CPESC (#2723), CEnvP (#002). As per Table 12 of the ECSP (Appendix E), CPESC review is only required where permanent ESC measures require change or removal. The SWP site does not materially change the activities or the ecological system that are described in the ESCP and that the activity is considered a temporary, short-term activity.

7.5 Rehabilitation management plan

Once a determination has been made that the SWP site is no longer required, a site-specific rehabilitation strategy will be developed in detail for the disturbed areas, based on the criteria and methodology outlined in the RMP (Appendix G). A specific strategy is required to ensure the operational history of the activity is considered during rehabilitation planning (such as spills etc.). As per the Code, rehabilitation will commence within 12 months of determining an asset is no longer required.

Infrastructure assets associated with the wash plant site that may have residual beneficial use (such as water bores, laydown yards, gates, fences, water management structure, etc.) will be offered for transfer to the pastoralist, subject to DLPE approval and compliance with the Code. Prior to considering the transfer of ownership, Tamboran will:

- Undertake an assessment of the status of the asset and whether it can be beneficially used by the local pastoralist. Where a beneficial use is anticipated, identify works required to be undertaken to ready the asset for transfer (i.e. any repairs, site remediation, equipment removal etc.)
- Obtain written agreement from the pastoralist to take ownership of the asset and document any stipulated liabilities.
- Where an asset cannot be beneficially utilised, the site will be rehabilitated to the pre-existing condition using assisted natural regeneration. This will include:
    - Removal of all surface facilities
    - Removal of all weeds (including reproductive material where present) and contaminated materials/wastes
    - Backfilling/shaping water management structures
    - Re-spreading of stockpiled topsoil/windrows
    - Reshaping the site to as close to natural form as possible
    - Ripping or scarifying any compacted surface
    - Spreading of stockpiled vegetation to aid in surface water flow control
    - Spreading seed of suitable local native species which has been determined through analogue sites representative surrounding vegetation communities
    - Source native seed supply and rehabilitation services from indigenous suppliers (where available).
    - Undertake yearly monitoring of the rehabilitation success requirements to assess the rehabilitation status of a site and determine where additional remedial works are required. Any weeds that have been introduced into the area by the activity will be identified and managed during the rehabilitation monitoring and maintenance period

Tamboran confirm that the RMP was prepared by suitably qualified persons (title and skill set):

- **Senior Environmental Manager** – BEnvSci, PGDipEnvMgt. Environmental Scientist, Manager and Auditor with over 24 years' experience across a range of industries and clients including but not limited to Oil and Gas, Mining, Northern Territory Government and Department of Defence. Her experience covers undertaking baseline environmental assessments and preparing and

implementing rehabilitation plans in the Northern Territory and specifically in the Beetaloo Sub-basin for oil and gas development.

- **Senior Environmental Manager** – BSc (Ecology & Environmental Biology), Master of Environmental Law with over 20 years' experience working in the mining and onshore petroleum industries, drafting environment management plans, reports and environmental impact statements across these industries.
- **Vice President (VP), Environment and Permit Approvals** - BEnvMgt. Environmental manager with over 20 years' experience in the environmental field, with 15 years within the onshore gas industry, with 10 years operating in the Northern Territory. VP-Environment and Permit Approvals person has extensive understanding of petroleum infrastructure rehabilitation, participating in the development and execution of infrastructure rehabilitation programs within the Surat and Bowen Basin, and the Beetaloo Sub-basin.

7.6 Spill management plan

A spill management plan (SMP) has been prepared to support Tamboran's exploration program in the Beetaloo Sub-basin (Appendix F). The SMP is a mandatory requirement prepared in accordance with the Code of Practice for Petroleum Activities in the Northern Territory (the Code). This SMP is designed to provide the strategy for the management of spills across Tamboran's Beetaloo exploration activities.

The SMP has been revised to incorporate the SWP activities.

8 Implementation strategy

8.1 Environment, health and safety management system

Tamboran's activities are governed by a Health, Safety and Environment (HSSE) policy (Figure **26**). Tamboran will implement a HSEMS, which ensures we conduct our business in line with all the elements of this policy, including but not limited to:

- Risk management and compliance
- Training and competency
- Contractor management
- Safety management and emergency response.

tamboran RESOURCES

Health, Safety and Environment Policy

Tamboran Resources Corporation (**Tamboran**) is committed to operating in a manner that prioritizes the safety of our people and the community and places an emphasis on preventing unforeseen environmental harm.

Tamboran will achieve this through:

- Creating a culture of work where it is understood that no task is too important that time cannot be taken to ensure it is performed safely and efficiently.
- Empowering our workforce (including contractors) to "stop the job" whenever they believe a task is unsafe or there is an unacceptable risk to people, the environment, or the safe operation of assets.
- Implementation of a contractor management process to ensure alignment of HSE values and safe execution of work.
- Compliance with all applicable legislative requirements, company policies, plans and processes.
- The application of our risk management framework, ensuring that all risks are identified, controlled, or eliminated where practicable.
- Ensuring HSE considerations are an integral part of planning, design, and procurement processes.
- Developing and managing our assets in an environmentally responsible manner and in accordance with ecologically sustainable development principals.
- Ensuring our people are trained and competent for the work they are undertaking.
- Managing all HSE incidents through reporting, investigation and learning with the aim of preventing re-occurrence.
- Effective communication, consultation, and promotion of worker participation to encourage all personnel to be actively engaged in HSE matters.
- Setting objectives aimed at preventing serious harm and improving HSE performance.
- Monitoring and improvement of the HSE management system that supports our people and the way we work.

Tamboran's Executive Leadership Team is committed to leading by example to influence our culture. By upholding health and safety as a core workplace value, Tamboran Resources will achieve positive outcomes for our people and the environment.

Authorised by

CEO
Joel Riddle

28 March 2024

COO
Faron Thibodeaux

28 March 2024

Governance – This policy will be reviewed every 2 years to ensure it remains relevant and effective for Tamboran Resources operations and risk profile. The Nomination and Governance Committee is responsible for undertaking this review.

Figure 26: Tamboran's Health, Safety, Security and Environment (HSSE) Policy

8.2 Roles and responsibilities

Overall roles and responsibilities for the implementation of the regulated activities described in this EMP are outlined in Table 46. There are two primary streams of responsibility which sit under the Chief Operating Officer and the Executive Vice President, Strategy and Sustainability.

Table 46: Roles and responsibilities

Role		Responsibility
Stream 1	Chief Operating Officer	Tamboran employee responsible for the overall program.
	Senior Approvals Manager	Ensures all activities associated with the wash plant are carried out in accordance with the EMP and work instruction(s).
	Manager Field Operations Senior HSE Manager Operating Company Representative Field HSE Advisor(s) Contract Administrator	Tamboran employees/consultants responsible executing operations in accordance with the EMP, Tamboran's HSEMS, contractual agreements and the exploration quality controls. These roles are ultimately responsible for ensuring all other parties are working within the HSE guidelines and provide guidance and advice to site personnel on: • Day-to-day management of the environment and implementation of this EMP, including reporting, monitoring compliance of operations of all regulated and associated activities. • Planning and implementation of Tamboran monitoring requirements including weeds, groundwater, soil and erosion, bushfire and emergency response
	Specialist contractors	Contractors engaged by Tamboran to undertake activities related to the SWP. They are responsible for compliance with this EMP at all times during execution of their work.
Stream 2	Vice President- Environment and Approvals	Tamboran employee responsible for managing regulatory approvals and program changes and reporting and supporting operations (including HSE). Also responsible for notifying the responsible Minister(s) and the owner/occupier of the land on which the activity is to be carried out; and for communications with the regulator and key stakeholders.
	Cultural managers	NLC representatives to provide cultural clearances during clearing and grubbing activities to ensure activities are conducted to avoid areas of cultural significance.

8.3 Contractor management

Most of the work executed under this EMP will be undertaken by contractors with oversight from a Tamboran Representative. Assessing the level of capability and competency of the contractors is a major focus of the execution strategy.

The interfaces between Tamboran and contractors' HSEMS are formalised and documented within the HSE bridging document. This is an operational document which is used on site to identify the systems / processes that take precedence during the execution of a work scope.

Figure 27 provides an overview of the EMP implementation process.

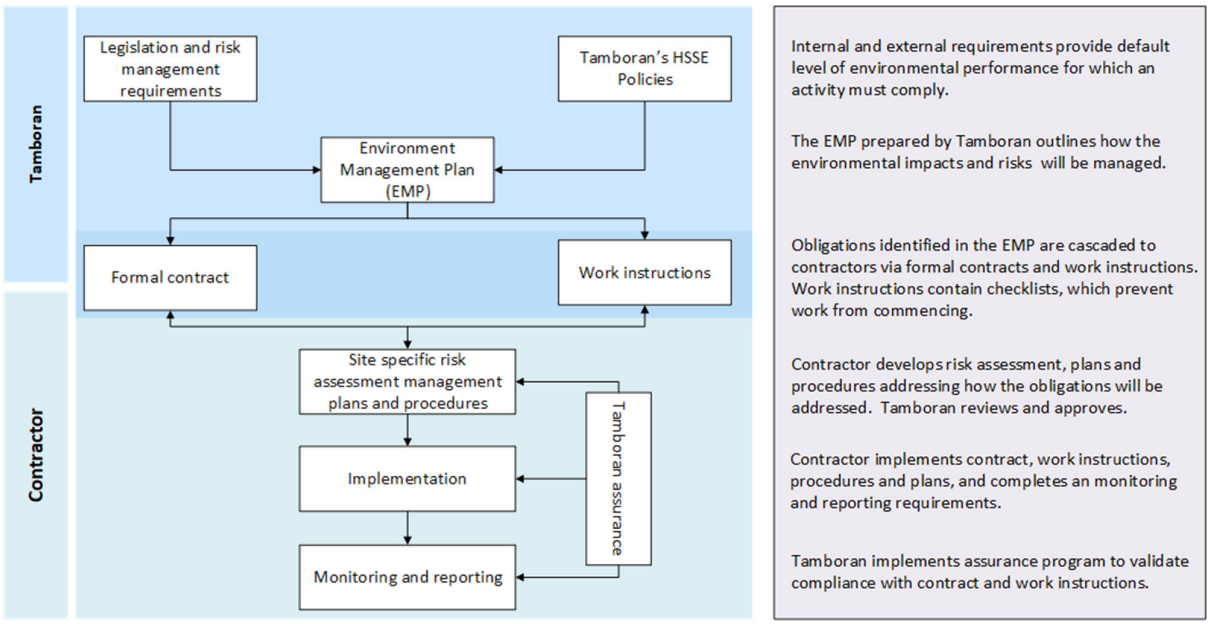

Figure 27: EMP implementation overview flowchart

8.4 Environmental commitment summary

The program environmental commitments outlined in Appendix H are sourced from the risk assessment (Appendix I) and environmental outcomes, performance standards and measurement criteria tables (Table 40 to Table 45). The implementation and compliance against these risk controls will be assessed as part of the annual environmental report (refer in section 8.10).

Specific commitments will be to:

- Record information to track performance, including non-conformances and corrective actions.
- Inspect and monitor operational controls on-site via regular environmental monitoring.
- Assess the level of conformance with objectives and targets detailed in this EMP.
- The operating company representative/HSE advisor will undertake site inspections and direct such action as may be considered necessary to protect, minimise or rectify any environmental concerns.

8.5 Work instructions

An instrument referred to as a 'work instruction' is the mechanism used to cascade the relevant environmental commitments to Tamboran personnel and contractors. It outlines the minimum compliance requirements that must be implemented and includes:

- Key compliance and system documents.
- A list of compliance commitments with responsible parties allocated.
- A list of inspections, procedures and other tools required to implement the content of the EMP.
- Monitoring and reporting requirements.

8.6 Incident reporting and investigation

All personnel working on site (including visitors) are required to report incidents and near-misses that have the potential to, or do, affect the environment.

All environmental incidents and near misses are managed as per Tamboran's Incident Management Procedure and tracked through an online incident reporting system. Incidents are investigated with the level of investigation and methodology (5 whys, ICAM etc) dependent on actual and potential consequence.

Personnel are also encouraged to submit hazard / observation cards to maintain a level of awareness of environmental risk and to ensure a cycle of continual improvement.

8.7 Reportable environmental incident reporting

The Regulations define a reportable incident as an incident arising from a regulated activity that has caused, or has the potential to cause, material environmental harm or serious environmental harm as defined under the Petroleum Act. This also includes any potential or actual damage to a sacred site. Environmental offences and penalties that meet this criteria are defined in s. 117AAB of the Petroleum Act.

Tamboran will assess incidents as they occur to determine if they are reportable. Where an incident is reportable, DLPE will be contacted (this may be verbal or in writing) as soon as practicable but no later than two hours after the first occurrence of the incident or after the time the interest holder becomes aware of the incident.

The Regulations define a recordable incident as an incident arising from a regulated activity that:

1. Has resulted in an environmental impact or environmental risk not specified in the current plan for the activity; or
2. Has resulted in a contravention of an environmental performance standard specified in the current plan for the activity; or
3. Is inconsistent with an environmental outcome specified in the current plan for the activity; and
4. Is not a reportable incident.

Tamboran will notify (this may be oral or in writing) DLPE of a recordable incident as soon as practicable but no later than 15-days after the reporting period (agreed period or each 90-day period after the day on which the EMP is approved).

8.7.1 NT Waste Management and Pollution Control Act 1998 incident reporting

In accordance with the *NT Waste Management and Pollution Control (WMPC) Act 1998,* where contaminants or waste is not confined within the land on which the petroleum activities are undertaken (i.e. the approved disturbance areas where the petroleum activity is occurring), Tamboran has a duty to notify of incidents causing or threatening to cause pollution as soon as practicable, but no less than 24-hours after becoming aware of the incident.

A notifiable incident is defined as an incident that causes, or is threatening or may threaten to cause, pollution resulting in material environmental harm or serious environmental harm.

A notification must include:

a) the incident causing or threatening to cause pollution

b) the place where the incident occurred

c) the date and time of the incident

d) how the pollution has occurred, is occurring or may occur

e) the attempts made to prevent, reduce, control, rectify or clean up the pollution or resultant environmental harm caused or threatening to be caused by the incident

f) the identity of the person notifying.

Tamboran shall make all notification under the WMPCA via the NT EPA Pollution Hotline 1800 064 567 and Petroleum Operations via the DLPE email: onshoregas.depws@nt.gov.au.

8.8 Monitoring, assurance and non-conformance management

In addition to regular monitoring as set out in this document, audits assessing compliance with this EMP, and associated work instruction will be undertaken by Tamboran during the execution of the activity. System deficiencies/non-compliances arising from activities will have corrective actions agreed and assigned to the relevant personnel and may be the subject of a formal non-conformance. These non-conformances or corrective actions shall be logged, and remedial actions identified and implemented. The status of corrective actions will be tracked through to closure and reported in the annual environmental report.

Audits assessing the implementation of the EMP commitments will be completed for each activity (Table 47). The results will be included in the annual environmental report.

Table 47: EMP audit schedule

Audit Type	Scope of audit	Frequency	Responsibility
Operational assurance	Operational compliance checks to ensure risk management controls are implemented	Monthly	Tamboran HSE representative
Annual assurance	Compliance against EMP commitments and risk management controls	Annually	Tamboran HSE representative

8.9 Emergency response plan

An Emergency Response Plan (ERP) has been developed and supports all Tamboran's activities within the Beetaloo Sub-basin. The ERP provides the framework for managing emergencies (i.e. spills, bushfires, medical emergencies) to minimise the impacts to personnel health and safety, and the environment. The ERP is provided in Appendix K.

8.10 Reporting

Internal and government reporting on performance standards will be carried out by the Tamboran authorised representative, and distributed to Tamboran management and the DLPE, in accordance with Section 35 of the Regulations. Quarterly and annual reports will be completed to summarise the compliance with this EMP, whether the environmental outcomes and performance standards in the plan were met and the details of any recordable and reportable incidents (Table 48).

Table 48: EMP reporting schedule

Frequency	Report detail	Recipient
Prior to the commencement of land clearing for SWP	A commencement of clearing notification.	a) Minister for Lands, Planning and Environment (via DLPE) b) Occupier of the land in which the activity is carried out c) Owner for the land for which the activity is to be carried out
Only if required	Incident report summarising reportable incidents.	DLPE
Monthly	Monthly activity summary report.	DLPE

Frequency	Report detail	Recipient
Quarterly	Quarterly incident report summarising recordable incidents during the period (during operational activities) and groundwater monitoring data.	DLPE
Annually	An annual environment performance report will be prepared and submitted to the Minister covering the following: • Summary of the works completed under the EMP during the reporting period. • Summary of performance against measurement criteria. • A summary of environmental incidents that occurred during the year (i.e. reportable and recordable incidents that occurred). • Any environmental studies or research associated with the activity. • Technical improvements. • Consultation undertaken. • Annual weed management performance reporting • Results of related research or of an ongoing monitoring program. • The relevant records outlined with section 8.11.	Tamboran management DLPE
Geospatial information	As per A.3.5 of the Code, geospatial information must be provided to the Minister. Geospatial data of all areas cleared will be provided annually as a part of the Annual Environmental Performance Report.	Minister for Lands, Planning and Environment (via DLPE)

8.11 Record keeping

The following records will be retained within Tamboran's document management system for a period of five years:

- Records linked to measurement criteria, commitments and statutory reporting requirements
- Induction records
- Waste records
- Hazardous goods manifests
- Fuel usage
- Weed inspections
- Non-compliances and corrective action records
- Internal audits and inspection records
- Management of change records.

To the extent these documents are 'prescribed records' for the purpose of the Regulations, they will be kept for the longer of five years following the period during which the petroleum interest is in force and 15-years after the record comes into existence.

8.12 Management of change

A management of change process will be implemented to ensure any changes to the regulated activities described in this EMP are assessed and communicated to ensure no new or unintended environmental risks or impacts are introduced. This allows adaptive management and the ability to use appropriate technologies.

It should be noted that changes can only be implemented where there is no new regulated activity, risk (including risk level) or impact is introduced. Where a new regulated activity, risk (including risk level) or impact is introduced, then a Revision of the EMP is required under the Regulations.

Examples of changes in the location of the regulated activity that may need to be considered in the future, include, a well pad, gathering lines, access, track, seismic line, gravel pit, laydowns etc. For changes in location of the regulated activities listed in this EMP, the following processes will be completed:

- Stakeholder engagement.
- A land condition assessment for the new location, including ecological and heritage scouting.
- An AAPA certificate granted covering the new location (if applicable).
- The relevant management plans outlined in Section 7 of this EMP will be updated as required.
- A Regulation 22 will be submitted to DLPE to modify the EMP, where the change to the location of the regulated activity does not introduce a new or increased environmental risk or impact not provided for in the EMP.
- A Regulation 17 will be submitted to DLPE to revise the EMP where the change to the location of the regulated activity has the potential to introduce a new or increased environmental risk or impact not provided for in the EMP.

8.13 EMP review

Implementation of this EMP will be continually monitored and revised as required based on monitoring and audit results, complaints, employee and stakeholder feedback, change to the proposed work program or a material increase in risk level.

A formal review, update and resubmission of this EMP will be undertaken every five years.

9 References

AECOM. 2011. A*rchaeological Assessment – Drill Sites and Access Roads*, unpublished for Falcon Oil and Gas Australia.

AECOM. 2012b. *Interim Report Archaeological Surveys 2011*, unpublished report for Hess Australia (Beetaloo) Pty Limited.

AECOM. 2013. *Environmental Closeout Survey, Sweetpea Seismic Survey 2006*, Prepared by AECOM for submission to DME, Darwin, NT.

AECOM. 2021. *Land Condition Assessment for Exploration Lease Pads 2021) Velkerri 76 N1, Amungee NW and Beetaloo W*, Prepared by AECOM for Origin Energy.

AECOM. 2023a. *Cultural Heritage Assessment – Shenandoah and Amungee Heritage Scouting,* dated 23 June 2023.

AECOM. 2023b. *Land Condition Assessment Shenandoah South E&A Program,* dated 22 October 2023.

AECOM. 2024a. *Cultural Heritage Assessment – Amungee North-West, Shenandoah North, Shenandoah South and Kyalla,* dated 15 March 2024.

AECOM. 2024b. *Land Condition Assessment Shenandoah South E&A Program,* dated 27 March 2024.

AECOM.2024c. *Land Condition Assessment Shenandoah South 2*, dated 28 May 2024.

AECOM. 2024d. *Land Condition Assessment Shenandoah South Program*, dated 24 July 2024.

AECOM. 2024e. *Cultural Heritage Assessment – Beetaloo Basin Heritage Scouting – Shenandoah South Exploration and Appraisal Program Area,* dated 19 September 2024.

AECOM. 2025. *Shenandoah South Sand Wash Plant Area, Exploration Permit 117,* dated 14 April 2025.

Atlas of Living Australia (ALA). 2024. Atlas of Living Australia Spatial Portal. https://spatial.ala.org.au/ [accessed 12 July, 2024].

Aumann, T and Baker-Gabb, D. 1991. RAOU Report 75. *A Management Plan for the Red Goshawk*. RAOU. Royal Australasian Ornithologists Union, Melbourne.

Australian Natural Resources Atlas (ANRA), 2008. *Rangelands 2008 Taking the Pulse- Stuart Plateau Bioregion*.

Australian Petroleum Production and Exploration Association Limited (APPEA), 2008. *Code of Environmental Practice*, Canberra, ACT.

AustRoads. 2019. *Guide To Traffic Management Part 12: Traffic Impacts of Developments.*

AustRoads. 2017. *Guide to Traffic Management Part 3: Traffic Studies and Analysis.*

Baker, B, Price, O, Woinarski, J, Gold, S. Connors, G, Fisher, A and Hempel, C. 2005. *Northern Territory Bioregions: assessment of key biodiversity values and threats*. Department of Natural Resources, Environment and the Arts, Northern Territory Government.

Barkly Regional Council, 2018. *The Region*, website accessed 18 September 2018, https://www.barkly.nt.gov.au/region/demographics.

Bubb, A, 2004. *'Pastoral industry survey 2004. Tennant Creek'*. Northern Territory Government: Darwin.

Bureau of Meteorology, 2024. Northern Territory Weather Observations. Available from http://www.bom.gov.au/nt/observations/index.shtml. Site accessed 29 May 2024.

BOM, 2017a. Bureau of Meteorology Submission #475. Hydraulic Fracturing Inquiry – NT Bureau of Meteorology input. https://frackinginquiry.nt.gov.au/__data/assets/pdf_file/0003/452118/Bureau-of-Meteorology-Submission-475_Redacted.pdf. Accessed 12 March 2024.

BOM, 2017b.Groundwater Dependent Ecosystems Atlas. Commonwealth of Australia. www.bom.gov.au/water/groundwater/gde accessed June 2024.

BOM, 2024. *Average annual rainfall. 30-year climatology (1991 – 2020).* Average annual, seasonal and monthly rainfall maps.http://www.bom.gov.au/climate/maps/averages/rainfall/?period=an&region=aus, accessed 22 March 2024.

Commonwealth of Australia. 2001. *Australian Native Vegetation Assessment 2001*, Land and Water Australia, Canberra.

CloudGMS, 2015. *Beetaloo Basin Hydrogeological Assessment.* Prepared by S. Fulton and A. Knapton, February 2015.

Cogger, HG. 2000. *Reptiles and Amphibians of Australia - 6th edition*. Sydney, NSW: Reed New Holland.

Cole, J and Woinarski, J. 2002. *Field Guide to the Rodents and Dasyurids of the Northern Territory*. Surrey Beatty and Sons, Chipping Norton, NSW.

Curtis, Lee K, Dennis, AJ, McDonald, K R, Kyne, PM, and Debus SJS, (eds.) 2012. *Queensland's Threatened Animals*. CSIRO Publishing, Collingswood.

CSIRO. 2024. *Bushfire Best Practice Guide.* https://research.csiro.au/bushfire/bushfire-basics/how-bushfires-behave/vegetation/, accessed 18 March 2024.

Davis, J, Gillespie, G, Cuff, N, Garcia, E, Andersen, A, Young, L, Leiper, I, Ribot, R, Kennard, M, Pintor, A, Bonney, S, and Wedd, D. 2021. *Beetaloo GBA Region Baseline Survey Program*. Research Institute for Environment & Livelihoods, Charles Darwin University, Darwin, Australia.

Department of Climate Change, Energy, the Environment and Water (DCCEEW). 2023a. *Conservation Advice for Tiliqua scincoides intermedia (northern blue-tongue skink)*. Australian Government, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW). 2023b. *Conservation Advice for Varanus mertensi (Mertens' Water Monitor)*. Australian Government, Canberra.

Department of Climate Change, Energy, the Environment and Water (DCCEEW). 2023c. *Conservation Advice for Varanus mitchelli (Mitchell's Water Monitor)*. Australian Government, Canberra.

Department of Environment (DoE). 2015. *Sawfish and River Sharks – Multispecies Recovery plan*. Commonwealth of Australia, Canberra. https://www.dcceew.gov.au/sites/default/files/documents/sawfish-river-sharks-multispecies-recoveryplan.pdf. [Accessed 19 March 2024]

Department of Environment Parks and Water Security (DEPWS) 2022a, SREBA Data Catalogue, https://srebadata.nt.gov.au/ [accessed 6 July 2023].

Department of Environment Parks and Water Security (DEPWS) 2022b, Regional Report, Strategic Regional Environmental and Baseline Assessment (SREBA) for the Beetaloo Sub-basin, Northern https://depws.nt.gov.au/__data/assets/pdf_file/0005/1247018/sreba-beetaloo-regional-report.pdf. [accessed 7 July 2023]

Department of Environment Parks and Water Security (DEPWS) 2022c, Meta data: SREBA Beetaloo Geology. https://srebadata.nt.gov.au/view/ntg-spa-000000076 [accessed 7 July 2023]

Department of Environment Parks and Water Security (DEPWS) 2022d, Aquatic Ecosystems Baseline Report, Strategic Regional Environmental and Baseline Assessment for the Beetaloo Sub-basin. https://territorystories.nt.gov.au/10070/903891 [accessed 7 July 2023].

Department of Environment Park and Water Security (DEPWS). 2021a. *Threatened species of the Northern Territory – Tassel sedge Carex fascicularis.* Northern Territory Government. https://nt.gov.au/__data/assets/pdf_file/0020/208424/carex-fascicularis.pdf.

Department of Environment Park and Water Security (DEPWS). 2021b. Tennant Creek Regional Weeds Strategy. depws.nt.gov.au/__data/assets/pdf_file/0006/258099/tennant-creek-regional-eedsstrategy.pdf. Site accessed 6th July 2023.

Department of Environment Park and Water Security (DEPWS). 2021c. Katherine Regional Weeds Strategy. Katherine Regional Weeds Strategy 2021-2026 (nt.gov.au). Site accessed 6th July 2023

Department of Environment, Parks and Water Security (DEPWS). 2021d. *Threatened species of the Northern Territory – Grey Falcon Falco hypoleucos.* Northern Territory Government. https://nt.gov.au/__data/assets/pdf_file/0020/206354/grey-falcon.pdf.

Department of Environment, Parks and Water Security (DEPWS). 2021e. *Threatened species of the Northern Territory – Crested Shrike-tit (northern) Falcunculus frontatus whitei*. Northern Territory Government. https://nt.gov.au/__data/assets/pdf_file/0004/376168/crested-shrike-tit.pdf.

Department of Environment, Parks and Water Security (DEPWS). 2021f. *Threatened species of the Northern Territory – Princess Parrot Polytelis alexandrae*. Northern Territory Government. https://nt.gov.au/__data/assets/pdf_file/0017/206360/princess-parrot.pdf

Department of Environment, Parks and Water Security (DEPWS). 2021g. *Threatened species of the Northern Territory – Australian Painted Snipe Rostratula australis.* Northern Territory Government. https://nt.gov.au/__data/assets/pdf_file/0018/206361/australian-painted-snipe.pdf.

Department of Environment, Parks and Water Security (DEPWS). 2021h. *Threatened species of the Northern Territory – Ghost Bat Macroderma gigas*. Northern Territory Government. https://nt.gov.au/__data/assets/pdf_file/0010/376138/ghost-bat.pdf

Department of Environment, Parks and Water Security (DEPWS). 2021i. *Threatened species of the Northern Territory - Bare-rumped sheath-tailed bat Saccolaimus saccolaimus nudicluniatus*. Northern Territory Government. Available from: https://nt.gov.au/__data/assets/pdf_file/0007/376117/barerumped-sheath-tailed-bat.pdf

Department of Environment, Parks and Water Security (DEPWS). 2021j. *Threatened species of the Northern Territory - Gulf snapping turtle Elseya lavarackorum*. Northern Territory Government. https://nt.gov.au/__data/assets/pdf_file/0008/376181/gulf-snapping-turtle.pdf

Department of Environment, Parks and Water Security (DEPWS). 2021k. *Threatened species of the Northern Territory – Mertens' Water Monitor Varanus mertensi.* Northern Territory Government. https://nt.gov.au/__data/assets/pdf_file/0018/206460/mertens-water-monitor.pdf

Department of the Environment (2014). *Tyto novaehollandiae kimberli in Species Profile and Threats Database*, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed Wed, 10 Sep 2019.

Department of the Environment. 2014. *Dasyurus hallucatus in Species Profile and Threats Database*, Department of the Environment, Canberra. Available from: http://www.environment.gov.au/sprat. Accessed Wed, 10 Sep 2024.

Department of Environment and Energy. 2018. *State and Territory Greenhouse Gas Inventories 2016*, published February 2018.

Department of the Environment and Energy. 2018. *Key threatening processes under the EPBC Act*. http://www.environment.gov.au/biodiversity/threatened/key-threatening-processes, accessed 14 September 2018.

Department of Environment and Natural Resource. 2018. *Daly Roper Beetaloo Water Control District*, Northern Territory Government, Darwin, NT.

Department of Environment, Parks and Water Security (DEPWS). 2018a. *Listing of "Threatened Animals", "Plants" and "Weeds"*, accessed August and September 2018. https://nt.gov.au/environment/animals/threatened-animals.

Department of Environment, Parks and Water Security (DEPWS). 2018b. *Northern Territory Stream Order, Strahler stream orders over the Northern Territory, topographic scale data 250k*, Spatial Data and Mapping Branch, Water Resources Division, Northern Territory Government, Darwin, NT.

Department of Environment, Parks and Water Security (DEPWS). 2024. *Land Clearing Guidelines. Northern Territory Planning Scheme*. Version 1.4 dated 01 August 2024. https://nt.gov.au/__data/assets/pdf_file/0007/236815/land-clearing-guidelines.pdf.

Department of Environment, Parks and Water Security (DEPWS). 2022. *Regional Report: Strategic Regional Environmental and Baseline Assessment for the Beetaloo Sub-basin*. DEPWS Technical Report 41/2022. Department of Environment, Parks and Water Security, Northern Territory Government. Berrimah, Northern Territory.

Department of Environment, Parks and Water Security (DEPWS). 2022. *SREBA Strategic Regional Environmental and Baseline Assessment* and *Data Catalogue*. https://srebadata.nt.gov.au/domain/NTG, accessed May 2022.

Department of Environment, Parks and Water Security (DEPWS). 2022a. *Water resources of the Wiso Basin water management area*. https://hdl.handle.net/10070/900058, accessed August 2024.

Department of Environment, Parks and Water Security (DEPWS). 2023 *Regional weeds strategies and plans*. https://depws.nt.gov.au/rangelands/guidelines-and-management-plans/weed-management-strategies-and-plans, accessed 30 June 2023.

Department of Industry, Tourism and Trade (DITT). 2016. *Partheneum found in the NT*. https://dpir.nt.gov.au/news/2016/december/parthenium-found-in-the-nt, accessed 14 September 2018.

Department of Infrastructure, Planning and Logistics (DIPL). 2023. *Annual Traffic Report 2023*, Version 1, dated February 2024. https://dipl.nt.gov.au/__data/assets/pdf_file/0005/1428539/annual-traffic-report-2023.pdf, accessed 17 September 2024.

Department of Land Resource Management. 2015. *Barkly Regional Weed Management Plan 2015 - 2020.*

Department of Land Resource Management and Charles Darwin University. 2018, *Guidelines for the Management of the Weeds of Beetaloo 2018*.

Department of Natural Resources and Environment. 2018. *Weed Management Planning Guide - Onshore Shale Gas Development Projects*.

Dickman CR. 2009. House cats as predators in the Australian environment: impacts and management. Human-Wildlife Conflicts 3:41-48.

Dickman, CR. 1996. Impact of exotic generalist predators on the native fauna of Australia. Wildlife Biology 2(3):185-195.

Dostine, PL and Franklin, DC. 2002. A comparison of the diet of three finch species in the Yinberrie Hills area, Northern Territory. Emu 102:159-164.

Environment Australia. 1998. *Best Practice Environmental Management in Mining - Dust Control*, Canberra, ACT.

Environment Protection Agency. 1995. *Best Practice Environmental Management in Mining - Environmental Impact Assessment*, Canberra, ACT.

Environment Australia. 1997. *Best Practice Environmental Management in Mining - Hazardous Materials Management, Storage and Disposal*, Canberra, ACT.

Environment Australia. 1998. *Best Practice Environmental Management in Mining - Landform Design for Rehabilitation*, Canberra, ACT.

Environment Australia. 1998. *Best Practice Environmental Management in Mining - Noise, Vibration and Airblast Control*, Canberra, ACT.

Environment Protection Agency. 1996. *Best Practice Environmental Management in Mining - Onshore Minerals and Petroleum Exploration*, Canberra, ACT.

Fitzsimons, P, Bond, M and Webber, S. 2010. *Creating a participatory adaptive capacity index for climate change adaptation - Report of engagement process in the South-West of Victoria*. Department of Primary Industries Victoria (in press).

Fleming MR, Johnson KA, Latz PK and McKean JR. 1983. *A Biological Survey of Junction Stock Reserve and Newcastle Waters Pastoral Lease on The Barkly Tablelands*, Wildlife Research Section, Conservation Commission of the NT.

Fulton, S and Knapton, A. 2015. *Beetaloo Basin Hydrogeological Assessment*. Prepared by CloudGMS

Garnett, S and Baker, G.B. 2021. *The Action Plan for Australian Birds 2020*. CSIRO Publishing.

Garnett, S, Szabo, J and Dutson, G. 2011. *The Action Plan for Australian Birds 2010*. CSIRO Publishing.

GISERA. 2020. *Characterising stygofauna and microbial assemblages in the Beetaloo Sub-basin*. Retrieved from Gas Industry Social and Environmental Research Alliance.

Higgins, PJ and Davies, SJJF. (eds.) 1996. *Handbook of Australian, New Zealand and Antarctic Birds. Volume Three - Snipe to Pigeons*. Melbourne, Victoria: Oxford University Press.

HLA-Envirosciences Pty Ltd (HLA). 2005. E*nvironmental Management Plan: Onshore Petroleum Exploration Beetaloo Basin, NT*. Report prepared for Sweetpea Petroleum Pty Ltd.

HLA. 2006a. *An Analysis of Available Water Quality Data and Gap Analysis for Beetaloo Basin, Northern Territory.* Report prepared for Sweetpea Petroleum Pty Ltd.

HLA. 2006b. *Surface Water Quality Investigation, Beetaloo Basin, Northern Territory.* Report prepared for Sweetpea Petroleum Pty Ltd.

HLA. 2006c. *Sweetpea Petroleum Environmental Program 2006: Baseline Vegetation Assessment.* Report prepared for Sweetpea Petroleum Pty Ltd.

HLA. 2006d. *Archaeological Assessment 2006 for the Sweetpea Petroleum Seismic Program, Beetaloo Basin, NT, 2006*. Report prepared for Sweetpea Petroleum Pty Ltd.

HLA. 2006e. *Beetaloo Basin: Cooee Hill and 80 Metre Tower Archaeological Assessment*. Report prepared for Sweetpea Petroleum Pty Ltd.

HLA. 2006f. *Beetaloo Basin: Yaroo, South Martyr's Tree and Dunmarra Archaeological Assessment*, unpublished report for Sweetpea Petroleum.

HLA. 2007a. *Supplementary Environmental Management Plan, Drilling Program 2007, Beetaloo Basin, NT.* Report prepared for Sweetpea Petroleum Pty Ltd.

HLA. 2007b. 2007 *Environmental Works Progress Report 1 (March to May 2007)*. Letter to Sweetpea Petroleum dated 28 May 2007.

HLA. 2007c. *Groundwater Monitoring Program, Sweetpea Petroleum Exploration Program, Beetaloo Basin, NT*. Report prepared for Sweetpea Petroleum Pty Ltd.

HLA. 2007d. *Archaeological Assessment Newcastle Waters Proposed Drilling Site for the Sweetpea Petroleum Seismic Program, Beetaloo Basin, NT, 2006*. Report prepared for Sweetpea Petroleum Pty Ltd.

Hose, GC, Sreekanth, J, Barron, O and Pollino, C. 2015. *Stygofauna in Australian Groundwater Systems: Extent of knowledge*. CSIRO, Australia.

Humphreys, G. Hamilton, Z., Finston, T. and Hitchen, Y. 2022. *Beetaloo Sub-basin Stygofauna Baseline Assessment*. Prepared for the Northern Territory Department of Environment, Parks and Water Security by Biota Environmental Sciences and Helix Molecular Solutions.

Land and Water Australia, 2004. *Australian Water Resources Assessment*. In: National Land and Water Resource Audit, 2004. Canberra, ACT.

Land and Water Australia, 2004. *Australian Water Resources Assessment*. In: National Land and Water Resource Audit, 2004. Canberra, ACT.

McCue, K. 2013 Historical earthquakes in the northern Territory, Australian Earthquake Engineering Society, https://aees.org.au/wp-content/uploads/2013/11/McCue_NT_EQs.pdf. Accessed 21 January 2019.

Menkhorst, P and Knight F. 2011. *A Field Guide to the Mammals of Australia*. Oxford University Press, Sydney.

North Australia Fire Information (NAFI), 2023. *Fire Maps*. http://www.firenorth.org.au Accessed 16 September 2024.

Northern Territory Government (NTG 2021a), A-Z list of weeds in the NT, List of declared weeds in the NT. https://nt.gov.au/__data/assets/pdf_file/0016/252133/declared-weeds-in-the-nt.pdf. Accessed on July 2023.

Northern Territory Government (NTG 2021 b), Important biodiversity conservation sites, Sites of conservation significance list, https://nt.gov.au/environment/environment-data-maps/importantbiodiversity-conservation-sites/conservation-significance-list. [accessed 7 July 2023].

Northern Territory Government. 2021. *Northern Territory Weed ID Deck 3rd edition*.

Northern Territory Government. 2021. *NT Weed Management Handbook*.

Northern Territory Government. 2018. A – Z List of Weeds in the Northern Territory. https://nt.gov.au/environment/weeds/weeds-in-the-nt/A-Z-list-of-weeds-in-the-NT accessed 13 September 2018.

Northern Territory Government. 2005. *Integrated Natural Resource Management Plan for the Northern Territory*, Northern Territory Government.

Orr, DM and Holmes, WE. 1984 *'Mitchell Grasslands.'* In G.N. Harrington, A.D. Wilson and M.D. Young (eds) Management of Australia's Rangelands, Australia, CSIRO: 241-254.

Palmer, C, Woinarski, J and Ward S. 2012. *Threatened Species of the Northern Territory: Gouldian Finch Erythrura gouldiae*. Department of Land Resource Management, Northern Territory Government.

Parks and Wildlife Commission of the NT. 2005. *Bullwaddy Conservation Reserve Plan of Management*, Parks and Wildlife Commission of the NT, Darwin.

Pavey, C. 2006. *National Recovery Plan for the Greater Bilby Macrotis lagotis*. Northern Territory Department of Natural Resources, Environment and the Arts.

Pizzey, G, Knight, F and Pizzey, S. 2012. *The Field Guide to Australian Birds*. HarperCollins Publishers, Sydney.

Primary Health Network, Northern Territory. 2020. *Barkly Region Data Report*. Australian Government, https://www.ntphn.org.au/wp-content/uploads/2021/06/Barkly-Regional-Data-Profile_FINAL.pdf.

Quaternary Archaeological Surveys. 1998. *Archaeological survey of the Stuart Highway to Mataranka Homestead Optic Fibre Cable Corridor, Northern Territory*, unpublished report for Telstra.

Rees GN, Oberprieler S, Nielsen D, Watson G, Shackleton M, Davis JA (2020) *Characterisation of the stygofauna and microbial assemblages of the Beetaloo Sub-basin, Northern Territory*. CSIRO, Australia.

Richards, C. Bond, M. (2023) *Environmental Health Baseline Report: Soils. Strategic Regional Environmental and Baseline Assessment for the Beetaloo Sub-basin*. Report prepared for the Northern Territory Department of Environment, Parks and Water Security by Tetra Tech Coffey.

Seismology Research Centre. 2017. *Earthquakes in Australia*, https://www.src.com.au/earthquakes/seismology-101/earthquakes-in-australia/ Accessed January 21, 2019.

Southgate, RI and Paltridge, R. 1998. *Recovery of the Greater Bilby Macrotis lagotis*. Final Report for Project Number 185, Nature Australia, Biodiversity Group, Endangered Species Program and Feral Pests Program.

Smith, JG and Phillips, BL. 2006. Toxic tucker: the potential impact of cane toads on Australian reptiles. Pacific Conservation Biology 12:40-49.

Smith, MA. 1986. An investigation of possible Pleistocene occupation at Lake Woods, Northern Territory, Australian Archaeology, 22:60-72.

Tennant Creek Regional Economic Development Committee, 2014, *Tennant Creek and Barkly Region Strategic & Action Plan 2014-2016*, endorsed 28 October 2014, Northern Territory Government, https://nt.gov.au/__data/assets/pdf_file/0007/198340/tennant-creek-and-barkly-region-strategic-and-action-plan.pdf

Threatened Species Scientific Committee (TSSC). 2020b. *Conservation Advice Trichosurus vulpecula arnhemensis Northern Brushtail Possum*. Commonwealth Government.: http://www.environment.gov.au/biodiversity/threatened/species/pubs/83091-conservation-advice-11052021.pdf.

Threatened Species Scientific Committee (TSSC). 2020a. *Falco hypoleucos Grey Falcon Conservation Advice.* Commonwealth Government: https://www.environment.gov.au/biodiversity/threatened/species/pubs/929-conservation-advice-09072020.pdf.

Tickell, SJ. 2003. *Water Resource Mapping Barkly Tablelands*, Unpublished draft report prepared by the Department of Infrastructure Planning and Environment, Darwin, NT.

Tracking Australian Painted Snipe. 2024. X. *Tracking Australian Painted Snipe*. https://x.com/trackingapsnipe

Trainor, CR. 2005. Distribution and Natural History of the Cryptic Dragon *Chelosonia Brunnea*: A Review of Records. Northern Territory Naturalist 18:24-44.

US EPA. 2016. *Hydraulic Fracturing for Oil and Gas: Impacts from the Hydraulic Fracturing Water Cycle on Drinking Water Resources in the United States (Final Report)*. U.S. Environment Protection Agency, Washington, DC, EPA/600/R-16/236F, 2016.

Ward, SJ. 2008. *Habitat-use, foraging and breeding ecology of the northern shrike-tit Falcunculus frontatus whitei.* Report to NHT (Department of Natural Resources, Environment, the Arts and Sport, Darwin).

Ward, SJ, Berghout, M and Baker, B. 2009. Notes on the form and habitat of nests of the northern shrike-tit. Northern Territory Naturalist 21:54-60.

Ward, S., Woinarski, J., Griffiths, T. and McKay, L. 2012. *Threatened Species of the Northern Territory: Yellow-spotted Monitor, Northern Sand Goanna, Floodplain Monitor Varanus panoptes*. Department of Land Resource Management, Northern Territory Government.

Woinarski, J. and Hill, B. 2012. *Threatened Species of the Northern Territory: Northern Quoll Dasyurus hallucatus*. Northern Territory Department of Environment and Natural Resources, Northern Territory Government, Darwin, NT.

Woinarski, JCZ and Tidemann, SC. 1991. The bird fauna of a deciduous woodland in the wet-dry tropics of northern Australia. Wildlife Research 18: 479-500.

Woinarski, J.C.Z. 2004a. *National Multi-species Recovery Plan for the Partridge Pigeon Geophaps smithii smithii, Crested Shrike-tit, Falcunculus frontatus whitei, Masked Owl Tyto novaehollandiae kimberli and Masked Owl Tiwi Islands Tyto novaehollandiae melvillensis 2004-2009*. Northern Territory Department of Infrastructure Planning and Environment. Available http://www.environment.gov.au/biodiversity/threatened/publications/recovery/smithii-whitei-kimberli-melvillensis/index.html.

Woinarski, JCZ. 2004b. *National Multi-species Recovery Plan for the Carpentarian Antechinus Pseudantechinus mimulus, Butler's Dunnart Sminthopsis butleri and Northern Hopping-mouse Notomys aquilo, 2004 - 2009*. Northern Territory Department of Infrastructure Planning and Environment.

Woinarski, JCZ and Fisher, A. 1995. Wildlife of lancewood (*Acacia shirleyi*) thickets and woodlands in northern Australia. 1. Variation in vertebrate species composition across the environmental range occupied by lancewood vegetation in the Northern Territory. Wildlife Research 22: 379-411.

Woinarski JCZ, Pavey C, Kerrigan R, Cowie I and Ward S. 2007. *Lost from our Landscape: Threatened Species of the Northern Territory*. Palmerston: Department of Natural Resources, Environment and the Arts.

Woinarski, J.C.Z, 2006. Threatened Species of the Northern Territory: Gulf Snapping Turtle. Department of Environment and Natural Resources, Northern Territory Government.

Woinarski, JCZ and Ward, S. 2012. *Threatened Species of the Northern Territory: Crested Shrike-tit Falcunculus (frontatus) whitei*. Department of Land Resource Management, Northern Territory Government.

Young L, Patykowski J, Leiper I, Nano C, Fisher A, Gillespie G, Barnett G, Buckley K, Hanrahan N, McDonald P, Miller A, Ribot R, Ruykys L, Stewart A, Zimny A (2022). *Terrestrial Ecosystems Baseline Report: Strategic Regional Environmental and Baseline Assessment for the Beetaloo Sub-basin*. DEPWS Technical Report 36/2022. Flora and Fauna Division, Northern Territory Department of Environment, Parks and Water Security, Darwin.

10 Acronyms and Abbreviations

Acronym	Meaning
3D	Three dimensional
°C	degrees Celsius
%	Percentage
AAPA	Aboriginal Areas Protection Authority
ABS	Australian Bureau of Statistics
ALA	Atlas of Living Australia
ALARP	as low as reasonably practicable
ANZECC	Australian and New Zealand Environment Conservation Council
ANRA	Australian Natural Resources Atlas
API	American Petroleum Institute
APPEA	Australian Petroleum Production and Exploration Association
ASRIS	Australian Soil Resource Information System
AS	Australian Standard
AWD	accelerated weight drop
BOM	Bureau of Meteorology
BMP	Bushfire Management Plan
BPESC	Best Practice Erosion and Sediment Control
CE, E, V, or NT	Critically Endangered, Endangered, Vulnerable and Near Threatened
CLA	Cambrian Limestone Aquifer
CPESC	Certified Professional in Erosion and Sediment Control
Code	Code of Practice: Onshore Petroleum Activities in the Northern Territory
Cth	Commonwealth
CY	calendar year
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEPWS/DLPE	Department of Environment, Parks and Water Security; now the Department of Lands, Planning and Environment
DLI	Department of Logistics and Infrastructure

Acronym	Meaning
DITT/DME	Department of Industry, Trade and Tourism; now the Department of Mining and Energy
DoH	Department of Health (NT)
EIS	Environment Impact Statement
EO	Environmental Outcome
EMP	Environment Management Plan
EP	Exploration Permit (e.g. EP 76, EP 98 and EP 117)
EPA	Environment Protection Authority (NT)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EPS	Environmental Performance Standard
ERP	Emergency Response Plan
ESC	erosion and sediment controls
ESCP	Erosion and Sediment Control Plan
GDE	Groundwater Dependent Ecosystems
GHG	Greenhouse gas
GPS	Global Positioning Device
ha	hectare
HSE	Health, Safety and Environment
HSEMPs	Health, Safety and Environment Management Plans
HSEMS	Health, Safety and Environment Management System
IBA	Important Bird Area
IECA	International Erosion Control Association
ILUA	Indigenous Land Use Agreement
ISO	International Organisation for Standardisation
JV	Joint venture
km	kilometre
km^2	square kilometres
km/hr	kilometres per hour
LOS	Level of Service
m	metre

Acronym	Meaning
Mya	millions of years ago
MD	measured depth
ML	megalitre
Ml	Local magnitude
mm	millimetre
MNES	Matters of National Environmental Significance
MTA	*Mineral Titles Act 2010*
SDS	Safety Data Sheet
NAFI	Northern Australian Fire Information
NATA	National Association of Testing Authorities
NEPM	National Environmental Protection Measure
NGERS	National Greenhouse and Energy Reporting Scheme
NICNAS	National Industrial Chemicals Notification and Assessment Scheme
NLC	Northern Land Council
NPI	National Pollutant Inventory
NT	Northern Territory
NT Por	NT Portion (Parcel Reference Table)
NTG	Northern Territory Government
NVIS	National Vegetation Information System
OHS	Occupational Health and Safety
ppm	parts per million
PER	Public Environment Report
PPE	Personal Protective Equipment
PPL	Perpetual Pastoral Lease
PSD	Particle size distribution
RMP	Rehabilitation Management Plan
RUSLE	Revised Universal Soil Loss Equation
RWA	Restricted Work Area
SWL	Standing Water Level

Acronym	Meaning
SWP	Refers to the Shenandoah South sand wash plant
tCO_2e	tonnes of carbon dioxide equivalent
TDS	Total Dissolved Solids
TIA	Traffic Impact Assessment
TMP	Traffic Management Plan
TO	Traditional Owner
TPWC Act	*Territory Parks and Wildlife Conservation Act* (NTG)
WEL	Water Extraction Licence
WMP	Weed Management Plan
WoNS	Weed of National Significance
WWMP	Wastewater Management Plan