

Well Drilling, Hydraulic Fracture Stimulation and Well Testing Environment Management Plan

EP136 - Beetaloo Sub-basin, NT

21-Jul-2022
Petroleum Exploration Program
Doc No. SWP4-3

Well Drilling, Hydraulic Fracture Stimulation and Well Testing Environment Management Plan

EP136 - Beetaloo Sub-basin, NT

Proponent: Sweetpea Petroleum Pty Ltd, wholly owned subsidiary of Tamboran Resources Pty Ltd

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Definitions/Acronyms	Meaning
Annulus/Annuli	The volume between wellbore and casing or between casing and tubing: - A-annulus refers to the annulus between the tubing and production casing. - B-annulus refers to the annulus between the production casing and the previous (larger diameter) casing Annulus Annuli.
Appraisal well	A well drilled principally to define more accurately the extent or nature of a previously discovered oil or gas accumulation.
Aquifer	A body of rock that is sufficiently permeable to conduct groundwater and currently supplying, or potentially being able to supply, water for environmental, cultural or consumptive (stock or domestic) uses, as determined by the Northern Territory Government.
bed and banks	in relation to a waterway, means the land over which normally flows, or which is normally covered by, the water of the waterway, whether permanently or intermittently, but does not include land from time to time temporarily covered by the flood waters of the waterway and abutting on or adjacent to its bed and banks, the bed being the relatively flat portion and the banks being the relatively steep portions of the land comprising the bed and banks.
Blowout preventer (BOP)	A device attached immediately above the casing, which can be closed to shut in the well.
Bore (or water bore)	Includes a water observation bore, water supply bore, or injection bore.
Camp wastewater	Treated sewage effluent, and greywater (laundry, showers, sink wastes, etc.) from camp and offices.
Casing or casing string	A pipe placed in a well to prevent the wall of the hole from caving in and to prevent movement of fluids from one formation to another.
Casing Shoe	The bottom of the casing string, including the cement around it, or the equipment run at the bottom of the casing string.
Cement bond log (CBL)	A log obtained from a downhole logging tool that determines the quality of cement bond on the exterior casing wall.
Cement Plug	A log obtained from a downhole logging tool that determines the quality of cement bond on the exterior casing wall.
Cementing	The application of a liquid slurry of cement and water to various points inside and outside the casing.
Christmas Tree	The assembly of control valves and pressure gauges attached to the Wellhead to control the flow into or out of the well after the well has been drilled and completed.
Circulation	The process of pumping a fluid down the well and back up to the surface in a drilling or workover operation.
Clearing	Removal of above-ground vegetation and associated rootstock
Compartmentalised resource	A resource restricted in lateral extent where petroleum has migrated from source rocks to a definable reservoir.
Competent person/ Competent personnel	A person with the necessary ability, knowledge, and relevant experience to conduct the task or activity.
Completion or completions	A flowpath in a well that allows the production of fluids from a discrete formation interval through the well, or the injection of fluids into a discrete formation interval through the well, and includes the necessary sub-surface equipment independent of other flowpaths in the well.

Definitions/Acronyms	Meaning
Continuous Resource	A resource hosted in source rock with significant lateral extent, such as a shale.
Development Well	A well that is drilled within the expected limits or boundaries of a petroleum accumulation and that is drilled principally to produce, or to facilitate the production of, the petroleum reserves from that accumulation.
Downstream	For the purposes of this document, downstream begins where the production of gas ends; that is the final processing required to meet the needs of other industry such as electricity production, cooking, making fertiliser as well as LNG transportation. and/or Petroleum industry processes associated with post-production activities such as refining, transportation and marketing of petroleum products.
Drilling Fluid	Fluids that contain some formation fluids and cuttings of the formation being drilled and other materials used in well drilling activities. A fluid circulated during drilling to lift cuttings from the wellbore to the surface and to cool the drill bit. Also known as drilling mud.
Exploration Lease Pad	means the disturbance area required to accommodate the placement of a drilling rig and provide an area for above ground water holding ponds or tanks when required. In total, the design of the exploration lease pad area has allowed for approximately 11 ha to be cleared for each lease area, including the provision of firebreaks to reduce the potential risk to infrastructure, as well as accommodate the water monitoring bore pads and tanks. The well pad and the tank pad make up the exploration lease pad.
Exploration well	A well drilled with a view to discovering a new oil or gas accumulation, or to obtaining stratigraphic information that may assist in the discovery of a new oil or gas accumulation.
Flaring	The controlled burning of natural gas for purposes other than producing energy.
Flowback Fluid	Fluid that is a mixture of hydraulic fracturing fluid and formation fluid that is allowed to flow from the well following hydraulic fracturing. As defined in the Petroleum (Environment) Regulations 2016.
Formation pressure	The pressure of fluids within the pores of a reservoir.
Fugitive Emissions	The term fugitive emissions in relation to the oil and gas industry refers to all non-combustion sources of greenhouse gasses (mainly methane) but also to the disposal of waste streams either by venting or flaring.
Garrett Gas Train	An instrument used for quantitative analyses of sulfides and carbonates in drilling fluid.
Geohazard	Geological hazards (such as caverns, karstic formations, voids and faults) which could negatively impact on the objectives of well operations.
Good Oilfield Practice	As defined in the <i>Petroleum Act 1984</i> (NT)
Groundwater Monitoring Bore Pad	means the groundwater monitoring bore pads that will be constructed on two by 50 x 50 m water bore pads within the overall exploration lease pad.
Hazardous chemical	As defined in the Northern Territory <i>Work Health and Safety (National Uniform Legislation) Regulations</i> , wastes and contaminants as defined under the <i>Petroleum Act 1984</i> and waste listed under the <i>Waste Management and Pollution Control Act 1998</i>

Definitions/Acronyms	Meaning
High pressure, high temperature wells (HPHT)	High temperature in this context is defined as when the undisturbed bottom hole temperature is greater than 150°C (300°F). High Pressure in this context is defined as either: a. the maximum pore pressure of any porous formation that exceeds a hydrostatic gradient of 0,18 bar/m (0,8 psi/ft) (representing an equivalent mud weight (EMW) of 1,85 SG or (15,4 ppg); or b. needing deployment of pressure control equipment with a rated working pressure in excess of 690 bar (69 MPa, 10,000 psi).
High temperature wells (HT)	High temperature wells, typically $\geq 150^{\circ}\text{C}$ (300°F) bottom hole static temperature.
Hydraulic fracture stimulation	A process used to enhance the productivity of a gas well. It involves pumping a specifically blended fluid, charged with proppant such as sand, down a well at high pressure to force passageways into the target formation(s). The proppant keeps the passageways open once the pressure is released and serves to improve the productivity of the well.
Hydraulic fracturing fluid	A fluid injected into a well as part of a stimulation operation. Hydraulic fracturing fluids contain water and proppant, and gels, friction reducers, crosslinkers, breakers and surfactants similar to household cosmetics and cleaning products; these additives are selected for their capability to improve the results of the stimulation operation and the productivity of the well.
Hydrocarbon bearing zone	A zone that can produce sustained flows of hydrocarbons under a particular set of conditions imposed on it by a petroleum well. Levels of flow potential shall be assessed for the risk to people, or the environment.
Initial flowback stage	The initial flowback stage begins with the onset of flowback where the pressure is insufficient for the separator to function. The initial flowback stage ends when the gas flow increases to a point where the separator can function correctly.
Interest holder	A person who holds a petroleum interest for a regulated activity. In this instance EP136 Interest Holder is Sweetpea Petroleum Pty Ltd who is wholly owned by Tamboran Resources Ltd.
interfere with a waterway	means any of the following: a. cause a material change to the shape of a waterway b. cause a material change to the volume, speed or direction of the flow or likely flow of water in or into a waterway c. cause an alteration to the stability of the bed or banks of a waterway, including by the removal of vegetation d. cause a material change to the chemical or biological characteristics of a waterway or the water in a waterway.
Intermediate casing	The string of casing that may be set in a well after the surface casing and preceding production casing / liner.
Intervention or well intervention	An operation carried out by re-entering an existing well.
Kick	An unplanned entry of water, gas, oil or other formation fluid into the wellbore during drilling.
Kick tolerance	Maximum influx volume that can be circulated out of well without breaking down the weakest zone in well
Leak-off pressure	The magnitude of pressure exerted on a formation that causes fluid to be forced into the formation. The fluid may be flowing into the pore spaces of the rock or into cracks opened and propagated into the formation by the fluid pressure.

Definitions/Acronyms	Meaning
Leak-off test	Progressive wellbore formation pressure test until leak-off to provide well integrity information.
Liner	A casing string that does not extend to the top of the wellbore, but instead is anchored or suspended from inside the bottom of the previous casing string.
Liquid petroleum	Petroleum that is transported from a petroleum well to a processing facility in a liquid phase excluding associated water.
Low gas to oil ratio well	Wells with a Gas to Oil Ratio of less than 300 scf of gas per stock tank barrel of oil produced.
Low pressure well	Wells which produce oil or gas at an insufficient pressure to maintain flow.
mature trees and shrubs	means any tree with a trunk diameter of 25 centimetres or greater at 1.3 metres above ground, including Corymbia and Eucalypt species, as well as the stands of Bullwaddy and Lancewood.
Managed pressure drilling	An adaptive drilling process used to precisely control the annular pressure to be close to the pore pressure throughout the wellbore whilst drilling.
Mandatory requirements	These are requirements that that must be complied with by interest holders in carrying out the activities. The terms shall or must are used for mandatory requirements. These are requirements which: i. if a corresponding principle has been identified, are the minimum measures required to achieve the principle; and ii. if no corresponding principle has been identified, are otherwise required to be carried out.
Methane emissions	Methane emissions from petroleum operations include fugitive emissions, contained emissions (those occurring at combustion), and any possible influence on natural emissions or shallow gas held in subsurface strata.
Non-operational	Any time when there is not manned activity occurring on the site. A non-operational site may have the following: • Storage of drill cuttings and drilling fluids • Storage of Wastewater • The use of passive monitoring facilities.
Tank Pad	means the cleared area specific for the tank pad, which is largely similar to those for well pad without the requirement of a flare pit, cellar and sump. This includes the tank pad area, an external area of 20 m for soil stockpiling and a fire break around the perimeter and a 20 m managed vegetation zone. The cleared perimeter comprises an asset protection zone around the tank pad.
waterway	means any of the following: a. a river, waterhole, creek, stream or watercourse b. a natural channel in which water flows, whether or not the flow is continuous c. a channel formed wholly or partly by the alteration or relocation of a waterway described in paragraph (a) or (b) d. a lake, lagoon, swamp or marsh, whether formed by geomorphic processes or modified by works: i. in which water collects, whether or not the collection is continuous; and ii. into, through or out of which a current (which forms the flow or part of the flow of a river, creek, stream or watercourse) passes, whether or not that passage is continuous

Definitions/Acronyms	Meaning
	e. land which is intermittently covered by water from a waterway described in paragraph (a), (b), (c) or (d) f. shallow groundwater immediately underlying the bed or banks of a waterway g. groundwater meaning water occurring or obtained from below the surface of the ground (other than water contained in works, not being a bore, for the distribution, reticulation, transportation, storage or treatment of water or waste).
Well barrier element	A system of one or several well barrier elements that contain fluids within a well to prevent uncontrolled flow of fluids within or out of the well.
Well construction	Well construction includes the following phases • Planning and design • Drilling • Evaluation • Stimulation (hydraulic fracturing) • Well testing • Completion • Intervention and workover • Suspension • Decommissioning
Well control equipment	Includes the: • BOP stack • BOP control system • full open safety valves • circulating hose (and circulating head) • drill-string safety valves (inside BOPs) • mud and cement pumps • the choke lines • kill lines and manifold • mud gas separator • all associated pipework, connections, fittings and valves • drill through equipment • pressure storage systems (e.g. accumulators).
Wellhead	The casing head and includes any casing hanger or spool, or tubing hanger, and any flow control equipment up to and including the wing valves. The surface termination of a wellbore that incorporates a means of hanging the production tubing and installing the Christmas tree and surface flow-control facilities.
Well Integrity	Application of technical, operational and organizational solutions to reduce risk of uncontrolled release of formation fluids and well fluids throughout the life cycle of a well.
Well operating envelope	Limited range of parameters in which operations will result in safe and acceptable equipment performance.
Well Site/Well Pad	Refers to the cleared area specific to the individual well sites based on approx. 280 m x 260 m and varies with specific rig selection. The well pad is a compacted area for the drill rig to be located and includes flare pit, cellar and sump (nominal 180 m x 180 m) and an external perimeter area of 20 m width to cater for soil stockpiling and a firebreak. An additional 20 m buffer of managed vegetation will be established as an asset protection zone.
Wet season	The months of October to April inclusive.

Definitions/Acronyms	Meaning
Workover	Well procedure to perform one or more remedial or maintenance operations on a producing well to maintain or attempt production increase. Examples of workover operations are downhole pump repairs, well deepening, plugging back, pulling and resetting liners, squeeze cementing and re-perforating.

Table of Acronyms

Acronyms	Meaning
AA 9	Access Authority 9 (from DITT)
AAA	Approved Access Agreement
AAPA	Aboriginal Areas Protection Authority
ALRA	<i>Aboriginal Land Rights (Northern Territory) Act 1976</i>
AICS	Australian Inventory of Chemical Substances
ABS	Australian Bureau of Statistics
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ALA	Atlas of Living Australia
ALARP	As low as reasonably practicable
ANZECC	Australian and New Zealand Environment and Conservation Council
APPEA	Australian Petroleum Production and Exploration Association Limited
AS	Australian Standard
ASRIS	Australian Soil Resource Information System
ANRA	Australian Natural Resources Atlas
BoM	Bureau of Meteorology
BOP	Blowout Preventer
BTEX	A subset of volatile organic chemicals (VOCs) including benzene, toluene, ethylbenzene and xylenes
CBL	Cement Bond Log
CLA	Cambrian Limestone Aquifer
COP	Code of Practice (the <i>Code of Practice: Onshore Petroleum Activities in the NT. Version 2. May 2019</i>)
CPESC	Certified Professional in Erosion and Sediment Control
D&C	Drilling and Completions
DAWE	Department of Agriculture, Water and the Environment (Commonwealth)
DD	Data Deficient
DDR	Daily Drilling Report
DENR	Department of Environment and Natural Resources (NT) previous department name for DEPWS
DEPWS	Department of Environment, Parks and Water Security (NT)
DFIT	Diagnostic Fracture Injection Test
DIDO	Drive-in/Drive-out
DIPL	Department of Infrastructure Planning and Logistics
DITT	Department of Industry, Tourism and Trade (NT)
DIWA	Directory of Important Wetlands in Australia
DoEE	Department of Environment and Energy (Commonwealth)

Acronyms	Meaning
DOH	Department of Health (NT)
DPIR	Department of Primary Industries and Resource (NT) previous department name for DITT
DST	Well Drilling, Hydraulic Fracture Stimulation and Well Testing
EC	Electrical Conductivity
EIS	Environmental Impact Statement
EMP	Environment Management Plan
EO	Environmental Outcome
EPA	Environment Protection Authority (NT)
EP Act	<i>Environment Protection Act 2019</i> (NT)
EPS	Environmental Performance Standard
EP###	Exploration Permit (e.g. EP136)
EPBC	Environment Protection and Biodiversity Conservation
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cmwth)
EPS	Environmental Performance Standards
ERA	Environmental Risk Assessment
ESCP	Erosion and Sediment Control Plan
ESD	Ecological Sustainable Development
EVNT	Endangered, Vulnerable or Near Threatened
EWCRP	Emergency and Well Control Response Plan
FIFO	Fly-in/Fly-out
GDE	Groundwater Dependent Ecosystems
GHG	Greenhouse Gas
GIS	Geographic Information System
GISERA	Gas Industry Social and Environmental Research Alliance
GP	Gravel Pit
H ₂ S	Hydrogen Sulfide
ha	Hectare
HF	Hydraulic Fracturing
HFS	Hydraulic Fracture Stimulation
HI	Hazard Index
HPHT	High Pressure, High Temperature
HQ	Hazard Quotient
HSE	Health, Safety and Environment
HSEMS	Health, Safety and Environment Management System
HVFR	High Viscosity Friction Reducer
IADC	International Association of Drilling Contractors
IBA	Important Bird Area

Acronyms	Meaning
IECA	International Erosion Control Association
IMP	Integrity Management Plan
JV	Joint Venture
Kg	Kilograms
km	Kilometre
km ²	Square Kilometres
km/hr	Kilometre per hour
LAA	Land Access Agreement
LACA	Land Access and Compensation Agreement
LAG	Local Aboriginal Groups
LCA	Land Condition Assessment
LCG	Land Clearing Guidelines
LEL	Lower Explosive Limit
LoR	Level or Reporting/Limit of Reporting
LP	Lease Pad
L	Litres
L/s	Litres per second
LWD	Logging While Drilling
m	metre
mAHD	metres Australian Height Datum
MAASP	Maximum allowable annular surface pressure
MAOP	Maximum allowable operating pressure
mbgl	metres below ground level
MC	Measurement Criteria
MD	Measured Depth
MESP	Maximum expected surface pressure
ML	Megalitres
ML/y	Megalitres/year
mm	millimetres
MNES	Matters of National Environmental Significance
MoC	Management of Change
MPa	Mega pascals
mRT	Metres Rotary Table, referenced to the rotary table height of the original drilling rig, all waterbore geometry is measured in mRT.
mTOC	metres Top of Casing
NAFI	Northern Australian Fire Information
NALWTF	Northern Australian Land and Water Task Force
NWBPL	Near Wellbore Pressure Loss

Acronyms	Meaning
NEPM	National Environment Protection Measure
NLC	Northern Land Council
NPI	National Pollutant Inventory
NRM	Natural Resource Management
NT	Northern Territory
NTD	Native Title Determination
NT EPA	NT Environment Protection Authority (NT)
NTG	Northern Territory Government
NGERS	National Greenhouse Energy Reporting Scheme
NORM	Naturally Occurring Radioactive Material
NOx	Nitrogen Oxides
NSPS	New Source Performance Standards (US EPA)
NVIS	National Vegetation Information System
OEM	Original Equipment Manufacturer
OGI	Optical Gas Imager
OHS	Occupational Health and Safety
PBT	Persistent and Bioaccumulative and Toxic
PER	Petroleum Environment Regulations
pH	Index of acidity or alkalinity of water
PM ₁₀	Particulate matter 10 micrometres or less in diameter
PMST	Protected Matters Search Tool
PPE	Personal Protective Equipment
PPFG	Pore pressure and fracture gradient
PPL	Perpetual Pastoral Lease
PSI	Parts per square inch
PWCNT	Parks and Wildlife Commission Northern Territory
QC	Quality Control
RUSLE	Revised Universal Soil Loss Equation
RWA	Restricted Work Area
SDS	Safety Data Sheet
Sweetpea	Sweetpea Petroleum Pty Ltd
SPRP	Spill Prevention and Response Plan
SPU	Sewerage Processing Unit
SRTM	Shuttle Radar Topography Mission
TAGG	Transport Authorities Greenhouse Group
TARP	Trigger Action Response Plan
TIS	Traffic Impact Statement

Acronyms	Meaning
TMP	Traffic Management Plan
TO/TOs	Traditional Owner/Traditional Owners
TPWC Act	<i>Territory Parks and Wildlife Conservation Act 1976</i>
TVD	Total Vertical Depth
WMP	Weed Management Plan
WOMP	Well Operations Management Plan
WoNS	Weeds of National Significance
WWMP	Wastewater Management Plan

Executive Summary

Sweetpea Petroleum Pty Ltd (Sweetpea), is proposing to carry out onshore gas exploration in the Barkly Region, Northern Territory (NT), specifically the area delineated under Exploration Permit 136 (EP136) in the Beetaloo Sub-basin (Figure 1). Sweetpea are the Title Holder and Operator of EP136 and a fully owned subsidiary of Tamboran Resources Ltd (Tamboran).

Tamboran has identified the northern and southern parts of EP136 as potentially prospective areas for hydrocarbon exploration based on its regional evaluation and analysis of publicly available exploration datasets. The exploration activities in the northern area will comprise a seismic survey; civil works on well lease pads and access tracks, and the installation of groundwater monitoring bores, which are subject to previous environmental approvals. This EMP is related to the planned drilling, fracture-stimulation, well testing and related well activities of exploration wells within the northern part of EP136.

This Well Drilling, Hydraulic Fracture Stimulation and Well Testing (DST) Environment Management Plan (EMP) forms the basis of Sweetpea's application to the Northern Territory (NT) Minister for Environment. The EMP has been prepared with reference to clauses in the *Schedule of Onshore Petroleum Exploration and Production Requirements 2021*, the *Code of Practice: Onshore Petroleum Activities in the NT* (2019), Section 67 of the *NT Petroleum Act* (1984) and the *Petroleum Environment Regulations* (2016); and with reference to the Exploration Agreement between Sweetpea, Native Title Parties and the Northern Land Council (NLC) for Petroleum Exploration Permits 136 and 143 dated 18 July 2012; and with reference to Sweetpea's Title to EP136 granted on 28 August 2012 and the current title instrument dated 30 November 2021 describing the minimum work program commitments. . Sweetpea will extend the work program period to 2025 either through an approved renewal of the permit, or suspension of work program conditions for Years 4 and 5 and extension of term.

The well activities described in this EMP build upon Sweetpea's Seismic and Water Bore EMP (Seismic EMP – SWP1-04) and the Civil Construction and Water Bore EMP (C&WB EMP – SWP2-03). The Seismic EMP was approved by the Minister for Environment on 2 November 2020 and the C&WB EMP was approved on 12 January 2022.

The overall objective of this EMP is to provide comprehensive strategies to minimise environmental impacts and the risk of any inadvertent adverse outcomes resulting from Sweetpea's well drilling, hydraulic fracture-stimulation, well testing and associated activities in the Beetaloo Sub-basin. Specifically, the EMP aims to:

- provide a description of the well drilling, hydraulic fracture-stimulation, well testing and other associated well activities (**regulated well activity**) and civil construction activities (**regulated surface activity**)
- provide a description of site-specific aspects of the existing environment (physical, biological, socio-economic, and cultural)
- provide site-specific impact management strategies to minimise environment and heritage risks associated with its construction activities, including ongoing monitoring and post-activity rehabilitation measures as well as preventative measures
- be a practical and usable document, with environmental management principles that are accessible, implementable, and effective
- reduce environmental impacts and risks to a level that is as low as reasonably practicable (ALARP) and acceptable for the activities being undertaken
- ensure relevant regulatory requirements are addressed.

Regulated Well Activity Location

The regulated activities are located within Tanumbirini Station perpetual pastoral lease (PPL) (NT Portion (Por) 701) in the north of EP136. The activities within the DST EMP are for commencement of drilling, fracture-stimulation and well testing activities (**regulated well activity**) at up to seven lease pads.

Minimal new surface disturbance is planned under this EMP, with only 1.2 ha anticipated to expand the civils camp to a larger camp for the increased number of people required to support the activities in scope of this EMP.

The locations of the regulated activities are presented in Figure 1 and Figure 2. The geographical coordinates and disturbance footprint associated with this EMP are provided in Table 1 (inclusive of the seven exploration lease pads, the central accommodation camp and the access tracks).

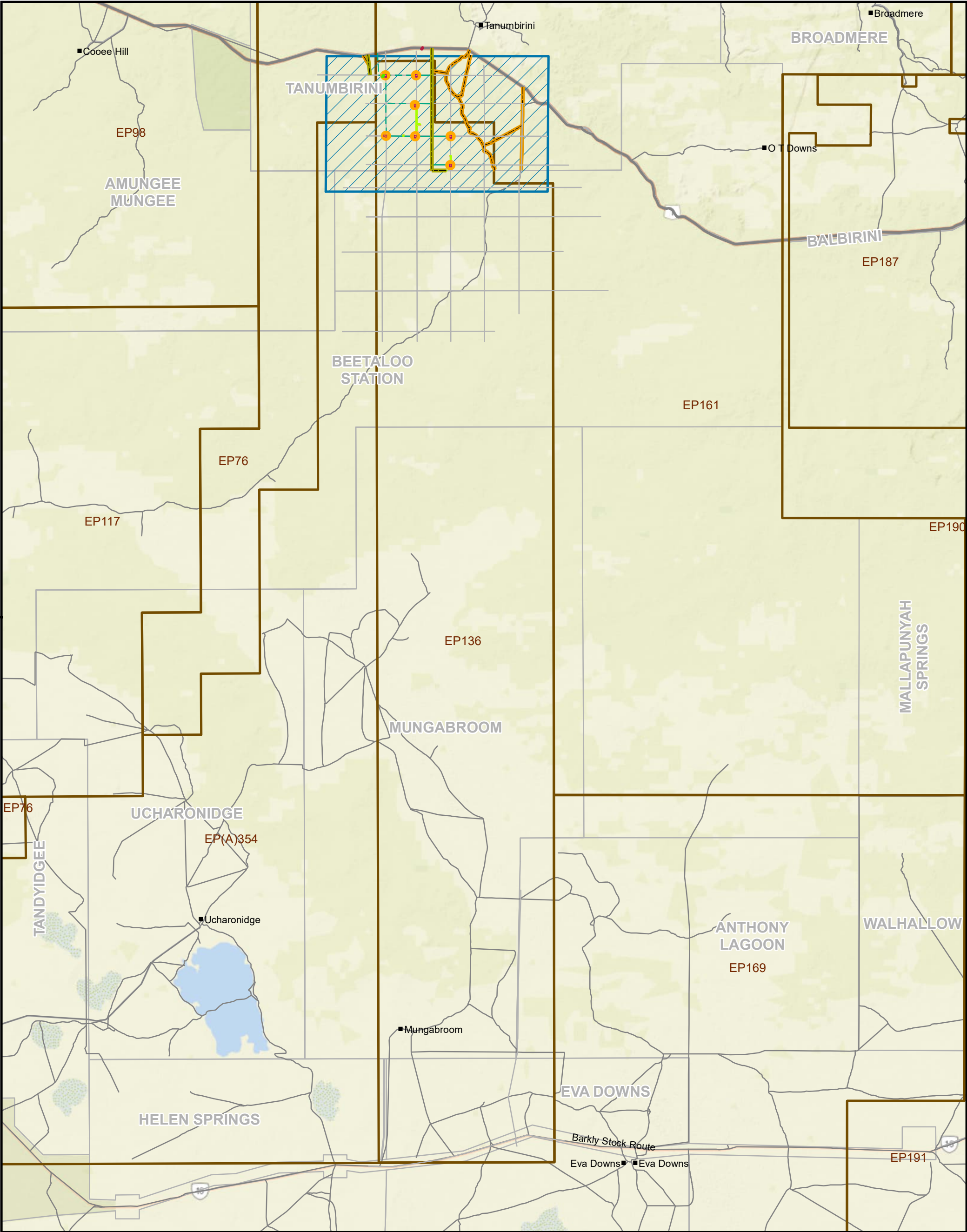
Table 1 Geographical Coordinates and Footprint of the Regulated Activities and Vegetation Clearing under this EMP

Infrastructure	Well Id or Site Id	Location Lat/Long	Access Track Length (km)	Entire Activity Footprint Area (Ha)	Vegetation Clearing under this EMP (Ha)
Lease Pad 1	Maverick T463 A1-1H	-16.517663°, 134.515147°	-	11.0	-
Lease Pad 2	Maverick T463 B2-1H	-16.517668°, 134.558468°	-	11.0	-
Lease Pad 3	Maverick T463 D3-1H	-16.558253°, 134.556614°	-	11.0	-
Lease Pad 4	Maverick T535 A4-1H	-16.600557°, 134.515315°	-	11.0	-
Lease Pad 5	Maverick T535 B5-1H	-16.600649°, 134.556760°	-	11.0	-
Lease Pad 6	Maverick T536 A6-1H	-16.600930°, 134.606624°	-	11.0	-
Lease Pad 7	Maverick T536 C7-1H	-16.639982°, 134.606535°	-	11.0	-
Main Camp Options	Highway Camp	-16.480922°, 134.565871°	-	2.5	1.2
	Lease Pad 1 Camp	-16.519364°, 134.510563°			
Gravel Pits (up to 10 gravel pits)			-	20.0	-
Option 1 - Lease Pad (LP) 'Eastern Access Track' (18m wide)*			38.26	67.74	-
Option 2 - Lease Pad (LP) 'Western Access Track' (18m wide)*			34.14	61.44	-
Gravel Pit (GP) Access Track (8m wide)			7.8	6.24	-
Total Disturbance Area Option 1 EAT			46.06	172.28	1.2
Total Disturbance Area Option 2 WAT			41.94	165.98	

* Access Track Options – updated based on the revised alignment as per C&WB EMP r22 Modification – new track option

Access to lease pads for the proposed regulated activity will be via access tracks constructed under the C&WB EMP (Figure 2).

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Projection: GDA 1994 MGA Zone 53

10 5 0 10 km

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Legend

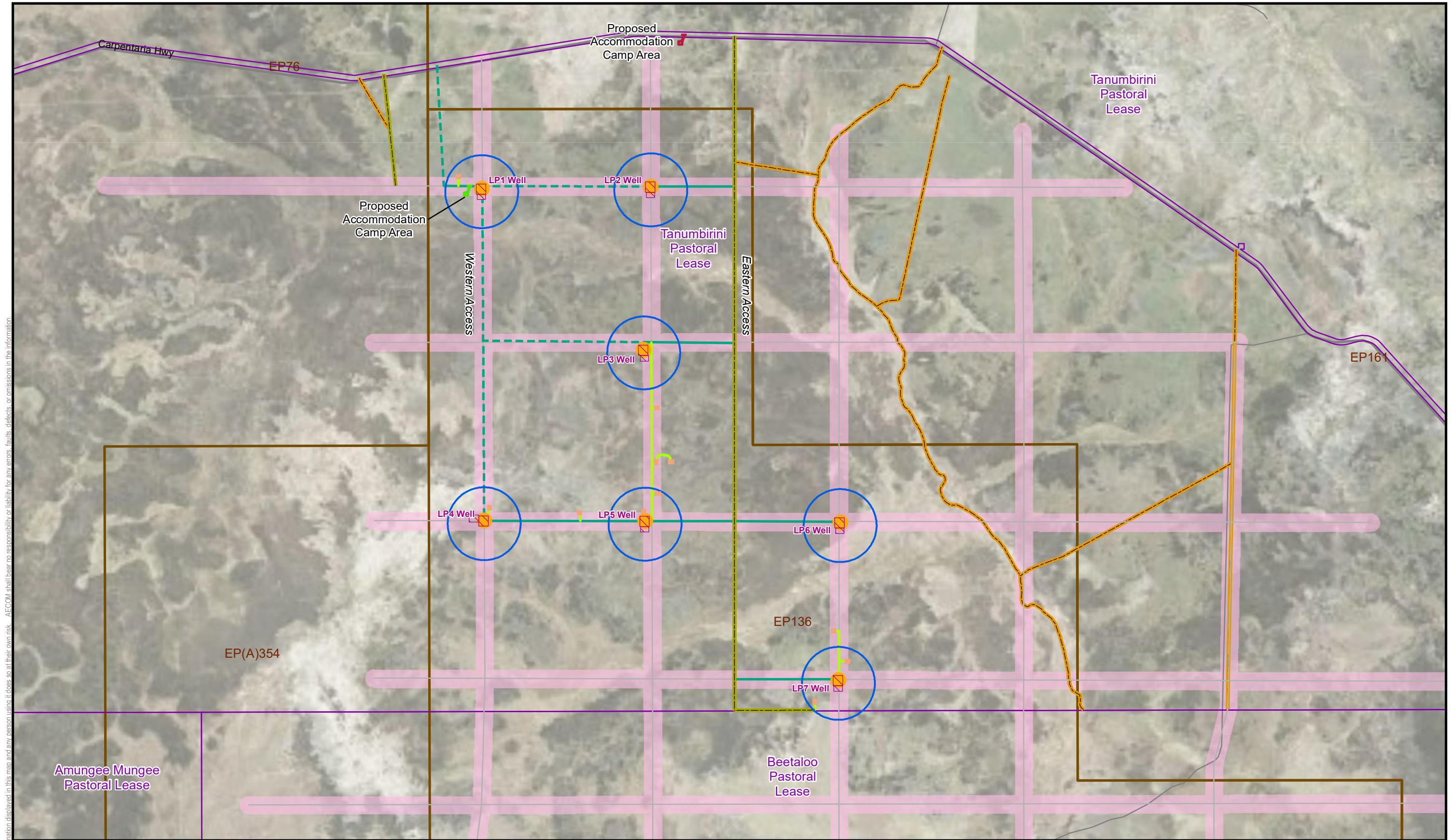
Well Site	Existing Access	Project Location
Gravel Pit Footprints	Gravel Pit Access	Petroleum Exploration Permit
Well Lease Area	Pastoral Track	
EP136 Proposed Accommodation Camp Option	Western Access Option Access	
Highway Proposed Accommodation Camp Option	Eastern Access Option Access	
	Seismic Lines - progressively rehabilitated	

Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

Sweetpea Petroleum Pty Ltd
Drilling, HFS and Testing EMP

Project Location

PROJECT ID	60611666	Figure 1
CREATED BY	prachi.kulkarni1	
LAST MODIFIED	12-Jul-2022	
VERSION	1	



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Projection: GDA 1994 MGA Zone 53

2 1 0 2 km

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- Well Site
- Existing Access
- Gravel Pit Access
- Western Access Option Access
- Eastern Access Option Access
- Seismic Lines - progressively rehabilitated
- Pastoral Track
- Highway

- Roads
- 250 m buffer to Seismic Line
- Gravel Pit Footprints
- Well Lease Area
- 1 km Bore Buffer
- EP136 Proposed Accommodation Camp Option
- Highway Proposed Accommodation Camp Option

- Native Title Register
- Petroleum Exploration Permit

Data sources:
Imagery: Digital Globe
Permit, Cadastre, Places, Bores - NT Gov 2019.
Pastora Infrastructure - AECOM 2020

**Sweetpea Petroleum Pty Ltd,
Drilling, HFS and Testing EMP**

**Location of Lease Pads, Gravel Pits,
Camp Pads, Seismic Lines and
Access Tracks**

PROJECT ID	60611666
CREATED BY	prachi.kulkarni1
LAST MODIFIED	12-Jul-2022
VERSION	1

Figure 2

A3 size

Regulated Activity Description

Sweetpea intend to conduct the regulated well activities and associated activities at seven exploration lease pads within the north of EP136 on Tanumbirini Station.

The exploration lease pads were assessed in the C&WB EMP and were sized to accommodate the placement of a drilling rig, provide an area for above-ground water holding ponds or tanks when required, and lay-down areas, turning areas, and day and main camps as required. In total, the design of the exploration lease pads requires an 11-ha area to support the drilling operations, including the provision of firebreaks to reduce the potential risk to infrastructure, as well as accommodate the water monitoring bore pads and other supporting activities.

The regulated activities to be carried out under this EMP include:

1. Increase the size of the camp approved under previous EMPs from 1.3 ha to 2.5 ha as per Table 1.
2. Exploration activities at up to seven well pads, including but not limited to the following:
 - i. Exploration well drilling and completions - vertically to 3,250m +/- 200m TVD and with a target measured depth range of horizontal wells from 4,100 m to 6,200 m (this would include a lateral section of between approximately 1,000 m and 3,000 m). It is noted that subsurface well paths will not go outside the EP136 boundary or enter any pastoral lease unless there is an access agreement in place.
 - ii. Multi-stage hydraulic fracture stimulation (horizontal wells and associated vertical wells), including water storage.
 - iii. Production testing and follow up testing, monitoring and work-over activities and management of wastewater.
 - iv. Routine and ongoing maintenance of any infrastructure and or services.
 - v. All activities associated with the plugging, abandonment, decommissioning and / or remediation of wells after testing and monitoring has been completed.
3. Any other minor works ancillary to the above-mentioned works.

Proposed Schedule

The regulated well activities including the associated activities are planned to commence in mid-2022 and proposed to be continued over a multi-year period (refer Section 3.1 for further details). Sweetpea propose to commence rig mobilisation from mid-2022 and commence the first exploration drilling activities around Q3 2022. Hydraulic fracture stimulation (HFS) activities will not commence until later in the year (following completion of mandatory baseline water monitoring), with well testing activity to follow directly after the completion of HFS activities and continue into 2023.

Sweetpea proposes to commence drilling a vertical pilot exploration well and horizontal exploration well on Lease Pad 1 (Maverick T463 A1-1H) in the northern area of EP136. Sweetpea plans to drill one vertical and horizontal well pair (i.e. a single well head) in 2022 and then continue the exploration drilling program in 2023, onwards, as outlined below. The timing of future drilling programs will be dependent on funding, timing of necessary approvals and schedule. Each well is estimated to take up to 70 days to drill, up to approximately 30 days for HFS, followed by well testing over 30-90 days. However, approval is sought for the possibility of testing up to 300 days if well testing data are ambiguous and a greater volume of data are required to inform future exploration and appraisal activities, this is considered more likely on earlier wells in this seven-well exploration program. HFS and well testing of Maverick T463 A1-1H on Lease Pad 1 the drilled well could occur in late 2022 or early 2023 pending timing of rig release, approvals and baseline water monitoring, and other necessary preparations.

A high-level, indicative activity schedule for drilling, fracture stimulation and testing operations, is summarised below (note that some steps occur in parallel not in sequence); testing and well maintenance activity is assumed to be ongoing throughout the period once wells are brought online for testing. The priority and order of wells and lease pads may be varied pending operational readiness, access feedback from stakeholders, and/or exploration results, however, there will be no change to the risk assessment and/or impact as a result of such schedule variations and Sweetpea will provide updates to the Department of Environment, Park and Water Security (DEPWS), Department of Industry, Tourism and Trade (DITT) and any impacted stakeholders.

- **May – ~December 2022:** Well 1 “Maverick T463 A1-1H” planned at Lease Pad 1.
 - a. Mobilise drilling rig and associated facilities to Lease Pad 1 pending readiness and other prioritisation factors (well name and exact Lease Pad will be advised to DITT and DEPWS prior to spud).
 - b. Mobilise and construct camp as needed at “Well 1” or one of the main camp locations at Highway Camp or Lease Pad 1 Camp.
 - c. Progressively mobilise and fill water tanks as needed.
 - d. Drill vertical pilot hole at “Well 1” to a prognosed total depth of approximately 2,500-3,500 m.
 - e. Prepare well for horizontal drilling as per Sweetpea’s Well Operations Management Plan (WOMP) by cementing deepest section of the pilot hole and setting a kick-off plug or whip-stock.
 - f. Drill, case and cement horizontal well and test as required under WOMP to confirm well acceptance criteria are met.
 - g. Mobilise hydraulic fracture stimulation and testing spread and other necessary equipment progressively to “Well 1”.
 - h. Undertake multi-stage hydraulic fracture stimulation operations and commence testing operations at “Well 1” (not to commence until water monitoring requirements are met).
 - i. Demobilise and/or stack drilling rig and hydraulic fracture stimulation spread and equipment for wet season.
- **April – December 2023:** Well 2 to Well 4 planned at Lease Pad 3 “Maverick T463 D3-1H”, and Lease Pad 4 “Maverick T535 A4-1H” and Lease Pad 6 “Maverick T536 A6-1H”, or Pad 5 “Maverick T535 B5-1H” or Pad 7 “Maverick T536 C7-1H”
 - a. Mobilise drilling rig and associated facilities to Well 2 pending readiness and other prioritisation factors.
 - b. Progressively mobilise and fill water tanks as needed.
 - c. Drill vertical pilot hole at Well 2 to a prognosed total depth of approximately 2,500-3,500 m.
 - d. Prepare well for horizontal drilling as per Sweetpea’s (WOMP) by cementing deepest section of the pilot hole and setting a kick-off plug or whip-stock.
 - e. Drill, case and cement horizontal well and test as required under WOMP to confirm well acceptance criteria are met.
 - f. Mobilise rig and other necessary equipment and material to “Well 3” and repeat steps (b) to (e).
 - g. Mobilise rig and other necessary equipment and material to “Well 4” and repeat steps (b) to (e).
 - h. Mobilise hydraulic fracture stimulation and testing spread and other necessary equipment progressively to “Well 2”.
 - i. Undertake multi-stage hydraulic fracture stimulation operations and commence testing operations at “Well 2”.

- j. Mobilise hydraulic fracture stimulation and testing spread and other necessary equipment progressively to “Well 3”
- k. Undertake multi-stage hydraulic fracture stimulation operations and commence testing operations at “Well 3”.
- l. Mobilise hydraulic fracture stimulation and testing spread and other necessary equipment progressively to “Well 4”.
- m. Undertake multi-stage hydraulic fracture stimulation operations and commence testing operations at “Well 4”.
- n. Demobilise and/or stack drilling rig and hydraulic fracture stimulation spread and equipment for wet season.
- **April – December 2024**, and thereafter: Well 5 to 7 planned at Lease Pad 5 “Maverick T535 B5-1H”, and/or Lease Pad 7 “Maverick T536 C7-1H” and/or Lease Pad 2 “Maverick T463 B2-1H”
 - a. Mobilise drilling rig and associated facilities to “Well 5” pending readiness and other prioritisation factors.
 - b. Mobilise and construct camp as needed at “Well 5” or one of the main camp locations at Highway Camp or Lease Pad 1 Camp.
 - c. Progressively mobilise and fill water tanks as needed.
 - d. Drill vertical pilot hole at “Well 5” to a prognosed total depth of approximately 2,500-3,500 m.
 - e. Prepare well for horizontal drilling as per WOMP by cementing deepest section of the pilot hole and setting a kick-off plug or whip-stock.
 - f. Drill, case and cement horizontal well and test as required under WOMP to confirm well acceptance criteria are met.
 - g. Mobilise rig and other necessary equipment and material to “Well 6” and repeat steps (c) to (f).
 - h. Mobilise rig and other necessary equipment and material to “Well 7” and repeat steps (c) to (f).
 - i. Mobilise hydraulic fracture stimulation and testing spread and other necessary equipment progressively to “Well 5”.
 - j. Undertake multi-stage hydraulic fracture stimulation operations and commence testing operations at “Well 5”.
 - k. Mobilise hydraulic fracture stimulation and testing spread and other necessary equipment progressively to “Well 6”.
 - l. Undertake multi-stage hydraulic fracture stimulation operations and commence testing operations at “Well 6”.
 - m. Mobilise hydraulic fracture stimulation and testing spread and other necessary equipment progressively to “Well 7”.
 - n. Undertake multi-stage hydraulic fracture stimulation operations and commence testing operations at “Well 7”.
 - o. Demobilise and/or stack drilling rig and hydraulic fracture stimulation spread and equipment for wet season.
 - p. Ongoing well testing operations, maintenance, workover and ancillary activity as required.

Mobilisation in the above assumes access via either the Western Access Track (WAT) or Eastern Access Track (EAT) as per the C&WB EMP. Both EAT and WAT provide for dry-season access with no further works that aren't sanctioned under a granted Sacred Site Clearance Certificate (SSCC). However, wet weather use of the EAT is assumed to require a new Sacred Site Clearance Certificate, this will not be needed in 2022 as Well 1 is located on north of Newcastle Creek and accessed via the first section of the WAT. If neither a new SSCC nor access to the WAT is available in 2023 and beyond then Sweetpea may have to stack equipment south of Newcastle Creek or move all equipment north of Newcastle Creek prior to wet weather and alter the operational priority. This approach mitigates the risk of not being able to do works, other than transit, of the Newcastle Creek crossing within RWA2.

Sweetpea will implement their wet weather contingency plan as detailed Appendix B should exploration activities continue past 1 October of each year.

Sacred Site Clearance Certificate

Sweetpea were issued an Aboriginal Areas Protection Authority (AAPA) Certificate for activities authorised by the *Petroleum Act 1984 (NT)* for petroleum exploration (reference RA2020/14-C2020/072)(AC2020/072).

AC2020/072 was issued following AAPA completing research and conducting meetings in June and July 2020, engaging with senior people in Katherine, Mataranka, Minyerri, Marlinja and Elliott about Sacred Sites and the works proposed by Sweetpea. The AAPA researcher confirmed what Sacred Sites are in the area and who has knowledge about the Sacred Sites that may need protection.

On-country field surveys were completed with knowledgeable people, using 4WD vehicles and a helicopter. The field surveys focused on confirming the locations of Sacred Sites within the EP and recording the wishes of senior people about how the sites can be protected.

AC2020/072 allows all drilling, hydraulic fracture stimulation and well testing activity proposed under this EMP. AAPA have raised, formally, a more recent desire to undertake further consultation regarding water extraction from water bores covered under AC2020/072, however, although we support AAPA's ongoing consultation we would say it is not required for approval of this EMP as:

1. The conditions of AC2020/072 already require the protection of sacred sites associated with water holes in the Newcastle Creek region;
2. The Civils & Water Bore EMP is already approved and approves the use of greater than 100 ML of water extracted under the approved Water Extraction Licence (GRF10346); and
3. The NLC have confirmed that consultation with custodians regarding the proposed exploration and appraisal program has been completed as per the relevant Exploration Agreement.

Sweetpea agree entirely with AAPA that the key objective is the protection of identified sacred sites and has consulted with governmental and independent third-party hydrogeological experts to confirm that within the bounds of scientific certainty there is no connection between the Cambrian Limestone Aquifers (where water is proposed to be extracted from) at depths greater than 60 m and the ephemeral springs and shallow, seasonal aquifer systems. Sweetpea has contracted an independent study, at arm's length, that will be provided to AAPA and any other interested stakeholders. Further detail regarding the accepted interpretation of the hydrogeology of the Newcastle Creek water holes is included in Section 4.1.5.5.

One limitation of AC2020/072 is that it allows for 'transit only' across the existing pastoral lease track at its intersection with Newcastle Creek in Restricted Work Area 2 (RWA2) - we say limitation in this instance as there is an existing pastoral track across the creek in this location and we would propose only to maintain this crossing and minimise the risk of any damage to the creek bed or banks through erosion or other impacts. Given the works would be within the existing 'easement' created by the pastoral track we see no possibility of impacts to sacred sites (and no sacred sites are noted at the crossing). We are simply seeking approval to do routine maintenance and/or minor upgrades to improve the standard of the track and protect the existing environment.

Sweetpea have been engaged with AAPA throughout 2021 to seek authority to undertake these minor works at this crossing to ensure it is suitable for use during wet weather, however, due to COVID19 and other operational delays the custodian consultation will now occur in early 2022. Sweetpea's contingency plan to the 'transit only' limitation is two-fold as discussed in the Proposed Schedule section above. Sweetpea are committed to meeting the conditions specified in the AAPA certificate to ensure risks to sacred sites and the identified Restricted Work Area are managed.

Existing Environmental Factors

The northern exploration area is typically dominated by *Corymbia* and *Eucalyptus* woodlands and tall shrublands and woodlands of Bullwaddy (*Macropteranthes kekwickii*) and Lancewood (*Acacia shirleyi*) with open grassland understorey. On alluvial plains and in drainage areas *Eucalyptus chlorophylla*, *E. microtheca* and *E. pruinosa* low woodlands occur, while on the plains *Corymbia dichromophloia* and *C. terminalis* open woodlands are more dominant.

A search of the Department of Agriculture, Water and the Environment (DAWE) Protected Matters database on Matters of National Environmental Significance (MNES), the NT Government natural resource database, and records from the Atlas of Living Australia (ALA) was undertaken for the exploration area with a 10 km buffer applied. No threatened vegetation communities are listed as likely to occur within the area.

A land condition assessment (LCA) and cultural heritage assessment were completed in November 2019 and again in May 2020 by AECOM Australia Pty Ltd (AECOM) scientist and heritage consultants. The LCA identified the ecological conditions and documented the exploration area prior to Sweetpea commencing exploration activities. A copy of the Land Condition Assessment report and the Heritage Assessment Report have been published on the DEPWS Approved Environment Management Plans (EMP) for the exploration areas. A summary of these reports are presented in Section 4.0 of this EMP.

The information obtained during field surveys have provided a benchmark of land condition that at completion will be the target for rehabilitation success. The heritage assessment also identified the surface expression of Aboriginal archaeology and potential cultural heritage values within or near the proposed activity footprint that will require specific management measure and controls to minimise impacts.

Weeds were not detected within the area during the land condition assessment survey. A population of Hyptis (Class B – spread to be controlled) was identified to a creek system situated on the eastern side of the exploration area and does not occur within the planned exploration area at this stage.

The anticipated environmental factors have been assessed through the course of the EMP preparation. The environmental risks associated with the drilling, hydraulic fracture stimulation and testing activities program have been identified in a thorough hazard identification and risk assessment process applied for the suite of exploration activities described above. The LCA and heritage survey informed the risk assessment process and mitigations required to manage risk to the environment.

The overall impacts of the proposed exploration activities to environmental, heritage and social factors, including Native Title Parties and the pastoral operations in the permit area is considered low due to the project controls specified in this EMP. The environmental, heritage and social factors will be managed through the implementation of a range of tried and tested mitigation measures that reduce the risk of environmental harm and impacts to as low as reasonably practicable (ALARP) and are considered acceptable.

Environmental Impacts and Inherent Risks

An environmental risk assessment was undertaken for this EMP. The impact causing activities and their relative likelihood of occurrence are presented in Table 2. The inherent risk assessment results are based on the proposed exploration activities and the timescale for land disturbance. The full risk assessment for the activities is presented in Section 6.0 of the EMP and Appendix A.

Table 2 Exploration Activity Inherent Risk Assessment Results

Activity	Environmental Factors										
	Disturbance							Pollution			
	Land / Waterways	Bushfire	Flora, Vegetation & Weeds	Groundwater	Fauna & Habitat	Cultural Heritage & Sacred Sites	People and Communities	Soil & Surface Water	Air Quality & Emissions	Groundwater	Noise, Vibration and Lighting
Main Camp and Fly Camp Operations	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Access - Creek Crossing - All Weather Access	Medium	Low	Medium	Low	Medium	Medium	Medium	Low	Low	Low	Low
Access – ongoing maintenance	Medium	Medium	Low	Low	Low	Low	Low	Low	Low	Low	Low
Lease Pad Operations	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
Groundwater extraction/use	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low
DST Operations	Low	Low	Low	Low	Low	Low	Low	Low	Medium	Medium	Low
Wastewater Management	Low	Low	Low	Low	Low	Low	Low	Medium	Low	Medium	Low
Wet Weather Operation & Maintenance	Medium	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low

The EMP has assessed that the regulated well activity and associated activities pose an acceptable risk through the implementation of control measures that allow all risks to be reduced to ALARP.

Nonetheless, ALARP is not a final position over the life of the regulated activity. Ongoing monitoring will allow for the discovery of new mitigation measures that could be implemented.

Key environmental risk mitigation areas covered in the DST EMP include:

- Protection of aquifers
- Management of the supply of groundwater for exploration activities in a sustainable manner
- Management of well operations, including flaring activities, to minimise potential for bushfires as result of activities
- Management of flowback activities to minimise the release of gas to the atmosphere
- Management of hydraulic fluids and chemicals to ensure no contact with aquifers or soil or soil substrate or natural water ways (i.e. Newcastle Creek)
- Management of waste and wastewater, including prevention of spills
- Mitigating the introduction and spread of weeds
- Sacred sites and cultural heritage protected.

The DST EMP also considers the annual onset of the wet season and have developed a wet weather contingency plan to minimise the regulated activities impact on the environment. Further details of wet weather contingencies have been considered in Section 7.3 and Appendix B. It should be noted that the above assessments are not intended to be assessments of impacts on pastoral business; whereas there are established protocols to assess environmental impacts and risks, assessing the impacts to a pastoral business is much more difficult and requires in depth understanding of that business. In this EMP measures to protect the environment are clearly articulated, however, specific measures to minimise impacts on pastoral business will require ongoing and future engagement with the pastoralist to understand their business activities at the time of proposed exploration activities. Sweetpea is committed to continuing to attempt such constructive engagement.

Environmental Outcomes

Overall Sweetpea will manage impacts through a range of best practice measures as described in the *Schedule of Onshore Petroleum Exploration and Production Requirements 2021* and the *Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019)* (also referred to as the Code).

Under the *Environment Protection Act 2019*, proposed projects that may have a significant effect on the environment are to be referred to the Northern Territory Environment Protection Authority (NT EPA) for assessment. Sweetpea have conducted a self-assessment using the pre-referral screening tool provided in Appendix 1 of the NT EPA Guideline *Referring a Proposal to the NT EPA Version 1.0*, dated 6 January 2021. The assessment was completed by appropriately qualified environmental consultant AECOM Australia Pty Ltd and is based on the consideration of the potential significant impacts of the activities on the indicative environmental values and sensitivities relevant for each of the NT EPA's environmental factors and objectives.

Based on the self-assessment, Sweetpea is of the view that the activities covered by this EMP do not trigger referral to the NT EPA under the *Environment Protection Act 2019*.

The environmental outcomes, environmental performance standards and measurement criteria for the planned regulated activities are outlined in the issue specific EMPs. The issue specific EMPs have been developed based on the results of the risk assessment as follows:

- groundwater (Section 7.2)
- land and surface water management (includes waterways, soil, erosion and sediment control measures) (Section 7.3)
- weeds (Section 7.4)
- bushfire (Section 7.5)
- waste and wastewater (Section 7.6 and Appendix F)
- spill prevention and response (Section Appendix G)
- noise, vibration and lighting emissions (Section 7.7)
- air quality and emissions (Section 7.8 and Appendix E)
- biodiversity management (Section 7.9)
- social environment and access (Section 7.10)
- cultural heritage and Sacred Sites (Section 7.11).

An Implementation Strategy is included which integrates with Sweetpea's systems and policies, specifically its Health, Safety and Environment Management System (HSEMS). As such, this EMP integrates into this wider system, specifically related to the following extant Sweetpea procedures:

- Well Operation Management Plan (WOMP)
- weed management
- refuelling procedures
- wastewater transfer procedures

- procedures for avoidance of potential fauna habitat and any identified heritage sites
- process for rehabilitation.

In addition, induction requirements, reporting requirements, incident management, environmental monitoring, auditing and review procedures are presented in the Implementation Strategy.

Chemical Risk Assessment

A chemical risk assessment (CRA) has been completed for all chemicals proposed to be used in the Hydraulic Fracturing process (as at the 29 April 2022). The CRA used a tiered assessment on the compiled hydraulic fracturing fluid systems proposed by screening of the potential human health and ecological hazards that should be considered for potential exposure to the hydraulic fracturing fluids during transportation, hydraulic fracturing activities (including storage), and subsequent treatment and disposal of flowback. It is noted that should changes/optimisation of the recipes over the course of the exploration program, the CRA will be updated.

The tiered assessment includes the following steps:

- Tier 1 – Identify chemicals of low human health and ecological concern that do not require additional chemical risk assessment in the tier assessment process.
- Tier 2 – Chemicals that are not identified as a low human health and ecological concern and therefore require an additional risk assessment to characterise potential risks. This is done using a quantitative evaluation of the risks based on the potential complete exposure pathways and Tier 1 assessment.

The human health and ecological hazard mitigation information provided in the chemical risk assessment dossiers and SDSs primarily focuses on safe handling, transportation and worker protection.

The assessment considered the Persistent *and* Bioaccumulative *and* Toxic (PBT) chemicals consistent with Australian risk assessment methodologies, if the hazard quotient (HQ) is less than or equal to 1, then no adverse health effects are likely associated with exposures. However, if the total hazard index (HI) is greater than 1, adverse health effects may be possible and therefore the assumptions inherent in the risk characterisation process warrant further evaluation. All chemicals assessed were below 1 meaning no further evaluation required and the risks are considered to be low and acceptable. This list of chemicals, as well as the result of the assessment is provided in Appendix C.

Sweetpea aligns its transport, storage and handling of hazardous chemicals with WHS Regulations, including all obligations and duties for storage and handling of hazardous chemicals and eliminating risks to workers from potential exposure and the potential requirements for health monitoring.

Regulated Activity Stakeholders

Sweetpea commenced consultation in July 2019 with key stakeholders that will be directly affected by the environmental impacts or environmental risks associated with the proposed exploration work program activities. Sweetpea have informed stakeholders of the intended program over the course of the EMP development. The identified stakeholders specific to this EMP include:

- The perpetual pastoral lease owner and their delegates for Tanumbirini Station on whose property the activities are proposed.
- The Traditional Owners (TOs) and Aboriginal People facilitated through the Northern Land Council (NLC) and the Aboriginal Areas Protection Authority as part of the AAPA clearance process.
- Gas pipeline operator, OSD Pipelines, where Sweetpea will require works approval to allow DST equipment to cross over the underground McArthur River Mine (MRM) pipeline.
- Northern Territory Government (NTG) departments including the Transport and Civil Services Division of Department of Infrastructure Planning and Logistics (DIPL) for access to road corridor permits and if intend to extract from NTG road bores, Department of Industry, Tourism and Trade (DITT) for the access authority to the neighbouring permit currently under application to the west (EP(A)354) and Department of Environment, Parks and Water Security (DEPWS) Water Resource Division in relation to groundwater monitoring requirements and water extraction.

Sweetpea's engagement process varies by stakeholder and depends on the receptiveness and preferences of the stakeholder; ideally it involves engaging stakeholders regarding the location and scope of proposed activities and their impacts, building relationships, sharing information, and bringing stakeholder voices into decisions in the ongoing planning and development. This ideal process allows for any specific issues that are identified by a stakeholder to be considered and addressed. The regulations, however, do not require two-way engagement necessarily, they do require that "...During the preparation of..." an EMP an interest holder must give stakeholders information about the proposed activity, and the location(s), "...anticipated environmental impacts and environmental risks...", and "...the proposed environmental outcomes..." of those activities.

Sweetpea withdrew an earlier EMP (SWP3-1) in March 2022 on the basis that there was not agreement from a key stakeholder that providing information in parallel to NT Government agency assessment process was acceptable and met the Petroleum (Environment) Regulations. Sweetpea withdrew the EMP in the interests of improving the working relationship with the particular stakeholder in question, and to decrease the risk of Judicial Review of an EMP approval. Sweetpea maintain that the provision of information in parallel to the extensive NT Government assessment process is in keeping with the intent and letter of the Petroleum (Environment) Regulations, given that the EMP remains "...in preparation..." up until all the formal feedback from DEPWS, the NT EPA, and other NT Government agencies is incorporated into a final EMP that is capable of submission to the Minister for approval. Regardless of Sweetpea's view, the EMP was withdrawn and this EMP is submitted to seek approval for the proposed exploration and appraisal program covered herein.

Sweetpea recognise there is always room for improving mutual understanding of pastoral business and exploration activities, and endeavour to actively engage and listen to stakeholder concerns and work to address those concerns. Sweetpea recognises that there will likely be some impact on pastoral business in the process of undertaking exploration activities; compensation for impacts is required and is best managed through negotiated or determined access agreements. Sweetpea will engage experts and seek guidance from pastoralists on how impacts can be avoided or minimised,

Sweetpea will continue to engage with the key stakeholders as the program progresses and results are obtained, and further stakeholders may be identified and will be engaged with as required. Sweetpea have maintained records of all interactions and communications with relevant stakeholders and will continue to do so over the life of the proposed exploration activities.

Current and Future Stakeholder Engagement

Community and stakeholder engagement is a fundamental obligation of Sweetpea in relation to the proposed work programs within EP136. Sweetpea's stakeholder and community engagement for the exploration program commenced in mid-July 2019 with the pastoral leaseholders on whose land the activities occur (and their delegates) and the NLC, who represent the Traditional Owners and Aboriginal People on whom the activities may impact. This engagement has continued over the course of the development of multiple EMPs, including arrangements with the station managers for the safe conduct of baseline investigations during November 2019, May 2019 and again in November 2020.

Sweetpea has endeavoured to clearly communicate to all interested parties via telephone calls, emails and face-to-face meetings wherever possible. The COVID-19 Pandemic did have some impact on the stakeholder engagement process which resulted in delays to additional AAPA on-country consultation and surveys, as well as the work program meetings with Traditional Owners facilitated by the NLC in accordance with the Exploration Agreement for EP136.

The following summarises AAPA and NLC consultations conducted for all of Sweetpea's intended exploration activities:

- AAPA Sacred Site Clearance:
 - Sweetpea applied for an AAPA Authority Certificate for EP136 in February 2020.
 - Minor modifications to activity and survey area following delays due to COVID-19 in May 2020.

- AAPA Anthropologist conducted meetings in June 2020, speaking to senior people in Katherine, Mataranka, Minyerri, Marlinja and Elliott about Sacred Sites and the works proposed by Sweetpea. The AAPA researcher confirmed what Sacred Sites are in the area and who has knowledge about the Sacred Sites that may need protection.
- In July 2020, AAPA followed up with an on-country field survey with knowledgeable people, using 4wd vehicles and a helicopter. The field survey focused on confirming where the Sacred Sites are and recording the wishes of senior people about how the sites can be protected.
- Authority Certificate issued for Sweetpea to conduct planned activities (reference RA2020/14-C2020/072).
- Sweetpea currently have two applications in progress with AAPA:
 - A relatively limited scope application to undertake minor works at the intersection of the existing pastoral track and Newcastle Creek (as discussed above) and to revisit water extraction (which is included in the application at the direction of AAPA and is also discussed above), and
 - A broader scope application that covers activities beyond the seven exploration wells and associated activities covered under AC2020/072 (Sweetpea have initiated this application well in advance of it being strictly required for any near-term EMP approvals to ensure that there is sufficient time for consultation and to manage future EMP submissions and stakeholder engagement).
- Northern Land Council work program meetings:
 - Under the Exploration Agreement between Sweetpea and the host Traditional Owners and NLC, Sweetpea are required to undertake work program meetings for each year's proposed activities.
 - Sweetpea have completed two Work Program Meetings facilitated by the NLC in August 2020 and in October 2021.
 - The 2020/2021 Work Program Meeting was held between 10 August and 14 August 2020 at Tennant Creek, Elliott and Mataranka which covered Sweetpea's intended exploration program over the next 5 years. A focus of this meeting was on seismic program, but also covered water bore drilling and monitoring and future exploration drilling.
 - The 2021/2022 Work Program Meeting was held between 27 October and 29 October 2021 at Katherine, Elliott and Tennant Creek.
 - The NLC facilitate the work program meetings and make arrangements for the appropriate Traditional Owners to attend. During 2020, ~60 Traditional Owners were in attendance over the four days, with similar numbers in 2021.
 - Work program meetings will continue over the duration of Sweetpea's exploration program to provide updates to the Traditional Owners.
 - Other meetings regarding the completion of an AA9 application have also occurred over the period of engagement regarding proposed work program (that AA9 is now circulating for execution having been fully agreed and endorsed at an early 2022 meeting of the relevant Prescribed Body Corporate).

At the beginning of January 2021, Sweetpea provided a proposed Work Program schedule for 2021 to all the EP136 Pastoral Leaseholders. The details of the subsequent and ongoing engagement with Tanumbirini Station (Rallen Australia) are included in Appendix D, the engagement with Rallen ultimately resulted in unsuccessful attempts to negotiate a LACA (or Access Agreement) and the parties entered into Alternative Dispute Resolution and then Northern Territory Civil and Administrative Tribunal (NTCAT) proceedings in accordance with relevant sections of the *Petroleum Act 1984* and the *Petroleum Regulations 2020*. The NTCAT proceedings were completed on 4 May 2022 when the NTCAT issued orders and determined an Approved Access Agreement (AAA).

Sweetpea is committed to attempting to keep open lines of communications with the Tanumbirini leaseholder throughout the program, however, actual communications frequency and method will be primarily a function of the pastoral leaseholder's preferences and directions.

Further details of the Stakeholder Engagement is presented in Section 5.0 and Appendix D of this EMP.

1.0 Introduction

1.1 Background

Sweetpea Petroleum Pty Ltd ("Sweetpea"), the Native Title Parties and the Northern Land Council ("NLC") are parties to the Exploration Agreement for Petroleum Exploration Permit 136 ("EP136") dated 18 July 2012 ("Exploration Agreement"). Sweetpea are the Title Holder and Operator of EP136 and are fully owned subsidiary of Tamboran Resources Ltd. (Tamboran) with a 100% interest in EP136 in the Beetaloo Sub-basin (Figure 3).

Sweetpea has identified the northern and southern parts of EP136 as potentially prospective areas for hydrocarbon exploration based on its regional evaluation and analysis of publicly available exploration datasets. Proposed exploration activities in the northern area include a seismic survey; civil works on well lease pads and access tracks, and the installation of groundwater monitoring bores which are each subject to previous environmental approvals. This EMP is related to the planned drilling, hydraulic fracture-stimulation (HFS), well testing and related well activities for exploration wells within the northern part of EP136.

Sweetpea was granted title to EP136 on 28 August 2012 and the Current Instrument setting out the permit term and minimum work program requirements is dated 30 November 2021. In current Permit Year 4 (ending 27 August 2022) Sweetpea is required to carry out at least the minimum of 60 km 2D seismic survey and drill one vertical exploration well. In Permit Year 5 (ending 27 August 2023) the minimum work program requires Sweetpea to enter a vertical exploration well, side-track, drill a horizontal well, conduct hydraulic fracturing, complete and test; and an assessment of petroleum resource potential. Sweetpea will extend the work program period to 2025 either through an approved renewal of the permit, or suspension of work program conditions for Years 4 and 5 and extension of term.

Sweetpea's planned 2022 Exploration Work Program includes commencement of the 2D seismic survey, the civil construction of up to seven exploration lease pads and their associated access tracks, gravel pits and groundwater monitoring bores in preparation for well drilling, HFS and well testing activities within the northern part of EP136.

The well activities described in this EMP build upon Sweetpea's Seismic and Water Bore EMP (Seismic EMP – SWP1-04) and the Civil Construction and Water Bore EMP (C&WB EMP – SWP2-03). The Seismic EMP was approved by the Minister for Environment on 2 November 2020 and the C&WB EMP was approved on 12 January 2022.

The location for well drilling, HFS and well testing activities planned is shown in Figure 4. These activities will be carried out on the Tanumbirini Station perpetual pastoral lease (PPL).

This Well Drilling, Hydraulic Fracture-Stimulation and Well Testing Environment Management Plan (DST EMP) forms the basis of Sweetpea's application to the Northern Territory (NT) Minister for Environment for the proposed exploration drilling, stimulation and testing program. The EMP has been prepared with reference to clauses in the *Schedule of Onshore Petroleum Exploration and Production Requirements 2021*, the *Onshore Petroleum Activities in the NT Code of Practice* (2019), Section 58 of the *NT Petroleum Act* (1984) and the *Petroleum Environment Regulations* (2016) and Exploration Agreements between Sweetpea, Native Title Holders and the Northern Land Council (NLC).

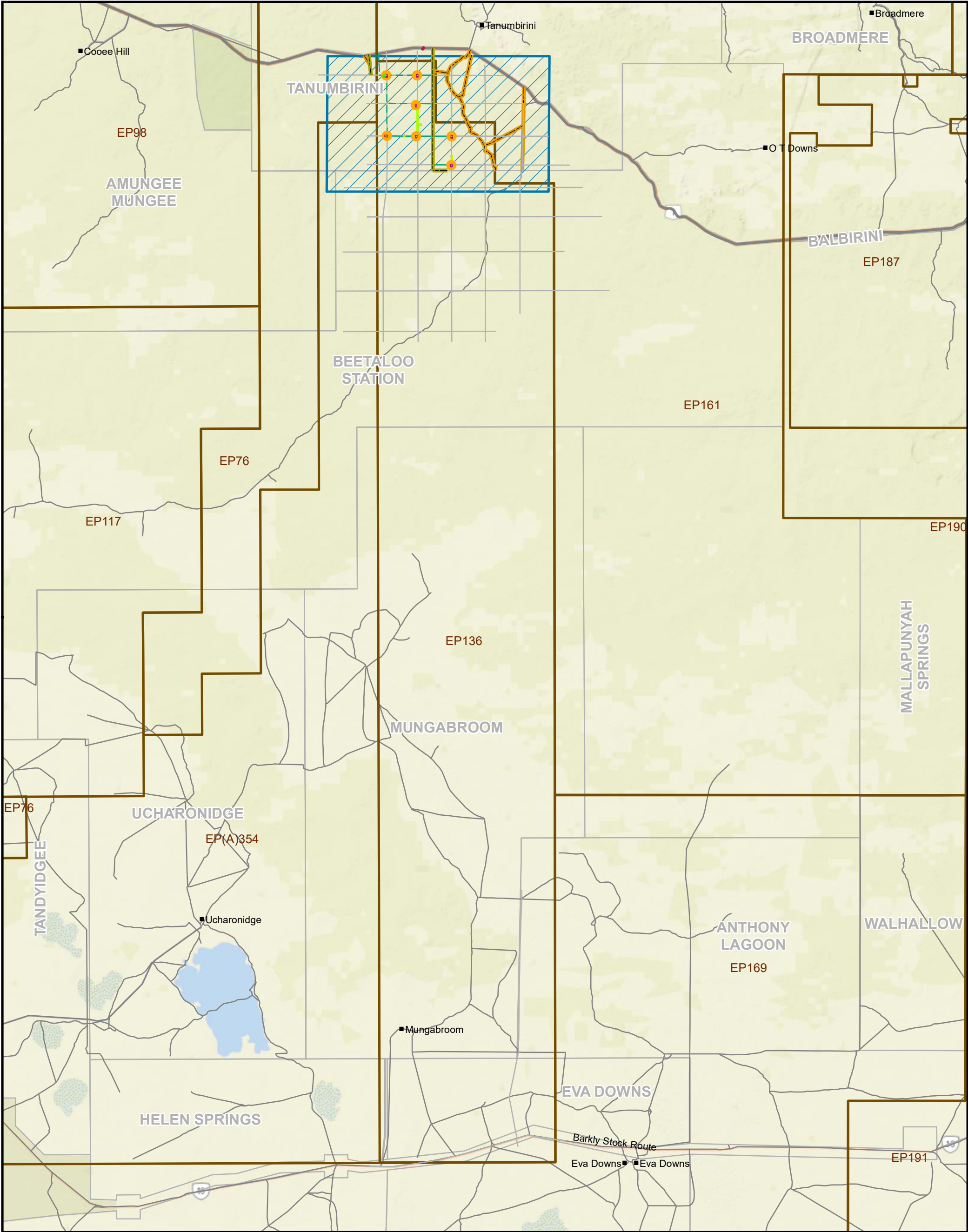
1.2 Project Proponent

The proponent for the project is Sweetpea Petroleum Pty Ltd (Sweetpea) as Title Holder and Operator of EP136. The contact details are provided below:

Company	Sweetpea Petroleum Pty Ltd, wholly owned by Tamboran Resources Ltd
ABN	42 074 750 879
EMP Name	Well Drilling, Hydraulic Fracture Stimulation and Well Testing EMP EP136 - Beetaloo Sub-basin, NT
Unique Identity No.	SWP4-2
Primary Contact	Gibson Porkime NT Operations Manager
Phone	+61 2 8330 6626
Email	gibson.porkime@tamboran.com
Registered Postal Address	Sweetpea Petroleum Pty Ltd C/-Tamboran Resources Limited GPO Box 4025 Darwin, NT 0801 Australia

Sweetpea will notify and provide updated details to the Department of Industry, Tourism and Trade (DITT) and the Department of Environment, Parks and Water Security (DEPWS) in the case that there is a change to contact details for the title holder.

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Projection: GDA 1994 MGA Zone 53
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Legend

- Well Site
- Gravel Pit Footprints
- Well Lease Area
- EP136 Proposed Accommodation Camp Option
- Highway Proposed Accommodation Camp Option
- Existing Access
- Gravel Pit Access
- Pastoral Track
- Western Access Option Access
- Eastern Access Option Access
- Seismic Lines - progressively rehabilitated
- Project Location
- Petroleum Exploration Permit



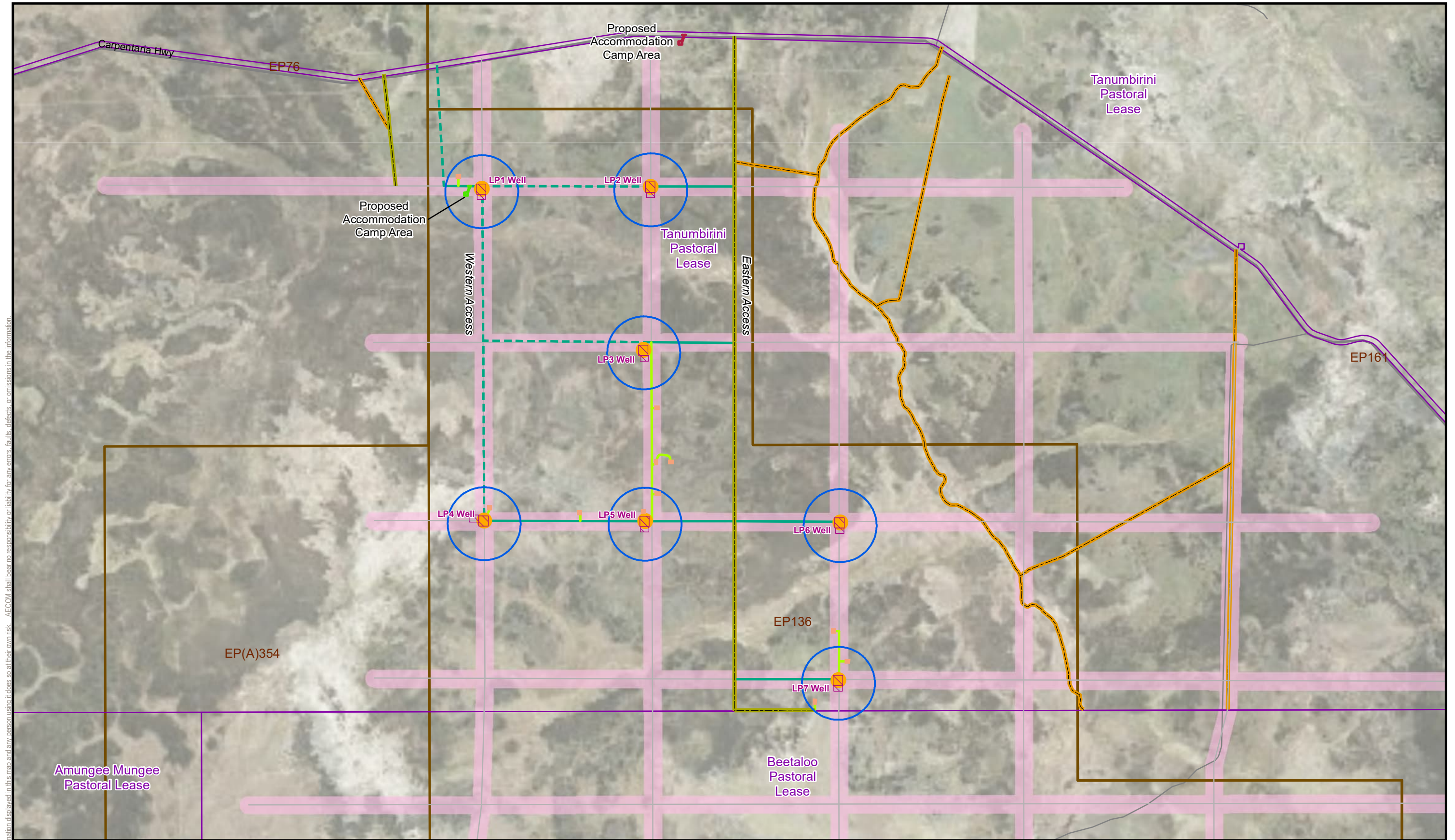
Data sources:
Co-ordinate system: GDA_1994_MGA_Zone_53
Permit Area, Cadastre - NT Gov 2019.
Places, Vegetation - Aust Gov 2019

**Sweetpea Petroleum Pty Ltd
Drilling, HFS and Testing EMP**

Project Location

PROJECT ID 60611666
CREATED BY prachi.kulkarni1
LAST MODIFIED 12-Jul-2022
VERSION 1

**Figure
3**



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Projection: GDA 1994 MGA Zone 53

2 1 0 2 km

1:100,000 (when printed at A3)

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- Well Site
- Existing Access
- Gravel Pit Access
- Western Access Option Access
- Eastern Access Option Access
- Seismic Lines - progressively rehabilitated
- Pastoral Track
- Highway

- Roads
- 250 m buffer to Seismic Line
- Gravel Pit Footprints
- Well Lease Area
- 1 km Bore Buffer
- EP136 Proposed Accommodation Camp Option
- Highway Proposed Accommodation Camp Option

- Native Title Register
- Petroleum Exploration Permit

Data sources:
Imagery: Digital Globe
Permit, Cadastre, Places, Bores - NT Gov 2019.
Pastora Infrastructure - AECOM 2020

**Sweetpea Petroleum Pty Ltd,
Drilling, HFS and Testing EMP**

**Location of Lease Pads, Gravel Pits,
Camp Pads, Seismic Lines and
Access Tracks**

PROJECT ID	60611666
CREATED BY	prachi.kulkarni1
LAST MODIFIED	12-Jul-2022
VERSION	1

Figure 4

A3 size

1.3 Project Description

The regulated well activity and associated activities to be carried out under the DST EMP include:

1. Increase the size of the camp approved under previous EMPs from 1.3 ha to 2.5 ha.
2. Exploration activities at up to seven well pads, including but not limited to the following:
 - i. Exploration well drilling and completions – vertically to an expected depth of 3,250m +/- 200 m total vertical depth (TVD) (however, the ultimate total depth could be greater or lesser than this estimate but is not anticipated to impact environmental risk), and with a target measured depth range of horizontal wells from 4,100 m to 6,200 m (this would include a lateral section of between approximately 1,000 m and 3,000 m). It is noted that subsurface well paths will not go outside the EP136 boundary.
 - ii. Multi-staged hydraulic fracture stimulation (horizontal wells and associated vertical wells), including water storage.
 - iii. Production testing and follow up testing, monitoring and work-over activities and management of wastewater.
 - iv. Routine and ongoing maintenance of any infrastructure and or services.
 - v. All activities associated with the plugging, abandonment, decommissioning and / or remediation of wells after testing and monitoring has been completed.
3. Any other minor works ancillary to the above-mentioned works.

1.4 Project Location and Footprint

The Well Drilling, Hydraulic Fracture Stimulation and Well Testing (DST) program is proposed within Tanumbirini perpetual pastoral lease and lies within the northern section of the EP136 exploration permit area (Figure 3).

The footprint of the exploration program is detailed in Table 3 and the location of the access tracks, lease pad areas, accommodation camp is provided in Figure 4. The only additional disturbance areas covered under this DST EMP is the moderate increase in size of the approved camp pads at either the Highway Camp and/or the Lease Pad 1 camp.

Table 3 Regulated Activity Footprint and Vegetation Clearing under this EMP

Infrastructure	Well Id or Site Id	Location Lat/Long	Access Track Length (km)	Entire Activity Footprint Area (Ha)	Vegetation Clearing under this EMP (Ha)
Lease Pad 1	Maverick T463 A1-1H	-16.517663°, 134.515147°	-	11.0	-
Lease Pad 2	Maverick T463 B2-1H	-16.517668°, 134.558468°	-	11.0	-
Lease Pad 3	Maverick T463 D3-1H	-16.558253°, 134.556614°	-	11.0	-
Lease Pad 4	Maverick T535 A4-1H	-16.600557°, 134.515315°	-	11.0	-
Lease Pad 5	Maverick T535 B5-1H	-16.600649°, 134.556760°	-	11.0	-
Lease Pad 6	Maverick T536 A6-1H	-16.600930°, 134.606624°	-	11.0	-
Lease Pad 7	Maverick T536 C7-1H	-16.639982°, 134.606535°	-	11.0	-
Main Camp Options	Highway Camp	-16.480922°, 134.565871°	-	2.5	1.2
	Lease Pad 1 Camp	-16.519364°, 134.510563°			
Gravel Pits (up to 10 gravel pits)			-	20.0	-
Option 1 - Lease Pad (LP) 'Eastern Access Track' (18m wide)*			38.26	67.74	-

Infrastructure	Well Id or Site Id	Location Lat/Long	Access Track Length (km)	Entire Activity Footprint Area (Ha)	Vegetation Clearing under this EMP (Ha)
Option 2 - Lease Pad (LP) 'Western Access Track' (18m wide)*			34.14	61.44	-
Gravel Pit (GP) Access Track (8m wide)			7.8	6.24	-
Total Disturbance Area Option 1 EAT			46.06	172.28	1.2
Total Disturbance Area Option 2 WAT			41.94	165.98	

* Access Track Options – updated based on the revised alignment as per C&WB EMP r22 Modification – new track option

1.5 Land Tenure and Access

1.5.1 Government Departments

A central accommodation camp to support exploration activities is proposed to be located at the Highway Camp location (as per Seismic EMP) or Lease Pad 1 (as per C&WB EMP) - with a preference for the Lease Pad 1 camp location. If the Highway Camp location is selected an Access Authority (AA 9) from DITT is required as it is outside EP136. No further authorities are required for the Lease Pad 1 Camp, as it is within EP136.

Sweetpea are finalising the required agreements with registered native title parties' body corporate, Northern Land Council (NLC) and the NT Government, prior to the AA 9 title being granted. It is anticipated that the agreement will be executed in the coming months as AA 9 consultations with Native Title Parties have now been completed.

1.5.2 Pastoral Properties

The proposed regulated well and associated exploration activities are entirely contained within Tanumbirini Station PPL in the northern section of EP136 to the south of the Carpentaria Highway. Sweetpea has undertaken consultation with both Tanumbirini Station to arrange access to undertake reconnaissance and scouting work on the property, including the baseline environmental and heritage assessments which informed this EMP.

For the avoidance of doubt, no exploration activities are proposed under this EMP to occur on the neighbouring Beetaloo PPL, including no provision under this EMP for horizontal drilling activities crossing into Beetaloo Station from Tanumbirini Station.

Sweetpea provided a final draft of EMP SWP3-1 to the Tanumbirini Station leaseholders in January 2022, which provided a complete summary of the proposed well drilling, hydraulic fracture stimulation and well testing scope covered in this EMP. Sweetpea had previously provided descriptions of the locations, program and scope. Sweetpea subsequently provided links to reputable scientific studies that provide further information (including the Final Report of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory; other Australian inquiries; US EPA's study of potential impact on drinking water resources; CSIRO review of community concerns about onshore gas development) to inform the Pastoral Lessees of the regulated activity, anticipated environmental impacts and risks, environmental outcomes and consequences for the pastoralist's activities.

Sweetpea is continuing the process of resolving an access agreement with the leaseholder in accordance with the *Petroleum Act 1984 (NT)* and Petroleum Regulations. Sweetpea expects that a LAA may ultimately be determined through the Northern Territory Civil and Administrative Tribunal (NTCAT), as per the *Petroleum Act 1984 (NT)*; however, Sweetpea always remain open to determining a LAA through negotiations. Sweetpea have considered a range of possible environmental impacts and disturbance as a result of the planned operations and will implement the following in an effort to minimise impacts:

- Comply with Standard Minimum Protections (under an AAA or LAA).
- Implement measures of the EMP to minimise impact on the cattle and pastoral operations that result from environmental impacts.

- Rehabilitate areas at completion of the program and conduct rehabilitation monitoring to ensure areas are rehabilitated in accordance with the EMP and law.
- Continue to engage and consult on the proposed activities.
- Compensate for impacts as required in accordance with the *Petroleum Act (1984)* and Petroleum Regulations.
- Report any incidents of damage to pastoralist's infrastructure and resolve in accordance with the *Petroleum Act (1984)* and Petroleum Regulations.

1.5.3 Traditional Owners and Northern Land Council

Petroleum exploration in the Beetaloo Sub-basin is subject to agreement between the proponent and the NLC, which has provisions under the Commonwealth *Native Title Act 1993* for (amongst others):

- Opportunity to comment on EMPs
- Indigenous employment opportunities
- Sacred Site clearance.

Sweetpea have an Exploration Agreement for EP136 and EP143 that was signed on 18 July 2012 between the Native Title Party, Northern Land Council (NLC) and Sweetpea Petroleum Pty Ltd. The Deed details how the project is to be undertaken that:

- Shows understanding and respect for the Native Title Party and their members and continues to keep them informed during the project as necessary with good communication.
- Minimises the deleterious impact on the Native Title Party and their members.
- Minimises the deleterious impact upon the environment.

As part of the AA 9, a new Exploration Agreement is also being drafted to incorporate certain, limited areas outside of EP136 that could be used for 2D seismic acquisition and/or camp locations.

The Exploration Agreement requires Sweetpea to provide an annual Work Program to the NLC and hold Work Program Meetings with the Native Title Party to be scheduled by the NLC. Sweetpea completed 2021 Work Program meetings held with the NLC and Native Title Parties during October 2021. Sweetpea presented the planned exploration activities for Quarter 4 2021 and beyond. Sweetpea also provided a final draft of the SWP3-1 EMP to the NLC in January 2022, and has incorporated feedback from the NLC into this EMP.

1.5.4 Aboriginal Area Protection Authority

Sacred Site Clearance Certificates for all exploration activities must be obtained prior to approval by the Minister of an EMP. The Legislation establishes a procedure for the protection and registration of sacred sites, through:

- procedures for avoidance of sacred sites
- establishing an Authority for the purposes of the Act
- procedures for the review of decisions of the Authority by the Minister.

Sweetpea were issued an Aboriginal Areas Protection Authority (AAPA) Certificate for activities authorised by the *Petroleum Act 1984 (NT)* for petroleum exploration (reference RA2020/14-C2020/072 (AC2020/072)).

AC2020/072 was issued following AAPA completing research and conducting meetings in June and July 2020, engaging with senior people in Katherine, Mataranka, Minyerri, Marlinja and Elliott about Sacred Sites and the works proposed by Sweetpea. The AAPA researcher confirmed what Sacred Sites are in the area and who has knowledge about the Sacred Sites that may need protection.

On-country field surveys were completed with knowledgeable people, using 4WD vehicles and a helicopter. The field surveys and consultations focused on confirming where the Sacred Sites are and recording the wishes of senior people about how the sites can be protected.

AC2020/072 allows all well drilling, hydraulic fracturing and well testing activities proposed under this EMP. AAPA have raised, formally, a more recent desire to undertake further consultation regarding water extraction from water bores covered under AC2020/072, however, although we support AAPA's ongoing consultation we would say it is not required for approval of this EMP as:

1. The conditions of AC2020/072 already require the protection of sacred sites associated with water holes in the Newcastle Creek region;
2. The Civils & Water Bore EMP is already approved and approves the use of greater than 100 ML of water extracted under the approved Water Extraction Licence (GRF10346); and
3. The NLC have confirmed that consultation with custodians regarding the proposed exploration and appraisal program has been completed as per the relevant Exploration Agreement.

Sweetpea agree entirely with AAPA that the key objective is the protection of identified sacred sites and has consulted with governmental and independent third-party hydrogeological experts to confirm that within the bounds of scientific certainty there is no connection between the Cambrian Limestone Aquifers (where water is proposed to be extracted from) at depths greater than 60 m and the ephemeral springs and shallow, seasonal aquifer systems. Sweetpea has contracted an independent study, at arm's length, that will be provided to AAPA and any other interested stakeholders. Further detail regarding the accepted interpretation of the hydrogeology of the Newcastle Creek water holes is included in Section 4.1.5.5.

One limitation of AC2020/072 is that it allows for 'transit only' across the existing pastoral lease track at its intersection with Newcastle Creek in Restricted Work Area 2 (RWA2) - we say limitation in this instance as there is an existing pastoral track across the creek in this location and we would propose only to maintain this crossing and minimise the risk of any damage to the creek bed or banks through erosion or other impacts. Given the works would be within the existing 'easement' created by the pastoral track we see no possibility of impacts to sacred sites (and no sacred sites are noted at the crossing). We are simply seeking approval to do routine maintenance and/or minor upgrades to improve the standard of the track and protect the existing environment.

Sweetpea have been engaged with AAPA throughout 2021 to seek authority to undertake these minor works at this crossing to ensure it is suitable for use during wet weather, however, due to COVID19 and other operational delays the custodian consultation will now occur in early 2022. Sweetpea's contingency plan to the 'transit only' limitation is two-fold as discussed in the Proposed Schedule section above. Sweetpea are committed to meeting the conditions specified in the AAPA certificate to ensure risks to sacred sites and the identified Restricted Work Area are managed.

Sweetpea are committed to continuing to engage AAPA and to meeting the conditions specified in AC2020/072 to ensure risks to sacred sites and identified restricted work areas are managed.

1.6 Objectives

The overall objective of this EMP is to provide comprehensive strategies to minimise environmental impacts and the risk of any inadvertent adverse outcomes resulting from Sweetpea's well drilling, hydraulic fracture stimulation (HFS) and well testing activities in the Beetaloo Sub-basin.

An EMP is a requirement of the *Petroleum (Environment) Regulations 2016* (the Regulations) and is required to be approved by the NT Minister for Environment to form a statutory document that is enforceable through the NT legislation.

The objectives of the Regulations are to ensure that the onshore oil and gas activities are carried out in a manner consistent with the principles of ecologically sustainable development (ESD) and environmental impacts and risks associated with onshore oil and gas activities are reduced to a level that is as low as reasonably practicable (ALARP) and acceptable.

In line with Regulations, this EMP aims to:

- provide a description of the regulated well activity and the associated activities
- provide a description of site-specific aspects of the existing environment (physical, biological, social, cultural)

- provide site-specific impact management strategies to minimise environment and heritage risks associated with its exploration activities – this includes ongoing monitoring and post-activity rehabilitation requirements as well as preventative measures
- be a practical and usable document, with environmental management principles that are accessible, implementable and effective
- align with the principles of Ecological Sustainable Development (ESD)
- ensure relevant regulatory requirements are addressed.

The EMP is an implementation and management tool for Sweetpea's regulated activities and will be utilised by the Regulator to verify the environmental outcomes and environmental performance standards are being achieved (DENR, 2020).

2.0 Environmental Legislation and other Requirements

The following sections respond to the specific requirements of Schedule 1, clause 10 of the Regulations, which requires the EMP to *specify any legislative requirements applicable to the regulated activity described in the plan that are relevant to the protection of the environment and demonstrate how those requirements will be met*. The follow section provides a summary of the range of NT relevant legislation, regulations, agreements, codes of practices and guidelines for specific controls and measures required to reduce the environmental impacts and environmental risks of the activity.

This assessment references A.3 Surface activities, B.4 Well Operations, C.4 Well site water management and D.4 Methane emissions monitoring, leak management, detection and reporting mandatory requirements as presented in the *Code of Practice: Onshore Petroleum Activities in the Northern Territory* and the legislative requirements applicable to the activity described in this EMP. It is noted that Sweetpea intend to conduct all their activities in accordance with best environmental management practices as required under the current codes and guidelines.

2.1 Summary of Key Legislation

A summary of the Commonwealth and Northern Territory legislative requirements is provided in Table 4.

Table 4 Key Commonwealth and Northern Territory Legislation Consideration

Legislation	Purpose	Responsible Agency	Relevance to Project			Actions
			H	M	L	
Commonwealth						
Environment Protection and Biodiversity Conservation Act 1999	Referral of proposed action or environmental approval. Establishes an assessment and approval framework for activities that have the potential for significant environmental impacts and a permitting system for protected matters.	Department of Agriculture, Water and Environment (DAWE)	✓			Sweetpea have assessed its potential impact on MNES and considered unlikely to be significant. A self-assessment was completed using the pre-referral screening tool and was completed by appropriately qualified environmental consultant AECOM Australia Pty Ltd. The assessment is based on the consideration of the potential significant impacts of the activities on the indicative environmental values and sensitivities relevant for each of the NT EPA's environmental factors and objectives.

Legislation	Purpose	Responsible Agency	Relevance to Project			Actions
			H	M	L	
						Sweetpea do not intend to refer the regulated activity described in this EMP to the Federal Government for assessment.
<i>Native Title Act 1993</i>	Recognises native title in lands over which native title is not extinguished and persons able to establish native title.	Prime Minister and Cabinet	✓			Two Native Title determinations (NTD27/2010 and NTD33/2012) within the exploration area. Sweetpea have existing Exploration Agreement with Native Title Parties and the Northern Land Council (NLC) for Petroleum Exploration.
<i>National Greenhouse and Energy Reporting Act 2007</i>	Reporting under National Greenhouse and Energy Reporting Scheme.	Australian Government - Clean Energy Regulator		✓		Sweetpea will report where it generates emissions over the threshold as detailed in Appendix E Methane Emissions Management Plan.
<i>National Environment Protection Council Act 1994 (National Environment Protection (Assessment of Site Contamination) Measure 1999) (NEPM)</i>	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.	DAWE		✓		Sweetpea will use the NEPM to assess the risk of contamination and for the assessment of the drilling fluids for disposal.
<i>National Environment Protection (National Pollutant Inventory) Measure 1998</i>	Reporting under the National Pollutant Inventory (NPI).	DAWE (NPI)			✓	Sweetpea's regulated activities are unlikely to trigger the threshold for reporting. If any NPI thresholds are triggered, Sweetpea would report pollution data to NPI annually.

Legislation	Purpose	Responsible Agency	Relevance to Project			Actions
			H	M	L	
Northern Territory Government						
General Environmental						
<i>Petroleum (Environment) Regulations 2016</i>	Approved EMP to conduct regulated activities.	Department of Environment, Parks, Water Security	✓			Sweetpea submit this Plan for the proposed regulated activity as it relates to the well drilling, hydraulic fracture stimulation and well testing, as well as other associated activities. EMP will be revised every 5-years.
<i>Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019)</i>	Activities to be performed under an EMP are to be consistent with the Code of Practice.		✓			The EMP has been developed in accordance with the Code of Practice and the Regulations, including all mandatory requirements, applicable to the regulated activities.
<i>Environmental Protection Act 2019 and Environmental Protection Regulations 2020</i>	Referral of proposed action or environmental approval. Under the <i>Environment Protection Act 2019</i> , proposed projects that may have a significant effect on the environment are to be referred to the NT EPA for assessment.	NT Environment Protection Authority (NT EPA)		✓		Sweetpea has conducted a self-assessment using the NT EPA Guideline, <i>Guidance for proponents – Referring a proposal to the NT EPA – version 2.0</i> , dated 10 March 2020. The assessment was based on consideration of the potential significant impacts of the activities on the indicative environmental values for each of the NT EPA's factors and objectives. Based on the self-assessment, Sweetpea is of the view that the activities covered by this EMP do not trigger referral to the NT EPA under the <i>Environment Protection Act 2019</i> .
<i>Petroleum Act 1984</i>	A petroleum exploration permit is required to explore for oil and gas in the NT.	Department of Industry, Tourism and Trade (DITT)	✓			Sweetpea is the registered holder of a 100% interest in Petroleum Exploration Permit EP136.
	Access Authority		✓			Access Authority application is being finalised by DITT for operations associated with access tracks and an accommodation camp located outside the permit area.

Legislation	Purpose	Responsible Agency	Relevance to Project			Actions
			H	M	L	
	Land access and compensatory agreement		✓			Sweetpea is continuing the process to obtain a necessary Land Access and Compensatory Agreements (LACA) to cover the scope of activities proposed under this EMP. Approved Access Agreement (AAA) received on 4 May 2022.
	Compensation to be paid to native title holders and owners/ occupiers of land where petroleum activities are proposed.		✓			Sweetpea have exploration agreements with Native Title Holders and compensation is paid for all activities under this EMP in accordance with the Agreement. Annual Work Program meetings are held with the Native Title Holders through the Northern Land Council.
	The <i>NT Schedule of Onshore Petroleum Exploration and Production Requirements</i> ('NT Schedule') covers key regulatory requirements for operational management of well activities in conjunction with the NT Code of Practice for Petroleum Activities.		✓			Sweetpea address requirements in the WOMP as relates to the NT Schedule requirements.
Schedule of Onshore Petroleum Exploration and Production Requirements (2021)	Mandatory schedules for the exploration or development of petroleum activities in the NT.		✓			Sweetpea address requirements in the WOMP as relates to the NT Schedule requirements.
<i>Control of Roads Act 1953</i> <i>Development Guidelines for Northern Territory Government Controlled Roads 2015</i>	A permit is required to do work within the Northern Territory (NT) Government road reserve. Road safety consideration for public using NT Roads, in particular where a heavy vehicle turn off the highway onto an unsealed road.	Department of Infrastructure, Planning and Logistics	✓			Sweetpea require access to EP136 via access road off the Carpentaria Highway. A Traffic Impact Statement has informed the development of a Traffic Management Plan for consultation with DIPL Transport and the application for permit is in progress.

Legislation	Purpose	Responsible Agency	Relevance to Project			Actions
			H	M	L	
Cultural and Heritage Considerations						
Northern Territory Aboriginal Sacred Sites Act 1989	Under the Act, all Indigenous sacred sites are protected regardless of whether or not they are registered.	Aboriginal Areas Protection Authority (AAPA)	✓			Sweetpea have obtained an Authority Certificate to conduct regulated activities under this EMP. Additional AAPA application is currently underway to clarify conditions of the existing Certificate and expand the activity description. Sweetpea are committed to meeting conditions of Restricted Work Areas (RWA) and avoid Sacred Sites.
Heritage Act 2011 and Heritage Regulation 2012	This Act relates to the protection of tangible heritage (Indigenous, Historical and Macassan).	Department of Territory Families, Housing and Communities – Heritage Branch		✓		A Cultural Heritage Assessment has been completed to inform the development of the EMP. Sweetpea intend to avoid all identified archaeological sites and to report any newly discovered sites to Heritage Branch and develop a proposed relocation protocol for artefacts with Traditional Owners. Specific measures have been developed to mitigate risks to heritage place or objects (refer Section 7.11).
Water Quality, Biodiversity and Land Conservation						
Water Act 1992 and Water Regulation 1992	A water extraction license to be obtained to take groundwater for hydraulic fracturing activities.	DEPWS – Water Resource Division	✓			Sweetpea has obtained a water extraction licence (GRF10346) to conduct activities under this EMP. The intended groundwater extraction bores to be used are located at each lease location.
	A bore work permit will be obtained prior to installation of water bores.			✓		The requirement for a Bore work Permit is covered under the Seismic EMP and C&WB EMP. It is noted however that Sweetpea will obtain a Bore Work Permit in accordance with section 57 of the Water Act 1992.

Legislation	Purpose	Responsible Agency	Relevance to Project			Actions
			H	M	L	
						The groundwater monitoring bores will be constructed on water bore pads within the overall exploration lease pad or proposed camp pad in accordance with DEPWS requirements including the Code of Practice, the <i>Preliminary Guideline: Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-basin</i> and the <i>Minimum Construction Requirements for Water Bores in Australia 4th Edition, 2020</i> (https://www.adia.com.au/documents/item/290).
	Prohibition of pollution and groundwater.		✓			Sweetpea's Waste and Wastewater Management Plan (Section 7.6 and Appendix F), Spill Prevention and Response Plan (Appendix G) and the Monitoring (Section 8.7) and Reporting (Section 8.5) requirements will ensure the conduct of the regulated activity would be in way that will not cause material or serious harm to environment. No surface water take is proposed for this activity.
	Interfering with a waterway, without a permit or other exemption, is an offence under the Act The definition to interfere with a waterway means: - cause a material change to the shape of a waterway - cause a material change to the volume, speed or direction of flow or likely flow of water in or into a waterway			✓		Sweetpea's activities require crossing ephemeral creeks to access the exploration lease pads. Activities associated with the upgrade and maintenance of creek crossings to gain access is covered by the C&WB EMP. The requirement for an Interference with a waterway permit are currently exempt for Sweetpea activities (Gazette S35 of 30 June 1992). However, it is noted that this exemption is currently being reviewed by Water Resources Division and may result in new requirements that Sweetpea will need to meet over the next 12 months.

Legislation	Purpose	Responsible Agency	Relevance to Project			Actions
			H	M	L	
	cause an alteration to the stability of the bed or banks of a waterway, including by the removal of vegetation					Sweetpea will continue to engage with Water Resource Division to ensure obligations under the Water Act are achieved. Sweetpea's mitigation measures have taken into consideration the sensitivities of the waterways where activities intersect. Refer Section 7.3 and Appendix B for specific measures.
<i>Territory Parks and Wildlife Conservation Act 1976</i>	Address the NTPS performance criteria and design exploration activity to satisfactorily exclude areas which should not be cleared due to their ecological and environmental value by determining the presence, extent and value of the important flora, fauna and habitat features and seasonal timing.	DEPWS – Flora and Fauna Division			✓	Sweetpea's DST EMP designed the exploration activity to exclude areas with ecological and environmental value. This was identified through baseline condition prior to commencement of activities as per Section 3.2 and Section 4.0. Specific measures to protect flora and fauna have been developed to minimise impact to ALARP as detailed in the Biodiversity Management Plan in Section 7.9.
<i>Weeds Management Act 2001</i>	Ensure that the risk of weed introduction and spread resulting from activities associated with this project are mitigated to protect the economic, community, industry and environmental interests of the Territory.	DEPWS – Weed Management Branch	✓			Sweetpea conducted a baseline weed survey as part of the Land Condition Assessment. This informed the development of a project specific weed management plan (Section 7.4 and Appendix H). Sweetpea's approved Weed Management Plan requires the implementation of weed prevention, detection and eradication controls during exploration activities.

Legislation	Purpose	Responsible Agency	Relevance to Project			Actions
			H	M	L	
<i>Bushfire Management Act 2016</i> and associated regulations	Bushfire management planning to be guided by the <i>Bushfire Management Act 2016</i> .	DEPWS – Bushfires NT		✓		Sweetpea has prepared a Bushfire Management Plan in accordance with the Act and the <i>Bushfire Management Planning Guide: Onshore Petroleum Projects</i> (refer Section 7.5 and Appendix I). Should permits to be required, Sweetpea would apply for a permit to burn if there is a declared fire danger period. Sweetpea will not undertake flaring or the lighting of fires during periods of total fire bans. However, welding activities are planned, which will be mitigated through use of fire watchmen and activities will not occur over vegetation.
	Compliance with total fire bans and fire permitting			✓		
<i>Soil Conservation and Land Utilisation Act 1969</i>	Makes provision for the prevention of soil erosion and for the conservation and reclamation of soil.	DEPWS – Soil Branch		✓		Sweetpea will establish and manage the operations of the disturbance areas in accordance with Section 7.3 and Appendix B. Controls implemented aim to minimise risk of erosion from the regulated activities.
Air Quality, Noise and Waste Management						
<i>Waste Management and Pollution Control Act 1998</i>	When an activity that is authorised under the <i>Petroleum Act 1984</i> , the WMPC Act only applies if a contaminant or waste is not confined within the authorised lease boundary.	NT EPA		✓		Sweetpea will take all reasonable and practicable measures to prevent or minimise pollution or environmental harm. Waste and Wastewater Management Plan (Section 7.6 and Appendix F), Spill Prevention and Response Plan (Appendix G) and the Monitoring (Section 8.7) and Reporting (Section 8.5) are applicable.
	s. 12 General environmental duty			✓		
	A.3.9 (f) If contamination is detected, remediation must commence immediately in accordance with the spill management plan and/or emergency contingency plan			✓		

Legislation	Purpose	Responsible Agency	Relevance to Project			Actions
			H	M	L	
	s. 2A Listed Wastes - Transport of any listed waste (Schedule 2 of the <i>Waste Management and Pollution Control (Administration) Regulations 1998</i>) must be conducted by a person licensed under the WMPC Act to transport that waste and that waste must be transported to a facility that is licensed under the WMPC Act to accept that waste.		✓			
<i>Dangerous Goods Act 1998</i> and Regulations	Provides for the safe storage, handling and transport of certain dangerous goods, specifically Class 1 and class 2 dangerous goods (explosives and gases).	NT WorkSafe, Department of the Attorney General and Justice		✓		All fuel storage facilities will be constructed in accordance with AS1940 and considers requirement of the WHS(NUL) Act and WMPC Act. Estimated quantities are provided in Table 13 in Section 3.10.1. In addition, Sweetpea will ensure that a dangerous goods licence are held by Sweetpea and its contractors where applicable.
<i>Public and Environmental Health Act 2011</i>	Outlines requirements for camps, specifically waste and wastewater (sewage and greywater) management. Provides conditions preventing pollution of watercourses and water supplies in the Northern Territory. Wastewater treatment systems may be subject to requirements under the <i>Public and Environmental Health Act 2011</i> and regulations.	Department of Health		✓		Sweetpea aligns its operations to ensure that the Wastewater treatment systems meet the requirements of the Act and that the sewerage plants meet the NT Code of Practice for Small Onsite Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent. Refer to Waste and Wastewater Management Plan (Section 7.6 and Appendix F), Spill Prevention and Response Plan (Appendix G) and the Monitoring (Section 8.7) and Reporting (Section 8.5) requirements.

Legislation	Purpose	Responsible Agency	Relevance to Project			Actions
			H	M	L	
<i>Radiation Protection Act 2004</i>	Requirements for the management of radiation for the protection of people and the environment from harmful radiation, and for related purposes.	Department of Health			✓	Sweetpea will comply with the Act through the proper handling of and disposal of drill cuttings in accordance with Waste and Wastewater Management Plan (Section 7.6 and Appendix F).
<i>Work Health and Safety (National Uniform Legislation) Act 2011</i>	Provides for a balanced and nationally consistent framework to secure the health and safety of workers and workplaces. The Act and its Regulation also provides for bunding, emergency planning, spillages, and reporting requirements.	NT WorkSafe, Department of the Attorney-General and Justice	✓			Sweetpea's exploration activities will be implemented in accordance with Work Health and Safety Legislation to ensure safety of workers. Sweetpea has a Health and Safety Plan that outlines how the requirements will be met. Sweetpea's activities will be managed under an Emergency Response Plan (Appendix K). Along with the implementation of the Waste and Wastewater Management Plan (Section 7.6 and Appendix F) and Spill Prevention and Response Plan (Appendix G). Sweetpea understand activities will be inspected by NT WorkSafe in accordance with the NT <i>WHS (NUL) Act</i> and the Regulations. Sweetpea will notify NT WorkSafe as required under the legislation on the range of potential hazardous works that may occur during the exploration activities.
<i>Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Act 2010 and Regulations</i>	Dangerous goods can only be transported by appropriately licensed personnel and within licensed vehicles	NT WorkSafe		✓		Sweetpea to ensure that any dangerous and hazardous goods transportation that occurs above the trigger levels are done so by appropriately licensed transportation personnel (including vehicles).

Legislation	Purpose	Responsible Agency	Relevance to Project			Actions
			H	M	L	
						Waste and Wastewater Management Plan (Section 7.6 and Appendix F), Spill Prevention and Response Plan (Appendix G) and the Monitoring (Section 8.7) and Reporting (Section 8.5) requirements
<i>Emergency Management Act 2013</i>	The Act reflects an 'all hazards' approach to all emergencies and disasters, natural or otherwise, and provides authority for all four phases of emergency management (prevention, preparedness, response and recovery). The Act provides for the adoption of measures necessary for the protection of life and property from the effects of disasters and emergencies and forms the legislative authority basis for emergency management activities across all levels of government.	NT Emergency Service		✓		Sweetpea's activities will be managed under an Emergency Response Plan (Appendix K). Where an emergency hazard impacts offsite, Sweetpea will adhere to all directions from the Minister for Police, Fire and Emergency Services (PFES).

2.2 Relevant Codes of Practice and Guidelines/Standards

Relevant codes of practice and guidelines/standards relevant to the regulated activities described in this EMP are summarised in Table 5.

Table 5 Code of Practice and Relevant Guidelines/Standards

Code of Practice and Relevant Guidelines, Standards and Policies
Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019) - Mandatory Code of Practice for the petroleum industry to ensure that petroleum activities in the Northern Territory are managed according to minimum acceptable standards to ensure that risks to the environment can be managed to a level that is as low as reasonably practicable (ALARP) and acceptable. - Sweetpea's EMP has been developed based on the requirements presented in the Code.
Code of Practice for On-site Wastewater Management (2014) - Provides guidance for the management of effluent. - Stipulates the approved sewage and sullage treatment devices and practices within the Northern Territory. Sewage and sullage produced and disposed of from the camps must be undertaken in accordance with the Code.
APPEA Code of Environmental Practice (2008) Provides an outline of environmental objectives which represent guidance on key aspects of good environmental practice in the petroleum industry
Best Practice Erosion and Sediment Control (International Erosion Control Association, 2008) - Facilitates the identification of those issues that should be considered when formulating and evaluating strategies for best practice erosion and sediment control. - Facilitates best practice stormwater management. - Facilitates active avoidance or minimisation of soil erosion resulting from construction activities. - Facilitate best practice soil and sediment control management on sites.
AS 1940: The storage and handling of flammable and combustible liquids, 2004 Provides guidance for the operation and handling of flammable and combustible liquids.
ISO 31000 Risk management- Principles and guidelines - This international standard provides a standardised to identify, assess and manage risk. - Assessment of risk in EMP's shall be undertaken in alignment with this guideline
ISO 19011: Guidelines for auditing management systems, 2018 Provides guidance on environmental auditing to a certifiable standard.
Guideline for the Preparation of an Environmental Management Plan (DENR, 2018) - Details the environmental protection measures to be included in Environmental Management Plans. - Includes changes emanating from the recommendations of the NT Hydraulic Fracturing inquiry.
Guideline for Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo sub-basin (DENR 2018) - Technical guidance for the onshore gas industry establishing the minimum expectations in relation to groundwater monitoring requirements. - Requires the establishment of control and impact monitoring bores prior to undertaking stimulation activities.
Northern Territory Natural Resource Management Plan 2016-2020 (Territory Natural Resource Management, 2016) - Describes the management direction for the NT's natural resources for the five-year period and beyond. - Four regional plans provide an overview of the current land condition, use and threats, key areas to monitor and improve approaches, and the level of coordination that occurs across key organisations responsible for implementing actions.
Northern Territory Planning Scheme, Land Clearing Guidelines (DEPWS, 2021) - Land Clearing Guidelines provides good land development practices for the Northern Territory by establishing standards for the management (i.e. clearing and retention) of native vegetation. - The application of these guidelines assist in preventing environmental degradation associated with clearing and help to support the sustainable development of the Northern Territory's natural resource based economy.

Code of Practice and Relevant Guidelines, Standards and Policies	
Only minor clearing activities (additional 1.2 ha) are proposed under the DST EMP having the remainder clearing of the 7 lease pads considered under the approved SWP2-3 Civil Construction and Water Bore EMP.	
Northern Territory Noise Management Framework Guideline (NT EPA, 2018) Provides guidance to the community and industry about the noise regulatory framework as it applies in the NT.	
Weed Management Planning Guide – Onshore Shale Gas Development Projects (DENR, 2019) Provides guidance to the industry about the weed management planning required to undertake Onshore Shale Gas Developments in the NT.	
Bushfire Management Planning Guide: Onshore Petroleum Project (2019) Guide to assist interest holders of onshore petroleum projects in the preparation of a Bushfire Management Plan as a component of an EMP under the Petroleum (Environment) Regulations 2016 and in accordance with the Code of Practice.	
Stakeholder Engagement Guidelines Land Access (2016) Provides the framework for consistent stakeholder engagement to obtain land access for exploration activities.	
Greenhouse Gas Emissions Management for New and Expanding Large Emitters - The NTG's recently released 'Greenhouse Gas Emissions Management for New and Expanding Large Emitters' Policy identifies the minimum requirements for the management of greenhouse gas emissions from new or expanding industrial and land use development projects. It has been established in recognition of the Northern Territory's target of net zero greenhouse gas emissions by 2050. - Sweetpea are required to report under the Large Emitters Policy for scope 1 emissions of 100,000 tCO₂-e in any financial year over the life cycle of a project, not counting emissions generated from land clearing directly associated with the project. - Sweetpea's Greenhouse Gas Abatement Plan (GGAP) is provided in Section 3.11.3 and mitigations in Section 7.8.	

2.3 Relevant Agreements and Operating Consent

Table 6 provides the relevant agreements and operating consents that Sweetpea will have in place prior to commencement of regulated activities.

Table 6 Relevant Agreements and Operating Consent

Agreements	Administered By:
AA 9 Certificate - Sweetpea require an Access Authority (AA 9) from the Department of Industry, Tourism and Trade (DITT) to carry on operations in areas outside of EP136. - Sweetpea are in the final stages of the AA 9 approval which will provide approval to locate an accommodation camp outside of EP136. - Sweetpea are finalising the required agreements with registered Native Title Parties' body corporate, Northern Land Council and the NT Government, prior to the AA 9 title being granted. It is anticipated that the agreement will be finalised in coming months after completion of the AA 9 consultations with Native Title Parties.	DITT
Native Title Petroleum Exploration Agreement (between the Host Traditional Owners, NLC and Sweetpea Petroleum Pty Ltd) - 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. - Site clearance will occur prior to any on ground activities. - The Native Title Agreement also includes clauses for the protection of the environment and rehabilitation. - Annual Work Program meetings are required to provide update on Sweetpea's exploration activities. 2021/2022 Work Program meeting was conducted in October 2021.	Northern Land Council

Agreements	Administered By:
AAPA Certificate Sweetpea have been issued an Aboriginal Areas Protection Authority (AAPA) Certificate for activities authorised by the <i>Petroleum Act 1984</i> (NT) for petroleum exploration (reference RA2020/14- C2020/072) which covers the exploration activity proposed in this EMP (refer to Section 1.5.4).	AAPA
Land Access and Compensation Agreement (LACA; if negotiated) or Approved Access Agreement (AAA; if determined by NTCAT) - A negotiated or determined access agreement between Sweetpea and a private pastoralist relating to the rights over 'land access'. - Engagement with Tanumbirini (Rallen Australia) ultimately resulted in unsuccessful attempts to negotiate a LACA (or Access Agreement) and the parties entered into Alternative Dispute Resolution and then Northern Territory Civil and Administrative Tribunal (NTCAT) proceedings in accordance with relevant sections of the <i>Petroleum Act 1984</i> and the <i>Petroleum Regulations 2020</i>. - The NTCAT proceedings were completed on 4 May 2022 when the NTCAT issued orders and determined an Approved Access Agreement (AAA).	Sweetpea and Land Holder
Apply for permit to work within a road reserve - Approval to work within a road reserve would be required for the identified access points from Carpentaria Highway onto EP136. - Sweetpea have a current application with DIPL for a permit to work and intersection design approval at four locations off the Carpentaria Highway.	DIPL
DBYD Works Approval Form for Pipeline Crossings - Sweetpea require a works approval to allow for the continuation of exploration activities where equipment and vehicles will need to cross over the underground pipeline located along Carpentaria Highway. - Specific conditions have been advised including: - A 25mm steel plate (3 m x 5 m) must be installed over the pipeline at locations where crossed by Sweetpea exploration activities. - Do not place the steel plates at locations where erosion is visible. - Report any issues found in the field to OSD Asset Services team. - Sweetpea shall notify OSD Asset Services one week prior to mobilisation. - An OSD technician to attend site to locate the pipeline and confirm the placement of the steel slabs. - All camps and office demountable shall be placed at least 300 m from the pipeline centreline (outside the pipeline radiation contour). - The pipeline easement shall not be used as a stockpiling, storage, laydown or parking area.	PowerWater, administered by OSD Asset Services

3.0 Description of Regulated Activity Well Activity and Associated Activities

3.1 Proposed Activity Summary and Schedule

The exploration activities covered by this EMP comprises of drilling, HFS and well testing activities on the seven (7) exploration lease pads constructed under the C&WB EMP. An overview of the regulated activities proposed is summarised as follows.

1. Increase the size of the camp approved under previous EMPs from 1.3 ha to 2.5 ha.
2. Exploration activities at up to seven exploration lease pads for:
 - a. Exploration well drilling and completions – vertically to an expected depth of 3,250m +/- 200 m total vertical depth (TVD) (however, the ultimate total depth could be greater or lesser than this estimate but is not anticipated to impact environmental risk), and with a target measured depth range of horizontal wells from 4,100 m to 6,200 m (this would include a lateral section of between approximately 1,000 m and 3,000 m). It is noted that subsurface well paths will not go outside the EP136 boundary.
 - b. Multi-stage hydraulic fracture stimulation, including water storage.
 - c. Production testing and follow up testing, monitoring and work-over activities and management of wastewater.
 - d. Routine and ongoing maintenance of any infrastructure and/or services.
 - e. All activities associated with the plugging, abandonment, decommissioning and/or remediation of wells after testing and monitoring has been completed.
3. Any other minor works ancillary to the above-mentioned works.

Table 7 presents the key components of the regulated activity and supporting activities. Section 6.2 presents the cumulative impacts of the regulated activities covered under this EMP and previous EMPs.

Table 7 Key Components of Regulated Activity and Supporting Activities

Component	Proposed
Approvals Related	
AAPA Certificate	RA2020/14-C2020/072
Total Area of Exploration Lease (EP136)	418,100 ha
Total Exploration Activity Area under this EMP	170-176 ha dependent on access options
Land clearing under this EMP	1.2 ha for increase of camp area
Total Exploration Activity Area under previous EMPs - Seismic EMP - C&WB EMP	279 ha (on 549.28 km of seismic lines) 146 ha (across 7 lease pads)
Number of exploration lease pads approved under C&WB EMP	Up to 7
Number of wells	Up to 7 vertical pilot to horizontal exploration wells
Groundwater	Gum Ridge Aquifer
Extraction Licence # and volume	GRF10346 299 ML/year Expiry - 31/12/2024
Number of water extraction bores	1-2 per exploration lease pad following installation in 2022 under C&WB EMP

Component	Proposed
Estimated total groundwater usage (cumulative)	897 ML (across 7 wells over 3-4 years) and equal to 299 ML/year as per Water Extraction Licence condition
Control Bores (expected) approved under Seismic and/or C&WB EMP	7 or 14 dependent on aquifers present (note only 14 total water bores currently approved under prior EMPs, additional approval will be required for additional control bores)
Impact Bores (expected) approved under Seismic and/or C&WB EMP	7 or 14 dependent on aquifers present (note only 14 total water bores currently approved under prior EMPs, additional approval will be required for additional control bores)
Timeframe	
Activity duration	Approximately April-December, annually, from 2022-2025
Duration of well drilling operations	Approximately 70 days per well, up to 7 wells total from 2022-2025
Duration of HFS operations	Approximately 10-30 days per well, up to 7 wells total from 2022-2025
Duration of well production testing	Approximately 90 days per well, with up to 300 days per well if production testing data are ambiguous and greater data volumes are required
Personnel (estimates)	
Operational workforce – civils	20 (mostly drive-in/drive out (DIDO))
Operational workforce – waterbore drilling	8 (mostly DIDO)
Operational workforce – well drilling	60 (mostly fly-in/fly-out (FIFO))
Operational workforce – HFS	60 (mostly FIFO)
Operational workforce – testing	6 (mostly FIFO)
Environmental monitoring	2-6 (DIDO)
Cultural Managers	2-6 (local)
Main Camp capacity (peak workforce)	Up to 100 (growth phased as needed)
Fly camp capacity per lease pad	Up to 12
Traffic Movement	
Peak movements for all activities (per day)	~40-50
Average movements per day for the first three months per well	~44
Average movements per day for the balance	~1-10
Truck load-out: wastewater transport	5-15 trucks per well
Tanks	
Closed-topped storage tanks	Up to 54 ML per wellpad
Maximum number of closed topped storage tanks	Up to 4 per well pad
Enclosed frac tanks (~80 KL)	6 to 12 tanks per wellpad
Open topped treatment tank	Up to 50 ML per wellpad
Maximum number of open-topped treatment tanks	Up to 4 per wellpad

Component	Proposed
HFS Lined open earthen pit – freshwater storage	1 per pad (32 to 88 ML)
Number of Transfer Pumps	2 x 8-inch pumps for transfer during frac operations per well pad and 2 x 4-inch pumps for transfer between tanks and pumping off rainwater from tops of enclosed tanks
Flowback Fluid: Volume – initial predicted Volume – predicted for off-site disposal	Up to ~20ML per well <1 ML per well
Produced Water: Volume – initial predicted Volume – predicted for off-site disposal	<1ML – wells are dry gas <1ML
HF Fluid, Proppant and emissions: Hydraulic fluid (Total) Proppant usage (Total)	Up to 90ML maximum for up to 50 stages per well (with likely exploration well stage range to be 15-30 in 2022 and 20-40 for 2023-24 to maintain water usage below 299 ML/yr limit) Up to 9,000 Tonne total for up to 50 stages per well
Greenhouse Gasses and Emissions	
Flares:	Vertical flare preferred, but may use horizontal flare
tCO ₂ -e emissions per annum (based on Financial Year July to June):	96,242 to 217,611 tCO ₂ -e per annum*
Large GHG Emitter threshold:	Possible to exceed the 100,000 tCO ₂ -e in any one of the financial years over the course of program*
% of Australia's Total GHG Emission (2021) per year	0.019% in year 1 up to 0.043% in year 4 (worse case)
Drilling cuttings and residue drilling fluid:	650 to 850 m ³ per well

*It is anticipated that a range of GHG emissions scenarios could result from exploration well tests on annual basis. GHG emissions from the activity will be materially reduced where production rates are or well test days are less than anticipated.

The activities described above are planned to commence in early- to mid-2022 and proposed to be continued over a multi-year period. Sweetpea propose to commence rig mobilisation in mid-2022 and commence the first drilling activities during Q3 2022. HFS activities will not commence until later in the year (following completion of mandatory baseline water monitoring), with testing activity to follow directly after the completion of HFS activities.

Sweetpea proposes to commence drilling a vertical pilot exploration well and horizontal exploration well on Pad 1 (or alternatively Pad 3 or Pad 4) in the northern area of EP136. Sweetpea plan to drill a vertical and horizontal well pair in 2022 (i.e. a single well head and a single well as it relates to the seven wells approved under this EMP) in 2022, as outlined below, pending funding, timing of necessary approvals and schedule. The well is estimated to take up to 70 days to drill, up to approximately 30 days for HFS, followed by testing over 30 to 90 days. Approval is sought for the possibility of testing up to 300 days if testing data are ambiguous and a greater volume of data are required to inform future exploration and appraisal activities, this is considered more likely on the earlier wells in this seven-well program. Fracture stimulation and testing of these wells could occur in 2022 or 2023 pending timing of rig release, approvals and baseline water monitoring, and other necessary preparations.

A high-level, indicative activity schedule for drilling, fracture stimulation and testing operations, is summarised below (note that some steps occur in parallel not in sequence) and in Table 8; testing and well maintenance activity is assumed to be ongoing throughout the period once wells are brought online for testing. The priority and order of wells and lease pads may be varied pending operational readiness, access feedback from stakeholders, and/or exploration results, however, there will be no change to the risk assessment and/or impact as a result of such schedule variations and Sweetpea will provide updates to DEPWS, DITT and any impacted stakeholders.

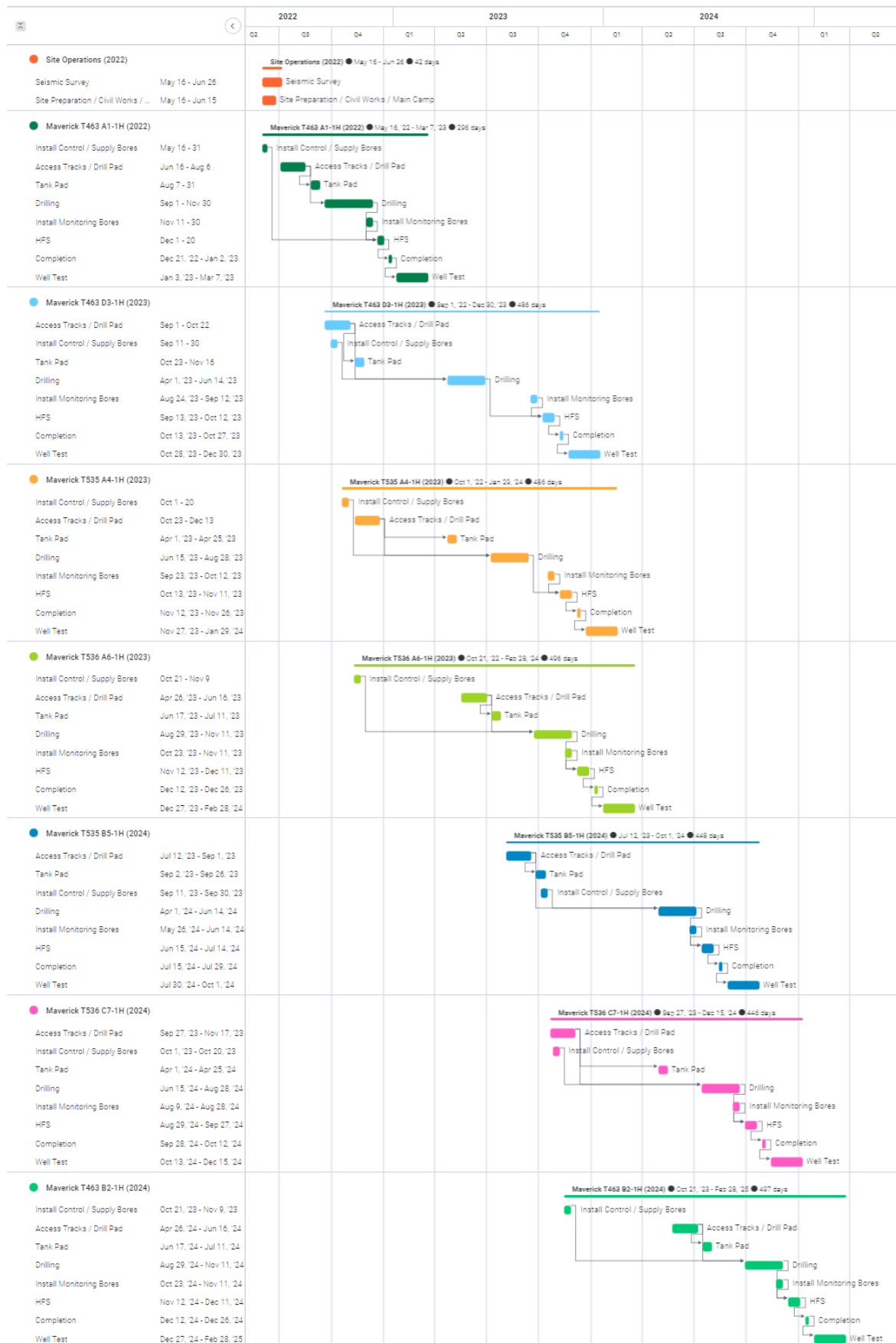
- **May – December 2022:** Well 1 “Maverick T463 A1-1H” planned at Lease Pad 1.
 - a. Mobilise drilling rig and associated facilities to Lease Pad 1 pending readiness and other prioritisation factors (well name and exact Lease Pad will be advised to DITT and DEPWS prior to spud).
 - b. Mobilise and construct camp as needed at “Well 1” or one of the main camp locations at Highway Camp or Lease Pad 1 Camp.
 - c. Progressively mobilise and fill water tanks as needed.
 - d. Drill vertical pilot hole at “Well 1” to a prognosed total depth of approximately 2,500-3,500 m.
 - e. Prepare well for horizontal drilling as per Sweetpea’s Well Operations Management Plan (WOMP) by cementing deepest section of the pilot hole and setting a kick-off plug or whip-stock.
 - f. Drill, case and cement horizontal well and test as required under WOMP to confirm well acceptance criteria are met.
 - g. Mobilise hydraulic fracture stimulation and testing spread and other necessary equipment progressively to “Well 1”.
 - h. Undertake multi-stage hydraulic fracture stimulation operations and commence testing operations at “Well 1” (not to commence until water monitoring requirements are met).
 - i. Demobilise and/or stack drilling rig and hydraulic fracture stimulation spread and equipment for wet season.
- **April – December 2023:** Well 2 to Well 4 planned at Lease Pad 3 “Maverick T463 D3-1H”, and Lease Pad 4 “Maverick T535 A4-1H” and Lease Pad 6 “Maverick T536 A6-1H”, or Pad 5 “Maverick T535 B5-1H” or Pad 7 “Maverick T536 C7-1H”
 - a. Mobilise drilling rig and associated facilities to Well 2 pending readiness and other prioritisation factors.
 - b. Progressively mobilise and fill water tanks as needed.
 - c. Drill vertical pilot hole at Well 2 to a prognosed total depth of approximately 2,500-3,500 m.
 - d. Prepare well for horizontal drilling as per Sweetpea’s (WOMP) by cementing deepest section of the pilot hole and setting a kick-off plug or whip-stock.
 - e. Drill, case and cement horizontal well and test as required under WOMP to confirm well acceptance criteria are met.
 - f. Mobilise rig and other necessary equipment and material to “Well 3” and repeat steps (b) to (e).
 - g. Mobilise rig and other necessary equipment and material to “Well 4” and repeat steps (b) to (e).
 - h. Mobilise hydraulic fracture stimulation and testing spread and other necessary equipment progressively to “Well 2”.
 - i. Undertake multi-stage hydraulic fracture stimulation operations and commence testing operations at “Well 2”.
 - j. Mobilise hydraulic fracture stimulation and testing spread and other necessary equipment progressively to “Well 3”
 - k. Undertake multi-stage hydraulic fracture stimulation operations and commence testing operations at “Well 3”.
 - l. Mobilise hydraulic fracture stimulation and testing spread and other necessary equipment progressively to “Well 4”.
 - m. Undertake multi-stage hydraulic fracture stimulation operations and commence testing operations at “Well 4”.

- n. Demobilise and/or stack drilling rig and hydraulic fracture stimulation spread and equipment for wet season.
- **April – December 2024**, and thereafter: Well 5 to 7 planned at Lease Pad 5 “Maverick T535 B5-1H”, and/or Lease Pad 7 “Maverick T536 C7-1H” and/or Lease Pad 2 “Maverick T463 B2-1H”
 - a. Mobilise drilling rig and associated facilities to “Well 5” pending readiness and other prioritisation factors.
 - b. Mobilise and construct camp as needed at “Well 5” or one of the main camp locations at Highway Camp or Lease Pad 1 Camp.
 - c. Progressively mobilise and fill water tanks as needed.
 - d. Drill vertical pilot hole at “Well 5” to a prognosed total depth of approximately 2,500-3,500 m.
 - e. Prepare well for horizontal drilling as per WOMP by cementing deepest section of the pilot hole and setting a kick-off plug or whipstock.
 - f. Drill, case and cement horizontal well and test as required under WOMP to confirm well acceptance criteria are met.
 - g. Mobilise rig and other necessary equipment and material to “Well 6” and repeat steps (c) to (f).
 - h. Mobilise rig and other necessary equipment and material to “Well 7” and repeat steps (c) to (f).
 - i. Mobilise hydraulic fracture stimulation and testing spread and other necessary equipment progressively to “Well 5”.
 - j. Undertake multi-stage hydraulic fracture stimulation operations and commence testing operations at “Well 5”.
 - k. Mobilise hydraulic fracture stimulation and testing spread and other necessary equipment progressively to “Well 6”.
 - l. Undertake multi-stage hydraulic fracture stimulation operations and commence testing operations at “Well 6”.
 - m. Mobilise hydraulic fracture stimulation and testing spread and other necessary equipment progressively to “Well 7”.
 - n. Undertake multi-stage hydraulic fracture stimulation operations and commence testing operations at “Well 7”.
 - o. Demobilise and/or stack drilling rig and hydraulic fracture stimulation spread and equipment for wet season.
 - p. Ongoing well testing operations, maintenance, workover and ancillary activity as required.

Sweetpea will implement their wet weather contingency plan as detailed in Appendix B should exploration activities continue past 1 October each year.

All activities associated with the plugging, abandonment, decommissioning and ~~/~~or remediation of wells will be completed after testing and monitoring has been completed. The timing of closeout activities will be dependent on the outcome.

Table 8 Gantt Chart of Exploration Program



3.2 Site Selection, Access and Preparation

Selection of exploration well locations is a critical step in the exploration workflow. Several factors are important to consider in any onshore exploration program, and for unconventional reservoir targets there is a degree of flexibility that allows these various factors to be considered more equally than for conventional oil and gas exploration.

Subsurface teams define priority areas where exploration or appraisal wells will provide data that are critical to understanding the potential of a play and/or prospect, progress resource and/or reserve maturation, or otherwise contribute to a new discovery or appraisal of a previous discovery. These priority areas can then be considered in terms of other factors, including but not limited to:

- a. Pastoral leaseholder operations
- b. Traditional Owner sacred sites, sites of significance, or other preferences
- c. Existing access and/or level of disturbance to create appropriate access
- d. Overland flow and/or flooding risk based on elevation data and water-course mapping (particularly in areas affected by monsoonal, wet-season storms)
- e. Other environmental factors as determined from scouting, land-condition assessments and any other relevant inputs.

Sweetpea have selected seven locations in the prospective Velkerri Formation fairway across the north of EP136, which will provide critical data and, in an exploration success case, lead to a discovery and a maiden resource booking. The organic-rich shales in the Amungee Member of the Velkerri Formation are the primary exploration targets for this program and are prognosed to be encountered between approximately 2,700m and 3,100m subsurface – this is considered an optimal depth for this reservoir target based on results in offset wells. In addition to the subsurface location criteria, each of the sites is also located to avoid low-lying areas, utilise existing access infrastructure (or land areas disturbed by 2D seismic survey lines), and avoid sacred sites as advised by AC2020/072. These selection criteria ensure the exploration program impact is minimised.

3.2.1 Highway Intersection

Junctions from the Carpentaria Highway onto EP136 will be used for the duration of activities and in accordance with the DIPL - Road Operations specifications applicable to the use and type of traffic anticipated. Intersection design details and approval was covered under the C&WB EMP.

3.2.2 Access Tracks

The regulated activity plans to use the access track created under the C&WB EMP (r22) off the Carpentaria Highway to Lease Pad 1. Subsequent access tracks will be constructed under the C&WB EMP to provide the access to all planned exploration lease pads. The primary access option is Western Access Track (WAT) – 34.14 km length x 18 m wide (Figure 6).

The constructed access tracks will be useable throughout the dry season, providing access for a range of exploration vehicles, including drill rigs and trucks (up to a double trailers) that will deliver materials and equipment to the lease areas. Access tracks used during the wet season will be subject to the wet weather contingency plan detailed in Appendix B. The WAT avoids RWA2 entirely.

Creek crossings and identified floodway's that are intersected by the WAT access tracks may require rock protection to manage and minimise erosion. Water crossings will be constructed under the C&WB EMP and maintained for duration of Sweetpea's activities.

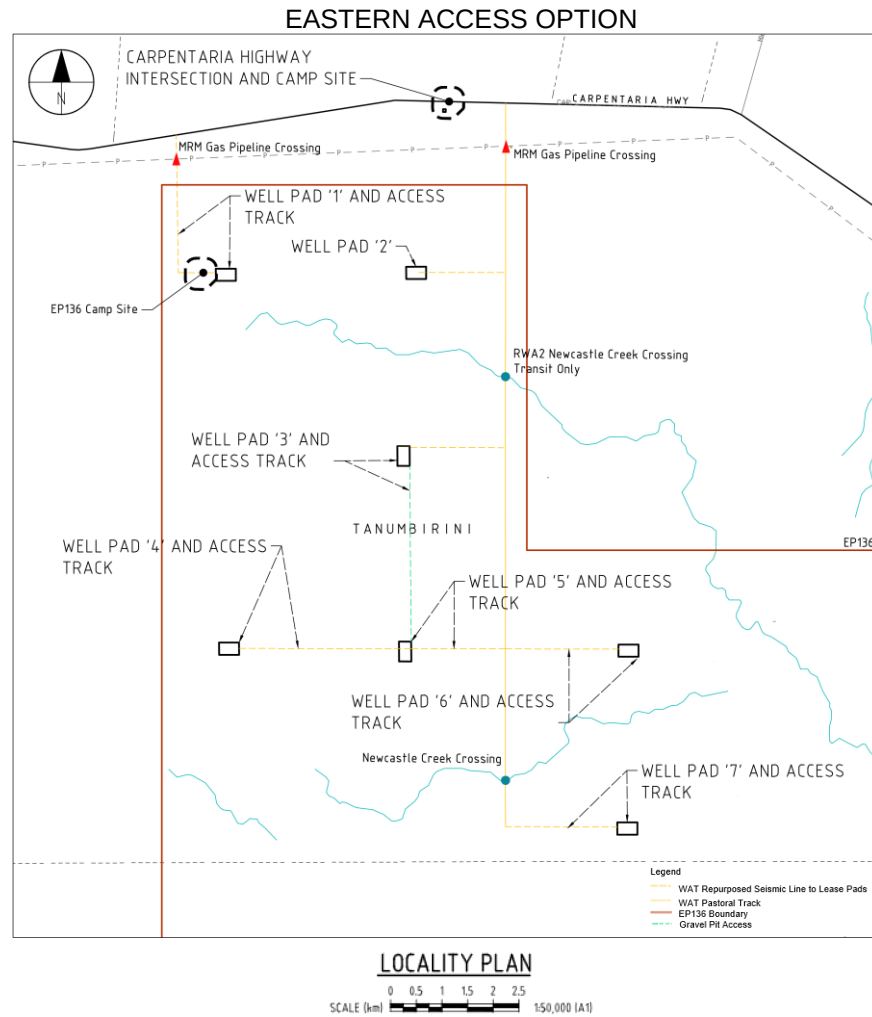


Figure 5 Eastern Access Track Option

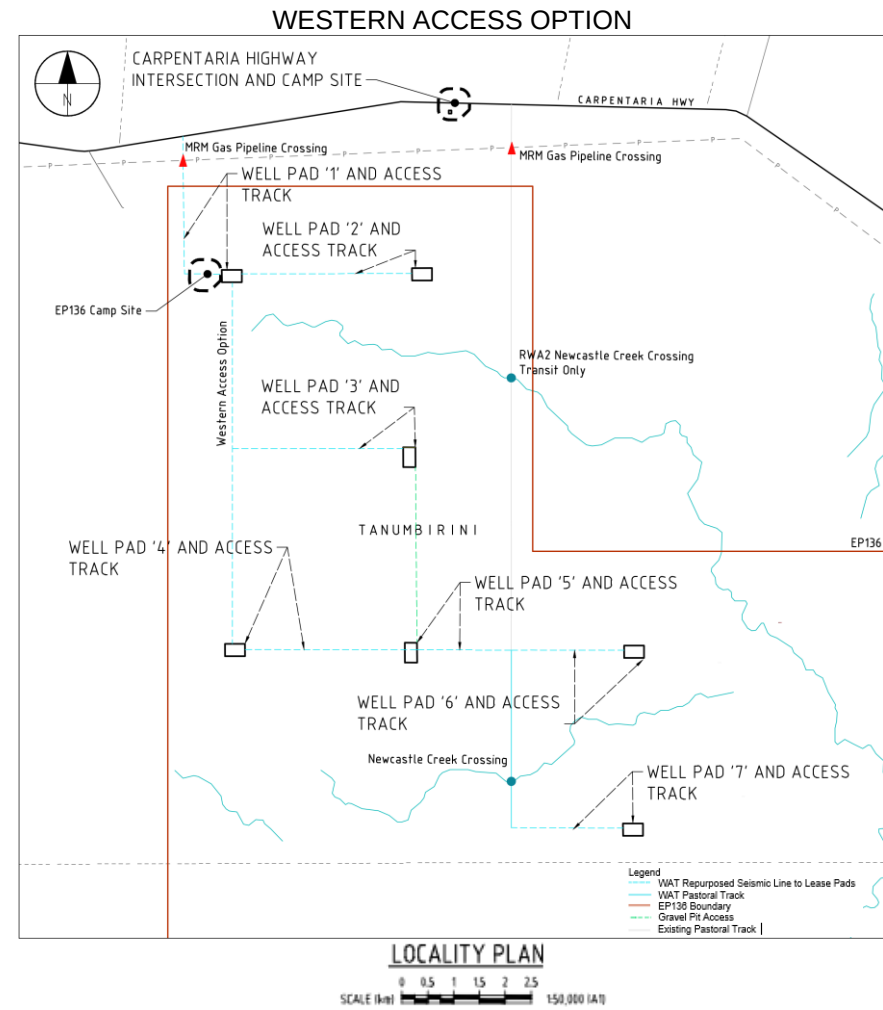


Figure 6 Western Access Track Option

Access off the Carpentaria Highway will require protection measures for the MRM gas pipeline. The protection measures will be implemented under the C&WB EMP and will be maintained over the course of the exploration program. Sweetpea will obtain a works approval from PowerWater asset provider OSD Pipelines and implement the specific conditions, including:

- Installation of a 25 mm steel plate (3 m x 5 m) over the pipeline at locations where crossed by exploration vehicles.
- All camps and office demountables are to be placed at least 300 m from the pipeline centreline (outside the pipeline radiation contour).
- The pipeline easement shall not be used for stockpiling, storage, laydown or parking area.

3.3 Exploration Lease Pads

The construction of seven exploration lease pads on Tanumbirini PPL is covered in the Sweetpea C&WB EMP approved in January 2022.

Just off the well pad, water tank pads will hold water in tanks used for drilling and/or HFS activities and/or to store flowback fluids. Figure 7 shows a conceptual well pad and tank pad layout, noting the layout may vary to accommodate local factors and type of drilling rig and tanks used. The cleared area specific to the individual well pad is 280 m x 260 m (72,800 m²). This encompasses the well pad (nominal 180 m x 180 m), which will be compacted, and an external perimeter area of 20 m width to cater for soil stockpiling and a firebreak. An additional 20 m buffer of managed vegetation will form an asset protection zone.

The water tank pads will be constructed under the C&WB EMP and will be similar to those for well pads without the requirement of a flare pit, cellar and sump. The cleared area for each individual tank pad will optimise the layout of the pad to maximise the water storage capacity within the approved clearing footprint (~36,800 m²). The water tank pad will include the tank pad area, an external area of 20 m for soil stockpiling and a fire break around the perimeter and a 20 m managed vegetation zone. The proposed disturbance does not exceed the 11 ha approved under the C&WB EMP.

Proposed tanks have a 10-15 ML capacity (depending on final configuration), are enclosed (floating top), and double lined. Tank size may vary and Sweetpea may use open top tanks for storage or evaporation as per requirements of the Code. All tanks will be equipped with the safety features required by the Code as detailed in Appendix F and Appendix G.

Typical tank features include:

- Vents as required (if enclosed)
- Leak detection system
- Radar tank level
- Satellite connection and real time monitoring and leak detection alerts
- Data recording of tank level data in a secure online system of record for retrieval at any time
- Geomembrane underneath liners for added protection
- Liners for all above ground storage tanks will meet or exceed all requirements for permeability, puncture and tear standards.

Other details for the conceptual exploration lease pad layout include:

- Access track that allows for a one-way in-out traffic flow that cater for up to a double trailer.
- Lease Pad drainage and erosion control including:
 - Raised bunds around the site perimeter to contain fluids on the compacted site and prevent free flowing water on to the site.
 - Slightly grade towards the edges of the pad away from the rig hardstand area with a 1% fall and may contain internal drainage channels or diversion berms to direct free surface fluids towards the sediment basin.

- Sediment basin that captures stormwater runoff. The stored water after rainfall event would be visually assessed (no visible oil, grease or other hydrocarbons) and physical parameters (pH, EC) taken to ensure the discharged water will not impact downgradient sensitive receiving environments. Appendix B provides the trigger action response plan (TARP) to be implemented to demonstrate water quality indicators are met. Where water quality meets the site indicators, water may be beneficially used on-site (for dust suppression) or discharged offsite. Laboratory testing would only be required where a known contaminating event had occurred in the preceding three months that may influence stormwater quality, visual inspection indicate potential contamination or where there is a sensitive receiving water body within 200 m of the discharge point.
- Fencing –stock proof fencing will be installed around the perimeter of the well pad and water tank pad and cattle grids will be installed at the entrance/exit points. A “hump” or “rise” will be installed at these entrance points to the pads to act as a barrier to water flow onto or off the pad in lieu of the perimeter bund (Appendix B).
- Mud sump – currently designed as a simple excavated rectangular pond with two compartments and compacted above ground bund of 0.3 m around the perimeter with the liner running up and over the bund. The size of the mud sump will give sufficient volume for drilling mud storage with freeboard of 1.3 m (see Section 3.10.5 for details of 1.3m freeboard estimate). The sump shape and layout may be modified to suit specific drilling rig requirements. Mud sump capacities will range from 2,000 m³ to 2,750 m³ to accommodate the range in horizontal well lengths covered in this EMP.
- Mud sump liner – the liners for the mud sump will meet the requirements of section C.4.1.2 of the *Code of Practice: Onshore Petroleum Activities in the NT (2019)*.
- Cellar design and specifications will be tailored to the selected drilling rig for each campaign of work but as a typical design it will consist of a steel plate walled cellar with a cement base and dimensions of 1.8 m deep x 3 m x 2.1 m. The ~6 mm steel plate walls of the cellar will be prefabricated with an access ladder on one corner of the cellar for use once installed. The cellar will have a nominal 20” conductor casing installed by a water drilling rig.
- Drilling (emergency) flare pit – the excavated earth is to be built up around the three sides of the flare pit away from the side where the flare line enters the pit (rig side) such that an earthen wall of ~2 m in height exists to contain the flare.
- Fire breaks / fire zone management – comprises a 10 m perimeter cleared around the lease pad, perimeter bund, fencing, a 10 m firebreak that encompasses a 4 m fire trail, and a 20 m perimeter functioning as a managed vegetation zone. This area comprises an asset protection zone around infrastructure (Appendix I).

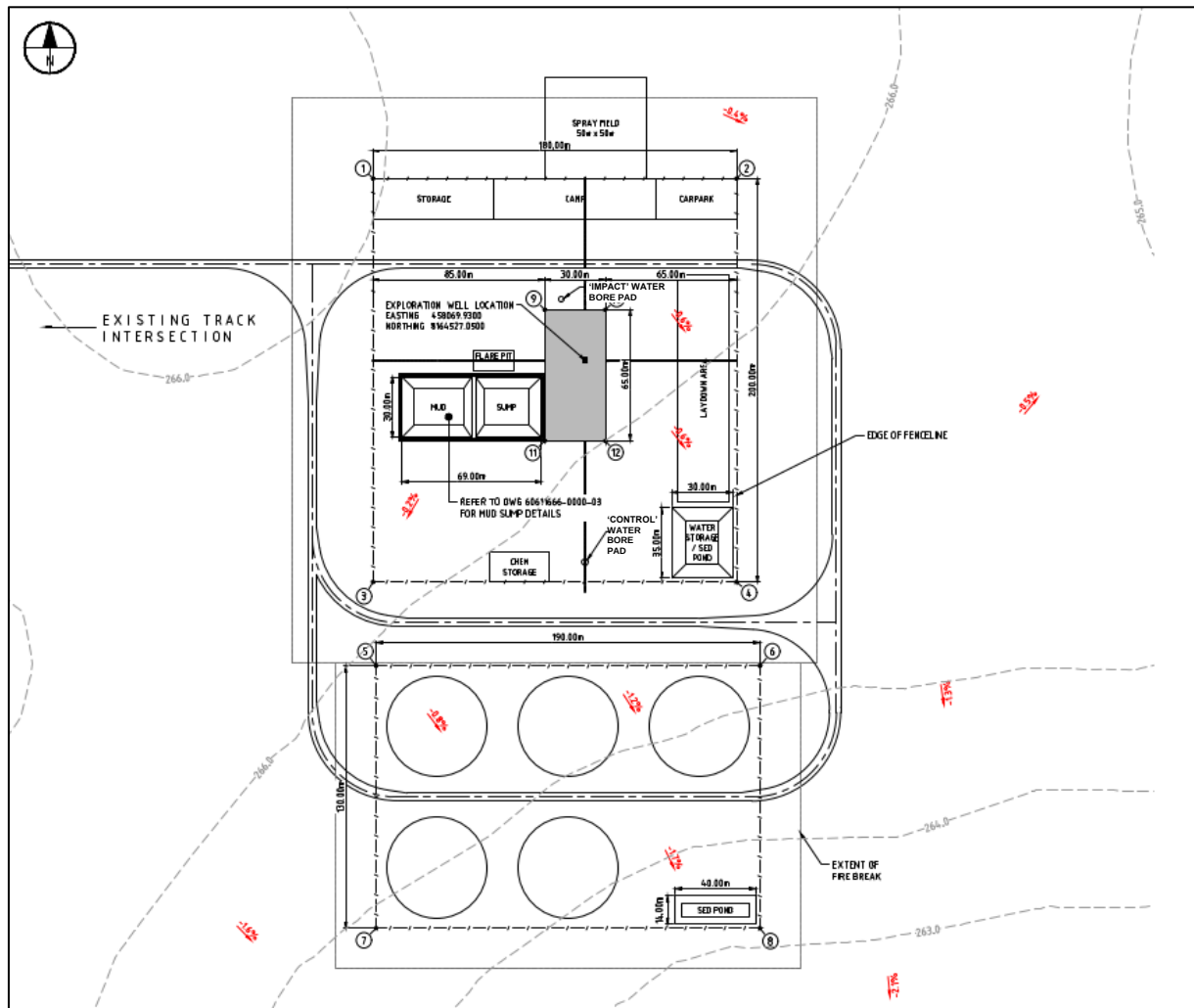


Figure 7 Conceptual well pad lay out

3.4 Groundwater Monitoring

In accordance with the *Preliminary Guideline: Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-basin* (DENR, 2018) (Guideline), Sweetpea will install control monitoring bores (CMB) and impact monitoring bores (IMB) for all wells drilled for HFS and undertake routine monitoring as detailed in Table 9.

Due to land access constraints outside of Sweetpea's control it has not been possible to install a CMB at the Maverick T463 A1-1H well location earlier than July 2022, and therefore it is not possible to acquire six months of local baseline data prior to the proposed commencement of drilling of Maverick T463 A1-1H in September 2022. However, the circumstances that have prevented Sweetpea from obtaining a longer series of baseline data are exceptional, as detailed below. Moreover, there are substantial regional baseline data, that combined with multiple samples from the Maverick T463 A1-1H CMB from July to September 2022, provide a sufficient pre-drill baseline. Finally, Sweetpea will acquire at least the required six months of baseline monitoring data prior to the commencement of HFS activities, as mandated by the CoP.

Table 9 Water quality and quantity monitoring plan

Monitoring Program	Location	Factors Assessed/Actions		Frequency
		Quality	Quantity	
Risk Analysis Reviews	Operationally, office based	Review of the monitoring programs outcomes	NA	Annual review, or as required due to incidents or events relevant to water quality
Baseline water quality	CMBs IMBs	NTG and Baseline water quality testing of two nearby bores (AECOM, 2015)	Water level of the Gum Ridge aquifer. Tracking of water level when taking samples.	CMB: A minimum of six samples across an approximately six-month period before undertaking hydraulic fracturing
General water	Any extraction bore	Bore water tested for analytes, as described in Table 6 of the Code Electrical conductivity (EC) data will be collected at completion of monitoring bores and continue until well decommissioning	EC tested when taking samples.	IMB: Quarterly for one year and then annually, or as required due to incidents or events relevant to water quality
			Water volume extracted will be measured using flowmeters	Continuous recording during extraction periods for compliance with water extraction licence conditions
Drill cuttings	Shakers and pits	Representative samples of drilling fluids and cuttings for analytes as described in Section C.8 and Table 9 of the Code	Based on drilling data and estimated at demobilisation	As required to inform quality and at drilling rig demobilisation
Drilling fluids	Pits			As required to inform quality and at drilling rig demobilisation
Fluid levels	Pits and tanks	Numerical telemetry monitoring and visual inspections		Continuous, while operational (6 hourly logging) Daily visual inspections.

Regarding the exceptional circumstances that have prevented Sweetpea from acquiring baseline data earlier than July 2022, it is relevant that Sweetpea has been in discussion with the Tanumbirini Station owners since mid-2020 in relation to Sweetpea's proposed activities (see Appendix D for further details). In the absence of productive engagement or negotiations during 2020, Sweetpea provided a draft land access agreement in December 2020. The draft agreement was not agreed, and no subsequent agreement was reached between the parties, and the following then occurred:

- Sweetpea applied to DITT on 14 April 2021 to appoint a mediator for pre-transition Alternative Dispute Resolution (ADR) with Rallen.
- A mediator was appointed by the Department on 31 May 2021.
- Facilitated negotiations with the mediator occurred on 28 July, 6 August and 11 August 2021.
- The mediator terminated the ADR process without success on 12 August 2021.
- An initiating application was filed with the Northern Territory Civil and Administrative Tribunal (NTCAT) on 13 August 2021.

- The matter, Sweetpea Petroleum Pty Ltd v. Rallen Australia Pty Ltd, was heard before NTCAT 8-10 December 2021.
- NTCAT judgements were then received on 7 Feb 2022.
- An Approved Access Agreement, however, was not determined until 4 May 2022.

Given the above, it was not possible for Sweetpea to access EP136 for the purposes of installing a CMB until late May 2022. In practice, it was not possible to access the specific Maverick T463 A1-1H CMB site until mid-June as it was first necessary to undertake civil construction activities to provide access to the location and to provide an appropriate location for water bore drilling activities to be undertaken. Sweetpea moved as quickly as feasibly possible to install a CMB at the Maverick T463 A1-1H location and commence sampling of that CMB.

Sweetpea will commence groundwater monitoring immediately upon completion of the CMBs prior to the start of exploration drilling (target 8 samples over 1-2 months). This monitoring is in addition to the CoP mandated six months of monitoring prior to the commencement of HFS activities and not in lieu of such monitoring.

Based on Sweetpea's interpretation of the hydrogeology of the area and data from offset wells we anticipate a good quality Gum Ridge aquifer and unsaturated Anthony Lagoon Beds (i.e. no aquifer to monitor in the Anthony Lagoon Beds). However, Sweetpea will be prepared to install monitoring bores in the Anthony Lagoon Beds if it is determined to be an aquifer at this location. The first water bore drilled at each pad will be drilled to test the full thickness of the Cambrian Limestone sequence to understand the hydrogeology and inform monitoring requirements.

The monitoring array Sweetpea are proposing includes one to two groundwater bores constructed upgradient (CMB) and one to two groundwater bores downgradient (IMB) of the exploration well, one IMB and one CMB in the Gum Ridge Formation and potentially one IMB and one CMB in the Anthony Lagoon Beds if determined to be an aquifer (Figure 8 to Figure 11). Additional monitoring bores may be required if additional aquifers were to be identified at any of the well locations, this would require consultation and agreement with DEPWS Water Resources Division. Based on the location of the proposed exploration wells relative to the Tanumbirini and Inacumba area water bores on the adjacent EP161, Sweetpea do not expect to intersect a third aquifer.

Sweetpea will gather data from CMBs and any other water bores available for monitoring (e.g. camp bore) and confirm the groundwater gradient before finalising the location(s) of IMBs to ensure they are downgradient of the exploration well(s).

The approvals for installation of the groundwater bores are subject to separate EMPs, namely the Seismic and Water Bore EMP (SWP1-4) and the Civil Construction and Water Bore EMP (SWP2-3).

Sweetpea will provide DEPWS electronically with baseline data and monitoring data for water as part of the reporting requirements of this EMP.

Groundwater monitoring events will be undertaken by suitably qualified and trained personnel as required by the Code of Practice and will follow standard industry practice including the draft *Preliminary Guideline: Groundwater Monitoring Bores for Petroleum Wells in the Beetaloo Basin*, the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC Guidelines) and *AS/NZ5667.1: 1998. Water Quality - Sampling Guidance on sampling of groundwaters*. It is noted that National Association of Testing Authorities (NATA) accredited laboratories will be utilised for analysis of all samples, unless there are no NATA laboratories for a specific analyte/substance. In this instance, duplicate samples would be provided to two separate laboratories for independent testing in accordance with the Code.

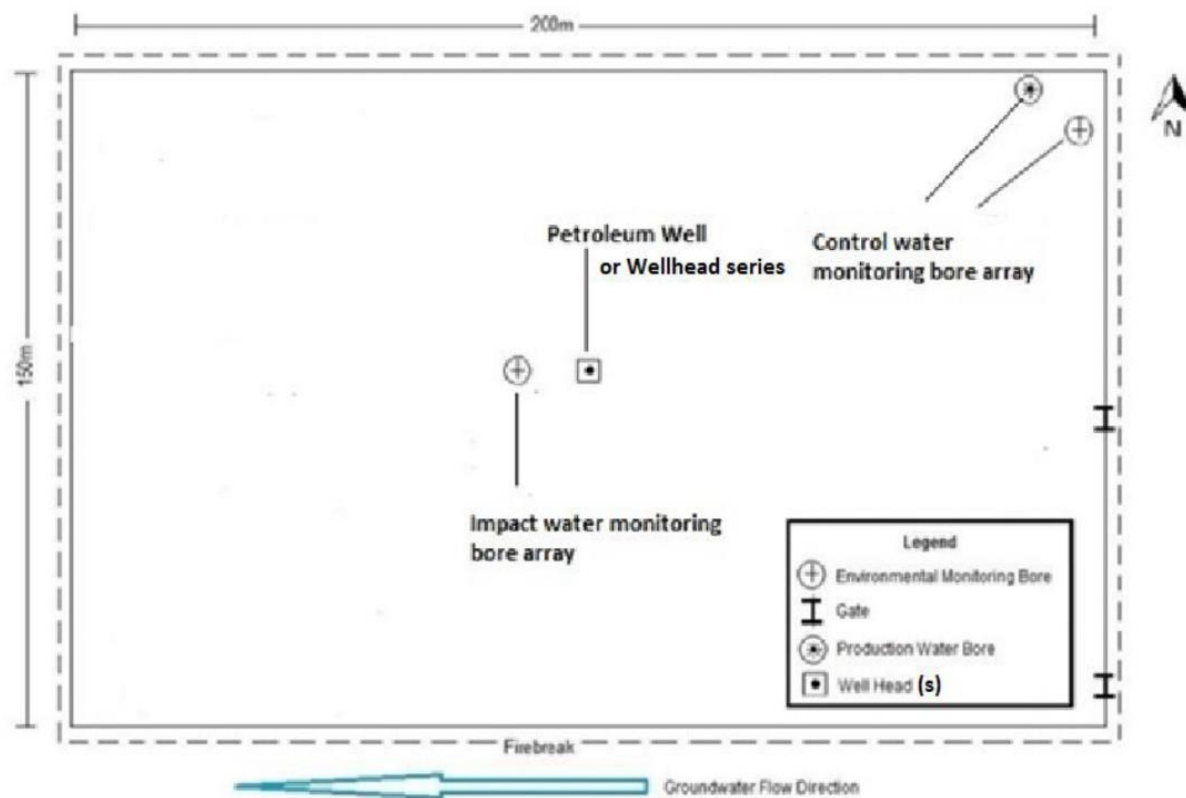


Figure 8 Indicative monitoring bore layout on a petroleum well pad (adopted from the DENR Preliminary Guideline, November 2018)

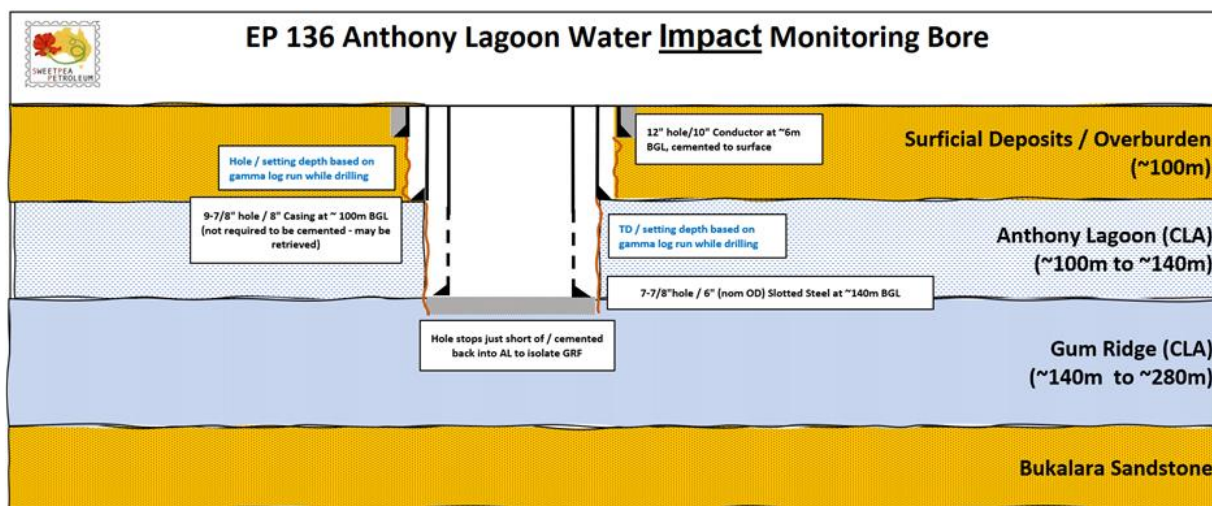


Figure 9 Proposed design for upper aquifer, Anthony Lagoon monitoring bore

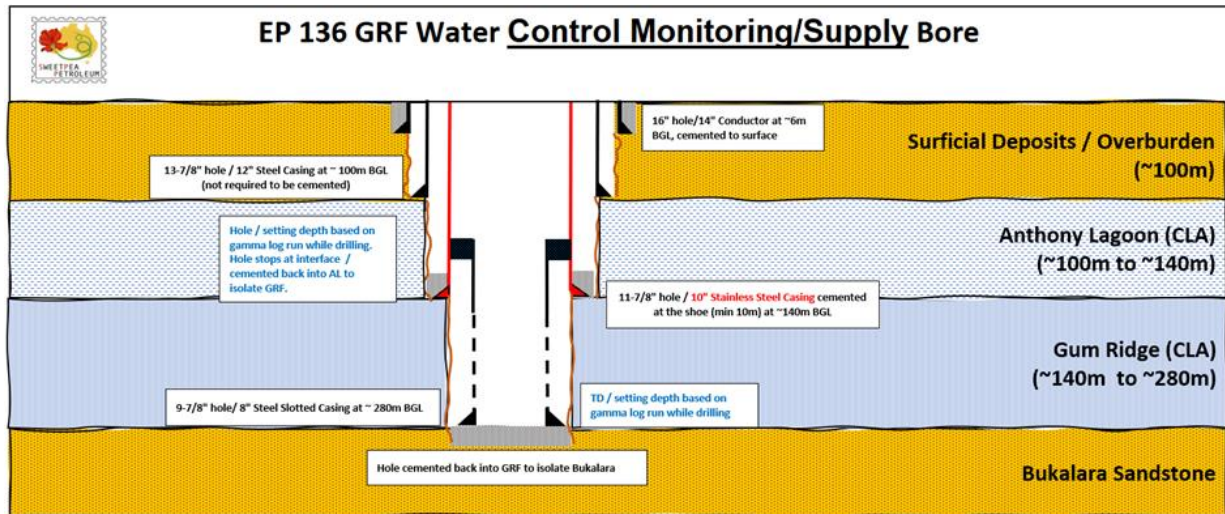


Figure 10 Proposed design for lower aquifer, Gum Ridge Formation monitoring bore

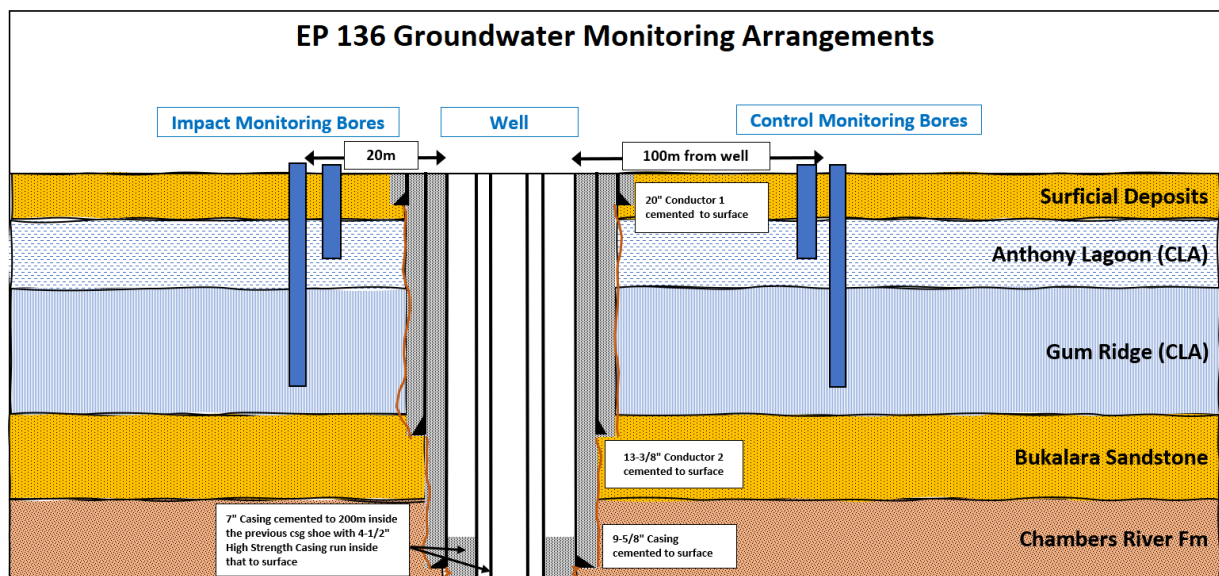


Figure 11 Schematic of groundwater monitoring array showing approximate distances to the petroleum exploration well.

3.5 Exploration Well Drilling

3.5.1 Well Summary, Evaluation and Reservoir Targets

The wells proposed under this EMP are exploration and appraisal wells targeting the deep, organic-rich shales of the Velkerri Formation (Figure 12). The presence and prospectivity of the Velkerri Formation in this area is established by a number of offset wells (summarised in Section 3.2 of the WOMP) and 2D seismic data.

The prognosed formation depths for these wells are summarised in Table 10; to confirm the depth of the target intervals within the Velkerri Formation, a vertical pilot well will be drilled at each exploration lease, to an expected depth of 3,250 m +/- 200 m TVD (however, the ultimate total depth could be greater or lesser than this estimate but is not anticipated to impact environmental risk) with a fit-for-purpose drilling rig (Figure 12). A horizontal sidetrack with a 1,000 - 3,000 m lateral length will then be drilled from the pilot well, into the selected target (Figure 12). It is noted that subsurface well paths will not go outside the EP136 boundary or cross over Beetaloo Station boundary.

Once drilled to the well total depth (TD), the horizontal well will be cased from surface to TD and cemented in place using fit-for-purpose casing and cement selected for the specific well conditions, as detailed in the WOMP.

The anticipated vertical offset between the deepest potential aquifer (Bukalara Sandstone) and the target formation for horizontal drilling (Amungee Member, Velkerri Formation) is over 2,000 m.

Evaluation of the vertical pilot wells will be necessary to select the optimal target (or 'landing zone') for the horizontal well. Proposed well evaluation activities could include, but are not necessarily limited to:

- Mud-logging (including X-ray fluorescence or XRF analysis of cuttings)
- Logging while drilling (LWD) or measurements while drilling (MWD)
- Wireline logging
- Formation testing
- Core acquisition
- Fluid sampling
- Open-hole formation integrity testing, such as leak-off tests (LOT), formation integrity tests (FIT), or diagnostic fracture injectivity tests (DFIT).

Drill cutting samples will be collected and stored for all wells (as per NTG requirements), and Sweetpea expect to acquire full-hole core on at least one exploration well to calibrate wireline log data and aid post-well evaluation. Wireline logging of the deepest ("TD") section of each well is planned, as per NTG requirements, with logging of the intermediate hole section considered contingent. Wireline and mud-logging data, in addition to any other evaluation data, will be used to define the optimal zone within the Amungee Member to target with a horizontal side-track. The selection of either the "A Shale", "B Shale" or "C Shale" target within the Amungee Member will not impact any risk assessments or well integrity aspects of the wells. All evaluation operations will be conducted as per the WOMP and Code (section B.4.12).

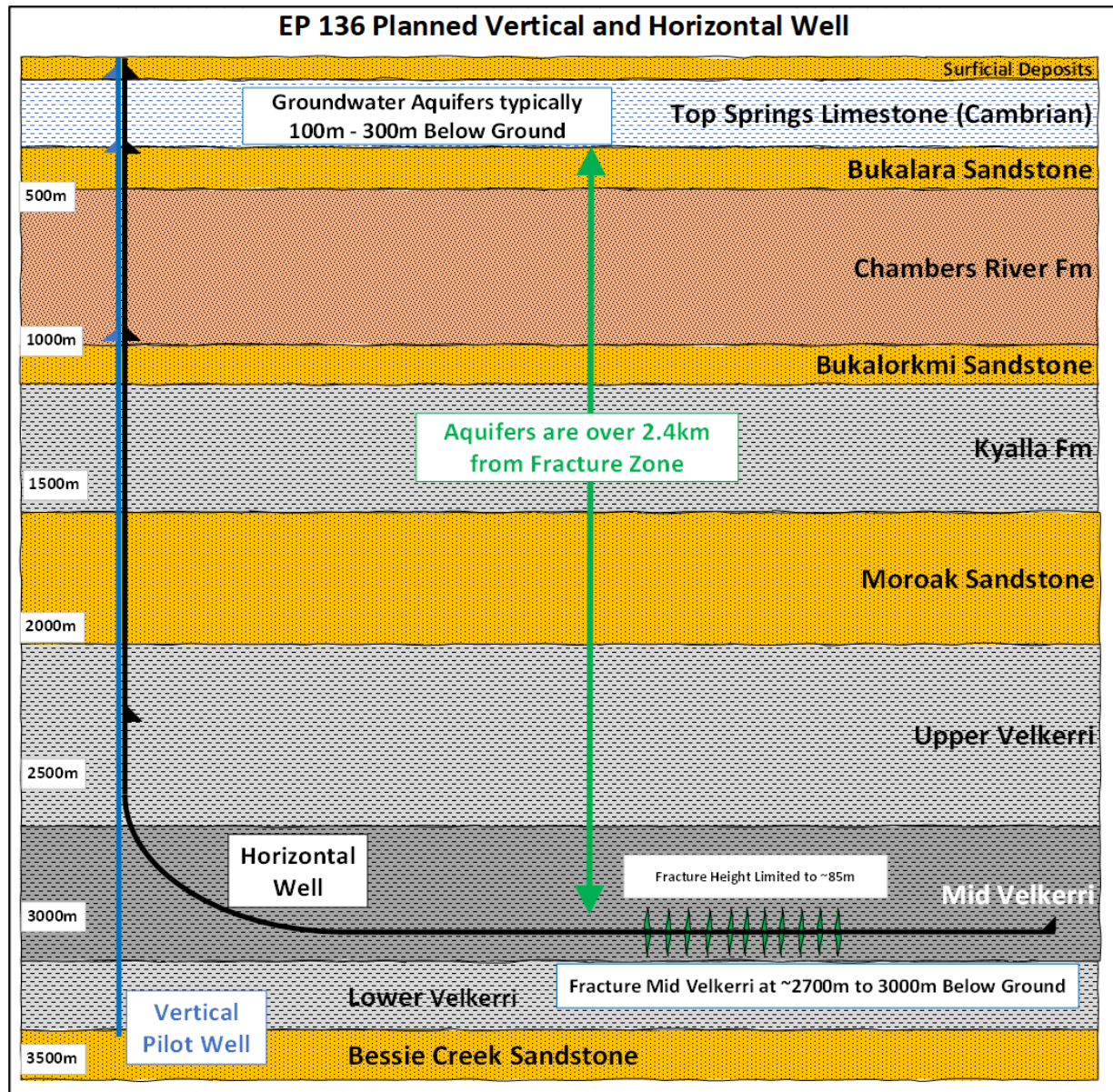


Figure 12 Example schematic of a vertical and horizontal well profile

Table 10 EP136 Prognosed Formations and Lithology

Formation	Top (mTVDGL)	Unit Thickness (m)	Lithology w/n Unit
Undifferentiated sediments	0	~60	Dominantly lateritised claystone with minor sandstone and conglomerate possible.
Cambrian Limestone Aquifer*	42-72	~250	Limestone, dolomitic limestone, siltstone.
Bukalara Sandstone	288-318	~170	Dominantly fine to very coarse-grained friable sandstone; thin to very thick-bedded. Some siltstone and claystone present.
Chambers River Formation (Hayfield Mudstone)	288-487	~560	Dominantly claystone with some siltstone, moderately hard.
Bukalorkmi Sandstone	799-1,049	~150	Well sorted siltstones and sandstones.
Kyalla Formation	946-1,196	~600	Light to medium grey siltstones and fine grained sandstones.
Moroak Sandstone	1,539-1,789	~500	Mixed siltstone and sandstone, variable colour from white, dark red, brown and grey.
Upper Velkerri (Wyworrie Member)	22,039-2,289	~450	Medium grey to dark grey siltstone.
Middle Velkerri (Amunsee Member)	2,492-2,742	~285	Medium grey to black organic shale to siltstone with some light grey silt lamination.
Lower Velkerri (Kalala Member)	3,002-3,252	~180	Medium grey to dark grey siltstone.
Bessie Creek Sandstone	3,181-3,431	-	Quartz sandstone, fine to medium and locally coarse grained

*In the Beetaloo Sub-basin area likely to be Ooloo Dolostone, Anthony Lagoon Formation and equivalents, and Gum Ridge Formation and equivalents.

3.5.2 Well Operations Management Plan

In addition to this EMP, Sweetpea has prepared a WOMP to cover the drilling, HFS, and extended production test (EPT) activities proposed in this EMP. The WOMP identifies the technical and managerial aspects of managing well integrity and must meet the requirements of Part B of the Code. The WOMP has been submitted to DITT for review and approval and Sweetpea can provide a copy of the WOMP to DEPWS if requested and will advise when approval of the WOMP is confirmed by DITT.

As the WOMP must cover requirements detailed in section B of the Code, these requirements are largely not repeated in this EMP to avoid ambiguity between the EMP and WOMP. One exception to this is Aquifer protection, which is addressed specifically in this EMP given that aspects of aquifer protection are partly a function of the geological environment in addition to well construction and well operations.

3.5.3 Well Integrity Management

Well integrity management requirements are covered in the WOMP, which details how the preferred and mandatory requirements of the Code are met, including:

- a. How Sweetpea manages well integrity throughout the full well life cycle through a well integrity management system, and
- b. Well integrity testing and validation criteria.

3.5.4 Aquifer Protection

Protection of aquifers is a key consideration in drilling and well construction activities and is addressed in Section B.4.2 of the Code. Water bore drilling prior to the drilling of a petroleum well provides the critical constraints regarding depth to, thickness, and properties of any aquifer(s) and allows drilling and casing design decisions to ensure that aquifers are isolated appropriately. Casing will be set across the Cambrian Limestone Aquifer interval prior to drilling ahead into permeable formations with saline formation fluids or hydrocarbon bearing zones.

Well acceptance criteria and validation of barriers will be confirmed as per the well design and WOMP and relevant sections of the Code (B.4.3, B.4.6, B.4.7); this ensures that barriers are appropriately designed, constructed, and validated to ensure aquifer protection.

In addition to the barriers designed to protect aquifers, water-based drilling fluids are planned for the exploration wells proposed in this EMP.

To ensure barriers and well integrity are maintained, and that aquifers are isolated after the conductor and surface casing are emplaced, Sweetpea will monitor groundwater in the IMBs as per Section 3.4 and use control data from the CMBs to ensure aquifers remain isolated.

With the current level of understanding of the aquifers within EP136:

- CMBs will be drilled ahead of the exploration drilling operations. Data collected (drill cuttings, gamma ray, water table level) from these water bores, drilled on same lease pad, will be used to evaluate presence of the CLA units in this region.
- If a single unit aquifer is present, the well design and construction will ensure aquifer protection in following way:
 - Top hole section will be drilled to a depth which isolates the shallow aquifer in this region.
 - A conductor casing string will be cemented in place with the expected top of cement at surface, with 'returns' to surface via primary cement job or with the assistance of secondary 'top up' jobs as required to ensure isolation.
 - Subsequently, a surface casing string will be cemented in place with the expected top of cement at surface.
- If the CLA units (Anthony Lagoons and Gum Ridge Formation) are present, the well design and construction will ensure aquifer protection in following way:
 - Top hole section will be drilled to a depth which isolates the shallow aquifers in this region.
 - A casing string will incorporate mechanical barrier placed at the interface of two regional aquifers. The casing will be cemented in place with the cement barrier placed at the interface of the two aquifers with the expected top of cement at surface.
- If a new aquifer is identified during drilling, Sweetpea will provide appropriate notification to the Minister as per section B.4.2.2 (e) of the Code and determine if an EMP revision is required.

Sweetpea note that aquifer protection is extensively covered by the Final Report of the Hydraulic Fracturing Inquiry, which made numerous recommendations that are now adopted in the Code, the Preliminary Guideline on Groundwater Monitoring, and other legislation and regulation.

3.5.5 Well Design and Well Barriers

The contents of this section are covered in the WOMP. Sweetpea's WOMP is under assessment by DITT and approval of the WOMP is required before the regulated activities under this EMP are carried out. Sweetpea will provide DEPWS notification when DITT approves the revised WOMP.

3.5.6 High-pressure High-temperature Well Design

Temperature: as per the WOMP, a bottom-hole temperature of approximately 144°C is anticipated for the proposed exploration wells. Sweetpea does not expect to exceed the 150°C This is based on analysis of offset well data.

Pressure: as per the WOMP, anticipated pore pressures are below the "High Pressure" definition of Section B.4.4 of the Code. This is based on analysis of offset well data.

3.5.7 Hydrogen Sulphide (H₂S)

No operators have reported H₂S while drilling, or during production tests, in offset wells, and the presence of H₂S is not anticipated in the EP136 exploration wells.

3.5.8 Casing and Tubing, Primary Cementing, Wellheads

Casing and tubing selection and well construction, including the cement program and wellheads, are covered in the WOMP. Sweetpea's WOMP is under assessment by DITT and approval of the WOMP is required before the regulated activities under this EMP are carried out. Sweetpea will provide DEPWS notification when DITT approves the revised WOMP.

3.5.9 Well Control

Well control procedures are covered in the WOMP and are finalised in collaboration with a Drilling Contractor prior to spud. Given the nature of reservoir targets (low permeability shales), wells will be drilled overbalance to prevent a kick or flows. Further details are provided in the WOMP, which is under assessment by DITT and approval of the WOMP is required before the regulated activities under this EMP are carried out. Sweetpea will provide DEPWS notification when DITT approves the revised WOMP.

3.5.10 Drilling Fluids

Drilling fluids (or drilling "muds") are necessary to ensure effective drilling and to lift formation cuttings to the surface. Proposed drilling fluids are detailed for each well section in the WOMP under assessment by DITT. All proposed drilling fluids are water based and designed to ensure low toxicity, with no benzene, toluene, ethylbenzene, or xylene (BTEX) additives (refer Appendix C).

Drilling fluids will be stored in fit-for-purpose mud tanks and/or drill sumps, and formation cuttings transferred to the cuttings pit. Drilling fluid management, including monitoring of drilling fluids and cuttings is covered in more detail in Appendix F WWMP.

3.5.11 Air and Gas Drilling Fluids

Air and gas drilling fluids are not proposed for use under this EMP. Only water-based drilling fluids to be utilised whilst drilling through potable aquifers, with no BTEX additives or chemicals with residual toxicity permitted.

3.6 Hydraulic Fracture Stimulation

The Hydraulic Fracture Stimulation (HFS) phase will commence following the completion of the drilling, casing and cementing activities, all well acceptance criteria being met, and well integrity validated. HFS is a technique used commonly in low-permeability rocks to increase oil and/or gas flow to a well from petroleum-bearing rock formations. This process is intended to create and prop open new fractures in the reservoir to maximise the potential for enhanced petroleum recovery.

Aquifers will be protected, as outlined in Section 3.5.4, through following procedures outlined in the WOMP and adhering to section B.4.13 of the Code.

3.6.1 Well Integrity Validation

Well integrity is critical to ensure the isolation of the wellbore from aquifers and the natural environment. Key to drilling and constructing a well that passes well integrity validation tests are the well acceptance criteria (WAC). WAC are a series of pre-defined, as-built checks that must be completed during well operations to ensure critical aspects of the project and well integrity are achieved. This requires that barriers are verified at critical stages of specific well activities. In addition to the assessment against WAC, the well barrier envelope is pressure-tested to a target pressure prior to HFS to confirm that the WAC has delivered the well integrity design targets.

The following testing and assessment will be completed for each well:

- Cement evaluation logs are run to ensure that at a minimum 150 mTVD of good quality cement is present from the target reservoir to the nearest aquifer to ensure zonal isolation.
- Confirmation of geological barriers and assessment of geological hazards for the 'as built' well using information from the drilling of the vertical pilot hole and horizontal well
- Mechanical integrity evaluation of the production casing via a pressure test, for a pre-defined minimum period, to the Maximum Allowable Operating Pressure (MAOP).

Modelling for the production casing includes fracture stimulation load cases which sets the Maximum Allowable Operating Pressure (MAOP) during the stimulation operation. Alarms will be set to activate if the well pressure during pumping operations is approaching the MAOP to allow the HFS operations team to intervene. As a fail-safe, pressure relief valves (PRV) will also be installed in-line with the HFS equipment and set to activate below the MAOP to ensure that the safe operating pressure of the well is never exceeded and that well integrity is maintained.

The MAOP and testing parameters are covered in the WOMP. Sweetpea's WOMP is under assessment by DITT and approval of the WOMP is required before the regulated activities under this EMP are carried out. Sweetpea will provide DEPWS notification when DITT approves the revised WOMP.

3.6.2 Hydraulic Fracture Stimulation Operations

HFS operations proposed under this EMP are anticipated to use the standard 'plug and perf' technique, used extensively in shale gas and tight gas operations to deliver multi-stage HFS in horizontal wells. A detailed description of the process is provided in Chapter 5.3.2.3 of the Final Report of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory (<https://frackinginquiry.nt.gov.au/inquiry-reports/final-report>).

Sweetpea are planning for approximately 20 stages in each of the wells drilled in 2022, and approximately 30 stages in each of the wells drilled in 2023 and beyond. Each stage, of approximately 60m (but anywhere from 30 to 200+m), is isolated by a plug and then perforated at multiple depths along the well (1-5 perforation intervals or 'clusters' of 0.2-2m) before the water-based fracturing fluid and proppant is pumped through the well into the formation via the perforation clusters.

Isolating plugs will be designed to dissolve and/or be drilled out following the completion of the final stage. Casing annuli will be monitored throughout the HFS operations to ensure that the production hole remains isolated from intermediate and surface casing, and any change in pressure will be investigated immediately to ensure no loss of well integrity. The following sequential steps are planned:

1. Perforation of the first and deepest HFS stage.
2. A DFIT is conducted to validate and update the proposed stimulation design. This stage is optional and typically only performed in exploration and/or appraisal wells, or until localised fracture characteristics are defined.
3. The main stimulation treatment is then pumped using a series of high-pressure pump trucks and either a high viscosity friction reducer (HVFR) fluid, or slickwater (friction reduced) fluid, or hybrid slickwater-gel fluid, with either clean, quartz sand or ceramic proppant. Gel sweeps (linear or cross-linked) will be run as needed during the operations.

4. Plug and perf operations, typically with a wireline unit, follow in sequence setting a mechanical isolation plug and perforating for the next stimulation treatment.
5. Steps 3 and 4 are repeated until the final fracture stimulation stage is completed.
6. All mechanical isolation plugs are milled or drilled out, typically with a coiled tubing unit.
7. Prepare for flowback.

Chemical tracers, individualised for each stage, may be added to the main stimulation treatment at specific concentrations to allow HFS and reservoir performance diagnostics. The presence and concentration of tracers can be measured during flowback to estimate the relative contribution of any individual stage. The low dosage of tracers are designed to be absorbed into both water and gas, and are unique in composition. For the specific scope of this EMP, Sweetpea proposes to use tracers in Wells 1 to 7. Chemical tracers are included in the CRA outlined in Appendix C.

The equipment and machinery required to carry out a hydraulic stimulation operation is highly mobile and able to be installed and removed relatively quickly. The equipment is designed to comply with state and federal regulations for road transport. This equipment includes the following to carry out a HFS operation:

- A data van – an on-site office to execute stimulation activities
- Water storage – the wastewater tanks will be constructed on-site, capable of managing the total volume of both make-up water and flowback water. Tanks storing flowback will be double lined with leak detection capable of monitoring any leaks between the primary and secondary liner
- Proppant trailer – a large sand storage and delivery trailer that holds the proppant
- Hydration unit – used to add stimulation additives and viscosifying fluids
- Blender unit – used to mix proppant and fluid additives prior to its injection into the well
- High pressure pumps – used to inject the hydraulic fracturing fluid mixtures from the blender unit down the well via the surface lines and hydraulic fracturing wellhead or coiled tubing unit
- Coiled tubing unit – a large length of coiled steel pipe that can be temporarily installed in the well to perform various downhole operations
- Wireline unit – for plug and perforation deployment
- Ancillary support buildings including offices, workshop, cranes, chemical storage area, equipment storage, laydowns and all other activities required to support stimulation activities.

Further details regarding the HFS operations are included in the WOMP.

3.6.3 Geological Hazard Assessment

A geohazard assessment has been undertaken to identify subsurface hazards (Table 11) that could pose an environmental risk during the drilling or HFS operations.

Table 11 Geohazard Assessment for EP136

Hazard	Observations
Loss Zones	The Cambrian Limestone formations (e.g. Top Springs and Gum Ridge formations, and Anthony Lagoon Beds) are variably karsted and cavernous and severe to total losses were experienced in the top-hole section of offset wells. Fresh water-based drilling fluids and casing-while-drilling are planned to mitigate the impact of any loss zones.
Shallowest Hydrocarbon (HC)	The shallowest HC within the area is potentially in the sands within the Kyalla Formation – casing will be set and pressure-tested over the CLA prior to drilling ahead through these zones.
Over Pressured Formations	Mild overpressure is anticipated in the Velkerri Formation based on offset well data.

Hazard	Observations
	An overbalanced drilling fluid column and the nanodarcy permeability of the Velkerri Formation shales mitigate this hazard.
Hazardous Gases	3-5 ppm H ₂ S was reported in Shenandoah-1 at 3,190 m, but no H ₂ S has been observed in repeated and more proximal offset wells.
Faults	The well locations have been targeted to avoid the basin edges where major faults have been identified in seismic data across the Beetaloo Sub-basin. Within the relatively undeformed, minimally structured and low dip depocentres throughgoing faults are not interpreted in 2D seismic data across the Beetaloo Sub-basin. 2D seismic acquisition and lateral drilling prior to hydraulic fracture stimulation is anticipated to confirm the absence of major faults, and if there is unexpectedly complex faulting then the fracture stimulation program can be adapted to account for the faulting. The >2 km of section between the Velkerri Formation and the CLA ensures that sub-seismic scale faulting interpreted during lateral drilling will not connect shallow aquifers with the reservoir target being stimulated. Induced fractures from HFS operations are modelled to stay within approximately 50-100 m of the horizontal well.
Unstable Formations	Unconsolidated surficial formations can cave in or result in cellar/conductor wash out.
High Temperature	Not anticipated. The BHST in offset wells were benign and <150° C. Expected temperature based on the analysis of offset wells data is at 144°C.

Potential induced seismicity during HFS operations will be monitored through Geoscience Australia's Beetaloo Sub-basin Seismic Monitoring Project (GABMP), which was installed as part of the Beetaloo Geobioregional assessment. An induced seismicity traffic light system will be implemented and followed during HFS operations to ensure there are clear guidelines for monitoring the GABMP in real-time and invoking any necessary changes in the pumping schedule. Traffic light systems define when operations need to be adjusted if an event of a certain magnitude is exceeded. This will be part of the Induced Seismicity Management process under the WOMP.

The potential for accumulation of naturally occurring radioactive materials (NORM) during drilling activities will be monitored to ensure risks to the health and safety of people and the environment. The hazard of NORMs in cuttings will be assessed using real-time, quantitative monitoring of NORM concentrations from X-ray fluorescence data as required by the NT *Radiation Protection Act* 2004, although elevated NORM levels associated with drilling activities within the Beetaloo Sub-basin is not anticipated to be significant.

3.6.4 Design

Evaluation data, including elastic properties and lithological parameters, allow a mechanical earth model (MEM) to be created and used in the HFS design process. Industry accredited stimulation software is used to optimise the HFS design based on evaluation data and the MEM. The basis of well specific hydraulic fracture design is to create a fracture within the target formation that will produce hydrocarbons through the number of required fractures. This is achieved by modelling fracture length, fracture conductivity, and fracture height for each created fracture as shown in Section 3.6.5.

A number of considerations influence the final design for each treatment, including:

- Depth and thickness of the formation target
- Lithology of formation target and bounding layers
- Minimum and maximum horizontal stress across all layers (target and bounding)

- Thickness of the seals above and below the target reservoir formation
- Porosity and permeability of the formation
- Pore fluid saturations (percentage of formation pore volume occupied by hydrocarbons or water)
- Pore fluid properties (e.g. density, water salinity)
- Offset well performance data (where available), including flow rates, formation pressure and produced fluid properties
- Formation boundaries (as identified from offset wells, log data, cuttings data, and/or seismic data)
- Bulk rock density, elastic properties and compressibility
- Natural fracture networks
- Stress field analysis to determine the maximum principal stress direction and the minimum principal stress direction.

Further details regarding the HFS design and treatment plan are described in the WOMP.

3.6.5 Fracture Stimulation Model

Utilising the Mechanical Earth Model, the proposed fracture stimulation job designs have been input into GOHFER (Grid Oriented Hydraulic Fracture Extension Replicator) software to determine expected fracture dimensions and outcomes:

- Fracture Length
- Fracture Height
- Fracture Width
- Proppant distribution with fracture
- Expected surface and Bottom Hole Pressures
- Expected production outcomes.

The modelling is also used to determine that there will not be an interference between fracture stimulation stages within the same wellbore as well as confirming the minimum separation of 600 m is achieved between the fracture stimulation stages and the nearest aquifer.

Hydraulic Geometry

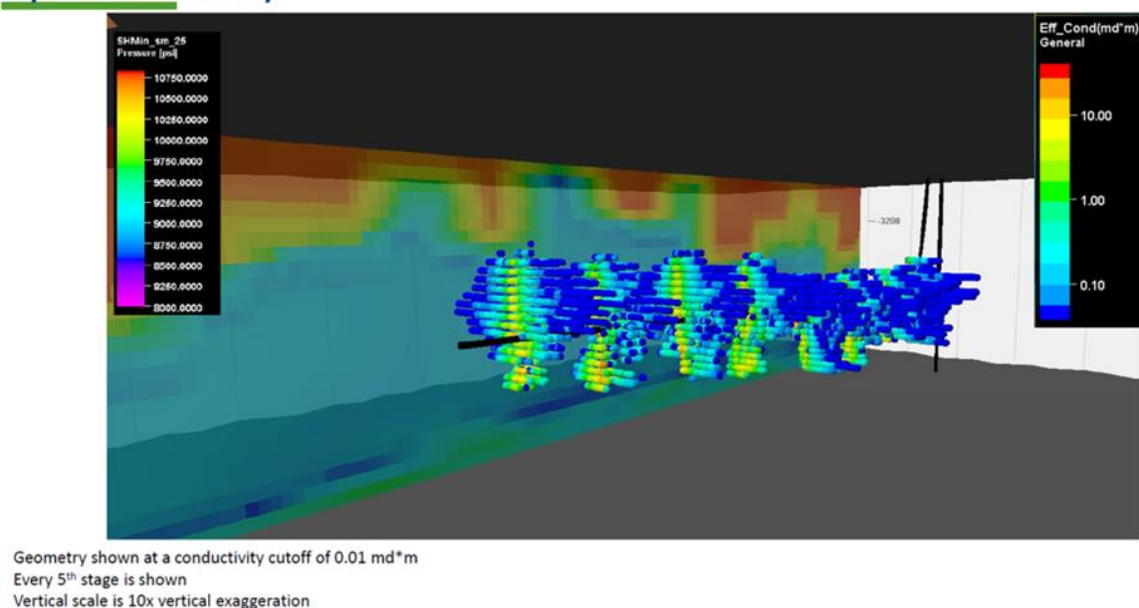


Figure 13 GOPHER Modelling

3.6.6 Hydraulic Fracturing Fluids

Sweetpea will use a range of chemicals, which are included in the Chemical Risk Assessment (CRA) provided in Appendix C, to support stimulation operations for the EP136 Program. All chemicals used in Australia must be approved for use by the Federal Government Department of Health and be listed on the Australian Inventory of Chemical Substances (AICS) which is maintained under the National Industrial Chemicals Notification and Assessment Scheme (NICNAS).

Sweetpea will contract a specialist HFS service provider to provide fit-for-purpose fluids support for the EP136 Program. Table 12 is a high-level summary of the fluid systems that are proposed to be pumped. High viscosity friction reducer (HVFR) is the preferred fracturing fluid system because of the advantages, such as (from Motiee et al., 2016; Van Dornen et al., 2017; Dahlgren, et al., 2018; Ba Geri et al., 2019):

- Reducing pipe friction during the fracturing process
- The potential to place higher proppant volume relative to conventional hydraulic fluid systems (such as hybrid and crosslinked)
- The potential to create more complex fracture networks due to a less viscous system
- Modelled higher fracture conductivity
- Fewer additives and equipment required - decreased relative environmental footprint
- Simplified hydraulic fracturing treatments by minimizing screen out risks
- Improved production results.

Appendix C provides volumes for each individual chemical constituent that formulate the parent chemical listed in Table 12. Due to our service providers intellectual property requirements the breakdown of each fluid system has not been disclosed but has been risked assessed as a whole by a qualified third party.

Slickwater and/or gel fluid systems are maintained as alternate options and/or use as a remedial measure to overcome any sub-optimal reservoir or operational outcomes. For example, gel fluids can reduce perforation or near-wellbore friction by initiating a fracture with a higher viscosity fluid system. The alternate fluid systems can be used on a continuum and a hybrid fluid system (of slickwater and gel fluids) may be utilised to improve performance or expected outcomes.

HFS fluid additives will be selected and managed to ensure all products used during well operations are used in accordance with the manufacturer's recommendations and relevant Safety Data Sheets (SDS). All chemicals used in the hydraulic fracturing fluid formulation will be recorded in the Post Job Report, along with fluid properties and total volumes of all materials. No BTEX additives will be used in any of the HFS fluid systems.

HFS fluids will not be used until such time the HFS modelling has demonstrated that the HFS fluids will be contained within the target formation. Verified well barriers and a safe separation distance will prevent any fluids migration to the nearest aquifer.

HFS fluid make up water is planned to be sourced from registered supply bores as per the EMP. Each well pad has a dedicated supply bore to minimise logistics and meet water monitoring bore requirements. Above ground, double lined fluid storage tanks with leak detection systems have been planned to ensure that sufficient and safe fluid storage for both make up and flowback water on location can be achieved.

Table 12 Hydraulic Fracturing Fluids Summary

Material Name	Typical Concentrations	Usage per Stage	Anticipated Well Usage*	Unit	Purpose	Storage Area
Fluid System - High Viscosity Friction Reducer (HVFR)						
Hydrochloric Acid	15%	3,800	76,000	L	Minimises Near Wellbore Pressure Loss (NWBPL)	Stimulation chemical storage area
Biocide	0.3 gpt	380	7,600	L	Bacteria Control	Stimulation chemical storage area
Acetic Acid	As required	190	3,800	L	pH Control	Stimulation chemical storage area
Clay Stabiliser	2 gpt	2,600	52,000	L	Prevents clay swelling	Stimulation chemical storage area
Scale Inhibitor	2 gpt	2,600	52,000	L	Inhibits formation of scale	Stimulation chemical storage area
Surfactant	1 gpt	1,300	26,000	L	Reduces surface tension of water	Stimulation chemical storage area
Friction Reducer	5 gpt	6,400	128,000	L	Reduces fluid system friction & increase fluid viscosity	Stimulation chemical storage area
Breaker	2 ppt	306	6,120	Kg	Lowers fluid system viscosity	Stimulation chemical storage area
Sand / Proppant	Up to 5 ppt	154,200	3,084,000	Kg	Props fractures open	Stimulation chemical storage area
Fluid System - High Viscosity Friction Reducer (HVFR)						
Hydrochloric Acid	15%	3,800	76,000	L	Minimises Near Wellbore Pressure Loss (NWBPL)	Stimulation chemical storage area
Biocide	0.3 gpt	360	7,200	L	Bacteria Control	Stimulation chemical storage area
Acetic Acid	As required	190	3,800	L	pH Control	Stimulation chemical storage area
Clay Stabiliser	2 gpt	2,400	48,000	L	Prevents clay swelling	Stimulation chemical storage area
Scale Inhibitor	2 gpt	600	12,000	L	Inhibits formation of scale	Stimulation chemical storage area
Surfactant	1 gpt	1,200	24,000	L	Reduces surface tension of water	Stimulation chemical storage area
Friction Reducer	5 gpt	1,700	34,000	L	Reduces fluid system friction and increase fluid viscosity	Stimulation chemical storage area
Breaker	2 ppt	200	4,000	Kg	Lowers fluid system viscosity	Stimulation chemical storage area
Guar	30 ppt	1,100	22,000	Kg	Provides base viscosity to suspend low concentration proppant	Stimulation chemical storage area

Material Name	Typical Concentrations	Usage per Stage	Anticipated Well Usage*	Unit	Purpose	Storage Area
Caustic Soda	As required	23	460	Kg	pH Control	Stimulation chemical storage area
Crosslinker	2.5 gpt	700	14,000	L	Further increases viscosity to suspend high concentration proppant	Stimulation chemical storage area
Sand / Proppant	Up to 5 ppt	154,200	3,084,000	Kg	Props fractures open	Stimulation chemical storage area

* Assumes 20 stages, wells drilling with longer laterals within this EMP may have more stages.

3.6.7 Hydraulic Fracturing Chemical Risk Assessment

The CRA has been completed for chemicals proposed to be used in the Hydraulic Fracturing process (as at 29 April 2022) (refer Appendix C). The CRA used a tiered assessment on the compiled hydraulic fracturing fluid systems proposed by screening of the potential human health and ecological hazards that should be considered for potential exposure to the hydraulic fracturing fluids during transportation, hydraulic fracturing activities (including storage), and subsequent treatment and disposal of flowback. Any changes to the chemicals and their concentrations proposed in the CRA will be provided to allow consideration by DEPWS and DITT, as well as other Stakeholders as required.

The chemical risk assessment comprised the following tasks:

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

The human health and ecological hazard mitigation information provided in the chemical risk assessment dossiers and SDSs primarily focused on safe handling, transportation, and worker protection.

Three Halliburton (HALSW, HALHybrid, HALHVFR) or two Schlumberger (SLB) (SLBHVFR/SW and SLBHybrid) stimulation fluid recipes have been assessed for Sweetpea's EP136 program.

The assessment considered the Persistent *and* Bioaccumulative *and* Toxic (PBT) chemicals consistent with Australian risk assessment methodologies, if the hazard quotient (HQ) is less than or equal to 1, then no adverse health effects are likely associated with exposures. However, if the total hazard index (HI) is greater than 1, adverse health effects may be possible and therefore the assumptions inherent in the risk characterisation process warrant further evaluation. All chemicals assessed were below 1 meaning no further evaluation required and the risks are considered to be low and acceptable.

The following is a summary of the tiered assessment from the CRA report:

Tier 1 Assessment Results

- Comparison of the chemicals with the assessment criteria as presented in DoEE (2017) indicated that 17 chemicals from the Halliburton recipes and 36 chemicals from the SLB recipes were not considered to require a Tier 2 assessment. Some of the chemicals have been assessed under the National Assessment of Chemicals Associated with Coal Seam Gas Extraction in Australia using the adapted IMAP screening process (NICNAS 2017) and were identified to be of low concern because of low hazard.
 - The Tier 1 screening for the Halliburton recipes indicated most chemicals (18 from slickwater (SW), 23 from Hybrid and 21 from HVFR fluid systems) were identified to require a Tier 2 assessment. None of these chemicals were identified to be toxic *and* persistent *and* bioaccumulative.

- The Tier 1 screening for the SLB recipes indicated 10 chemicals (4 from HVFR, 6 from Hybrid) were identified to require a Tier 2 assessment. None of these chemicals were identified to be toxic *and* persistent *and* bioaccumulative.

Tier 2 Assessment Results

- Halliburton recipes:
 - Risk associated with potential exposure to workers based on a combination of Halliburton's hydraulic fracturing fluid systems are summarised with the data provided in the CRA report in Appendix C. Based on this risk evaluation, no unacceptable risk to workers was identified in all of the possible combinations of stimulation fluids, drilling fluids and chemical tracers. It is noted that conservative risk scenarios assessed included regular exposure to the flowback water during the hydraulic stimulation and evaporation phases, with exposures to high theoretical concentrations of chemicals of potential concern (COPC) in the flowback water. None of the chemicals were identified to be toxic *and* persistent *and* bioaccumulative.
- SLB recipes:
 - The calculated risks associated with potential exposure to COPC identified in flowback water, where the SLB Hybrid or SLB HVFR/SW stimulation fluid recipe is used and assuming 100% mass recovery is below the target of 1, hence risks are considered to be low and acceptable.

Overall, the chemicals assessed were of low concern when appropriate handling, storage and disposal practices are used. It is noted that any changes and/or optimisation of the recipes over the course of the exploration program will need to meet the same threshold for inclusion in the final HFS fluids system.

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

The following prescribed chemical legislation, as defined by the *Petroleum (Environment) Regulations 2016*, will be followed as it relates to the transport, storage, and handling of HFS chemicals:

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

3.7 Flowback and Extended Production Testing Activities

Once the HFS operations are complete, the well and site will be prepared for flowback and extended production testing (EPT) activities, as per the WOMP and section B.4.13 of the Code. As per the Code, all flowback activities will be managed to minimise the release of gas to atmosphere.

Flowback describes the initial return of HFS fluids to surface and directly to flowback storage tanks or enclosed ponds. As the rate of HFS fluids returning to surface declines (hours to days), gas flow rates are expected to increase and as soon as the separator will function the flowback stream will be sent to the separator.

Sweetpea will use a multi-phase separator to separate out water and gas streams, in addition to any hydrocarbon fluids (which are considered unlikely and/or of low volume in this program). Flowback fluid/water from the separator continues to flow to appropriate storage, gas is diverted to a flare and any hydrocarbon liquids to fit-for-purpose storage tanks.

Sweetpea anticipate that the majority of the seven wells proposed in this EMP will have EPT durations of 90 days or less, but propose that some wells may require up to 300 days of EPT to provide sufficient data certainty to plan subsequent exploration and appraisal decisions and inform resource estimates. For the purposes of this EMP, our CO₂ emission estimates are based on:

1. Two EPTs up to 300 days
2. Two EPTs up to 90 days
3. Three EPTs up to 60 days.

Due to the remoteness of the location and the relatively small volumes of gas produced during a 60 to 300 day EPT, it is not practical to capture the gas or produce it to market and gas will, therefore, be flared onsite. Minimal venting is expected, and only likely during very early flowback when gas concentrations are negligible. Rates and volumes of gas will be recorded and reported as per the Code.

Emissions will be estimated or directly measured as governed under the *Commonwealth National Greenhouse and Energy Reporting (Measurement) Determination* (2008) and reported per Part D of the Code. During system upsets or accidental release, emissions will be estimated using methods consistent with the *National Greenhouse and Energy Reporting (Measurement) Determination 2008*.

3.7.1 Equipment/Lines

Typical equipment utilised in flowback operations consist of a junk catcher, choke manifold, sand trap or separator, test separator, a flare with continuous ignition device, a flowback tank (if needed to cool the fluid down prior to placing in storage tanks) and storage tanks. Gas detection monitors will be used on location during all flowback operations.

- All lines to use cable lock (or like) safety system in case of line part. Cement blocks to be incorporated into cable lock (or like) safety system as additional safety measure.
- All lines, valves and equipment utilised will have a working pressure rating in excess of all anticipated pressures and will be tested and operated accordingly
- The line from the wellhead to the choke manifold will be rated and pressure tested to the MASP (maximum anticipated surface pressure).
- Equipment will include accurate flow measurement device(s).
- In the event condensate is produced, it will be captured and separated from the other fluid streams on location via the test separator and stored in a double lined container and trucked off location.

Flowback operations will be managed to minimise the release of gas to the atmosphere. Flowback will be sent to a separator as soon as there is enough gas for the separator to function, directing the separated gas to a completion combustion device equipped with a continuous ignition device (refer to Section 3.7.2 Venting and Flaring).

Venting is only performed when the gas flow is insufficient to allow the separator to function properly, or when the use of a combustion device creates a fire or safety hazard or where heat emissions may negatively impact the environment

Daily and cumulative volume and rates of produced gas, condensate (not anticipated) and water will be measured daily and reported.

All flowback water and produced water will be stored in double lined tanks equipped with proper leak detection, telemetry, proper venting (if enclosed tank), radar tank level detection and monitored as required per the Codes of Practice.

3.7.2 Venting and Flaring

Flowback operations will be managed to minimize the release of gas to the atmosphere. Flowback will be sent to a separator as soon as there is enough gas for the separator to function, directing the separated gas to a completion combustion device equipped with a continuous ignition device.

Venting is only performed when the gas flow is insufficient to allow the separator to function properly, or when the use of a combustion device creates a fire or safety hazard or where heat emissions may negatively impact the environment.

Gas detection system will be utilised on location during various operations to alert the personnel of unsafe build-up of gas.

3.7.3 Flare Design and Efficiency

Any produced gas will be sent to a combustion device (typically a flare) equipped with a continuous ignition device. In order to minimise emissions and potential of brushfire risk, the following controls will be incorporated into the test.

- The flare system will be designed to handle in excess of the anticipated gas volumes during the initial testing of the well.
- The flare will incorporate a continuous ignition device.
- The flares will have a tip efficiency of at least 96%.
- The flare will be located a minimum of 45 m from the wellhead, separator, production tanks, combustion device or source of flammable vapours and site offices.

Sweetpea plan to use a vertical flare stack. In the event circumstances dictate the use of a horizontal flare, it will be set up with a properly designed flare pit.

3.8 Completion Activities

At some point during flowback, once a sufficient volume of HFS fluid has been recovered and fluid rates are relatively low, a workover rig will be used to install production tubing and associated completion equipment such as packers, nipple profiles, tubing hanger and the production tree. Production tubing has a smaller internal diameter than casing, which allows the well to continue to 'clean up' under the same reservoir conditions where otherwise the well may not be able to continue to flow (i.e. up casing).

3.9 Well Suspension and Decommissioning

Sweetpea propose to suspend wells once production testing operations are completed on each well, to be reactivated as future producers in an exploration success case that leads to development. Suspension details are provided in the WOMP. The WOMP also considers the need for well decommissioning, with plug and abandon operations also included in the WOMP. If the well is decommissioned, cement plugs will be installed as permanent barriers to flow prior to cutting off the wellhead. The cement plugs will be set and tested as per section B.4.15.2 of the Code.

The WOMP is under assessment by DITT and approval of the WOMP is required before the regulated activities under this EMP are carried out. Sweetpea will provide DEPWS notification when DITT approves the revised WOMP.

3.10 Waste and Wastewater Management

This section provides an overview of how waste and wastewater will be managed during the regulated activity. More detailed information relates to wastewater management is presented in Appendix F.

3.10.1 General

During the regulated well activity, waste will be managed in accordance with the internationally accepted guide for prioritising waste management practices with the objective of achieving optimal environmental outcomes.

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

1. Avoid: eliminate the generation of wastes through design modification.
2. Reduce: reduce unnecessary resource use or substitute a less resource intensive product or service.
3. Re-use: re-use a waste without further processing.
4. Recycle: recover resources from a waste.
5. Treatment: treat the waste to reduce the hazard of the waste prior to disposal.

6. Disposal: disposal of waste if there is no viable alternative.

All wastes, 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 proposed activity area, for disposal or recycling at a licensed facility authorised to receive those wastes (as summarised in the NT Listed Waste Company Summary spreadsheet).

Table 13 provides the waste management methods for the proposed DST program.

Table 13 Waste and Disposal Methods

Waste Source	Indicative volumes	Disposal Method
Domestic Activities (main camp, mini-camp and offices)		
Sewage and grey	>2,000 L per day at the main accommodation camp <2,000 L per day at each well pad fly camp (~1.46 ML/annum)	Treatment: Using a wastewater system approved by the NT Department of Health and in accordance with the <i>Code of Practice for On-site Wastewater Management</i> . Treated water will be dispersed to a dedicated area of land suitably landscaped for the disposal of reclaimed water by means of surface irrigation onto a suitable medium and plants capable of effecting a high rate of evapo- transpiration.
Storm water	Wet season only. Sized to capture first 20 mm of runoff from site. Up to 0.015 ML per lease pad per storm event	Released to Grade: Camp and Lease pads will be designed to divert water around the lease pads through ESC measures. Where stormwater is captured on the disturbed areas, they will be directed through ESC measures detailed in Appendix B.
Food waste, paper and plastic	10 kg/day	Disposal: Collected in dedicated waste bins for transport to an approved landfill. All food waste bins will remain covered to avoid attraction of pests (refer Section 7.6)
Glass and cans	1 kg/day	Recycled: Collected in separate waste bins for recycling at an off-site facility.
General Industrial Waste		
Chemical bags and cardboard packaging materials	<100 kg per annum	Recycled: Compacted and collected at the accommodation camp for transport to a licenced recycling centre.
Scrap metals	<1 tonne per annum	Recycled: Collected in designated skip for recycling at an approved location.
Used chemical and fuel drums	<0.5 tonnes per annum	Recycled: Collected in designated skip for recycling at an approved location.
Chemical wastes	<100 kg per annum	Re-use/disposal: Collected in approved containers for disposal at approved landfill or returned to supplier or recycled.
Timber pallets	<1 tonne per annum	Recycled: Recycled at an approved facility or returned to supplier.
Vehicle tyres	<1 tonne per annum	Disposal: Disposed of at an approved landfill.
Oily rags, oil contaminated material, filters and other hydrocarbon material	<100 kg per annum	Recycled/ Disposal: Oil from machinery or encountered during drilling. Will be collected in suitable containers for disposal at approved landfill or recycled at an approved recycling facility.

Waste Source	Indicative volumes	Disposal Method
Drilling, HFS and Testing Waste		
Drilling cuttings, cement returns and fluids from exploration drilling	Drilling Fluids ~1 ML per well Cuttings ~650-850 m ³ per well	Disposal: All drilling fluids will be directed to an onsite mud sump. The liquid contents of the sump will be evaporated, and the sump backfilled.
Hydraulic fracture stimulation flowback fluids	Up to ~20ML per well <1 ML offsite disposal	Storage/Evaporation and Disposal: Frac flowback fluid evaporation and eventual disposal.
Well Production Testing	<1 ML per well (wells are dry gas) <1 ML offsite disposal	Storage/Evaporation and Disposal: Production water will be evaporation and eventual disposal. Reuse options may be considered pending technology option risk assessment and ALARP.
Drilling completion, suspension and kill fluids	0.5 to 1 ML per well	Storage/Evaporation and Disposal: Production water will be evaporation and eventual disposal. Reuse options may be considered pending technology option risk assessment and ALARP.
Naturally Occurring Radioactive Material (NORMs)	0 kg reportable	NORMs above reportable thresholds are not likely to be generated. However, if NORMs occur at levels that exceed reportable thresholds then a separate waste management plan will be developed for handling of NORMs material at an appropriate licensed waste disposal facility.

Solid and organic waste from the accommodation camp will be disposed of into sealed bins set up adjacent to the camp area. The sealed bins will be transported regularly for disposal of waste to a licensed landfill. Waste transfer certificates will be retained and provided to DEPWS as part of the annual reporting requirements (Section 7.6).

3.10.2 Wastewater Management Plan (WWMP)

The WWMP has been developed to meet the requirements of the NT Code of Practice and covers the following wastewater types:

- Drilling fluids, cuttings and cement returns
- Hydraulic Fracture Stimulation (HFS) fluids
- Completion and kill fluids
- Produced water

The WWMP covers the information on how the wastewater from Sweetpea's activities will handled, stored, disposed, reused or recycled.

3.10.3 Estimated Quantities and Quality of Wastewater from Flowback and Production

Quantities of HFS fluid recovered during flowback are estimated to be in the range of 40% to 50% (but could range from 20% to 70%). The volume recovered is primarily a function of the lateral length, the number of stages pumped and the length of time the well is produced for. It is anticipated that for each stage a volume of approximately 1 to 2 ML will be pumped and anywhere from 0.2 to 1.4 ML per stage recovered. Flowback fluid properties will be monitored, and reports submitted as required under the Code of Practice (refer Section 3.10.7 Monitoring/Site Water Balancing/Reporting for further detail).

Water re-use technologies will potentially be utilised to condition the flowback and produced water for re-use on future fracture stimulation of wells to help minimise waste. If water re-use is not feasible or in place, evaporation methods may be needed in the interim. The quality of all fluids that are to be re-used for fracture stimulation treatments will be monitored and will not contain benzene, toluene, ethylbenzene, or xylene (BTEX) above the prescribed levels detailed in the Code for stimulation and drilling fluids (refer Table 14).

Table 14 BTEX maximum allowable levels in water used for stimulation and drilling fluids

Compound	Maximum Level (ppb or µg/L) [#]
benzene	600
toluene	180
ethylbenzene	80
xylene	200

[#] Australian and New Zealand Environment Conservation Council Environmental Protection Guidelines (ANZECC 2000) 99% protection level.

Any solids derived from water re-use technology or sediments in the bottom of a tank will be monitored and disposed of properly either on location or at licensed and approved disposal sites as set out in the regulations. Testing of solids will be required prior to any off-site disposal, if required, to determine how and what approved licensed disposal facility the solids may need to be transferred to by licensed contractors.

Any remaining water in a tank that is to be disposed of will be tested and disposed of at an approved wastewater handling facility by approved and licensed trucking contractors. Proper testing of the water as per regulations will determine the appropriate disposal site.

3.10.4 Drilling Fluid Storage

Drilling fluid storage is a regulated activity under section C.4.1 of the Code and proposed management of storage is covered in Section 7.6 and Appendix F WWMP and Appendix G SPRP.

Drilling fluids, muds and cuttings will be managed in accordance with the following key safeguards:

- contained in an engineered pit on the well pad that is lined with an impermeable membrane in accordance with section C.4.1.2 (b) of the Code
- the excess drilling fluids may be transferred into an above ground storage tank that meets section B.4.16.2(h) of the Code to assist with drying out the muds and cuttings
- if required geomembranes will be installed under the liners to prevent punctures and tears
- the open tank and pits will be marked with the appropriate freeboard applicable for the season to ensure capacity is available, including 1.3 m freeboard during the wet season as detailed in Section 3.10.5
- drilling operations will cease if the freeboard is not maintained in the drilling pits and open tanks
- the open pit and tanks will be fitted with fauna ladders, and the lease pad fenced off from stock and other larger fauna species.

An assessment of the environmental impacts and environmental risks posed by the drill cuttings and residual drilling fluids will be carried out before disposal options determined. The disposal options for the drill cuttings and residue from drilling fluids will consider the results of the assessment to either remain onsite or required offsite disposal.

The potential for accumulation of naturally occurring radioactive materials (NORM) will be monitored to ensure risks to the health and safety of people and the environment, although elevated NORM levels associated with drilling activities are not anticipated to be significant. NORM will be monitored using real-time, quantitative monitoring of NORM concentrations from X-ray fluorescence data and will be included in waste classification for both onsite and offsite disposal options.

Recycling and re-use of the solid waste from the drill cuttings may be considered if a viable option is identified to minimise the volume of waste that is disposed of onsite or transported and managed offsite.

3.10.4.1 Flowback and Produced Water

All above ground storage tanks will be designed to handle the anticipated volumes of flowback and produced water in accordance with section C.4.2 of the Code.

The proposed management of wastewater storage is covered further in Section 7.6 and Appendix F and Appendix G.

Flowback and produced water storage will incorporate the following key safeguards:

- Storage of flowback fluid and produced water will meet the secondary containment requirement as per Section A.3.8 (g) and have sufficient capacity to hold 100% of the largest tank volume stored, plus 10%.
- Above ground closed top storage tanks will be designed and constructed in accordance with Australian Standards (including AS1554.1 and AS3990) including:
 - Designed to withstand bushfire attack (20 m firebreak, plus APZ) and meet local wind loading considerations.
 - Fitted with leak detection and high-level alarms, calibrated to the relevant freeboard requirement of 1.3 m open topped tanks and 0.5 m for enclosed tanks.
 - Prevents entry of rainwater.
 - Fitted with vents to prevent the build-up of explosive gasses.
- Above ground open topped treatment tanks will be designed and constructed in accordance with Australian Standards (including AS1554.1 and AS3990), as per closed top storage tanks, plus:
 - Marked with appropriate freeboard (1.3 m in wetseason).
 - Fitted with fauna ladders and minimises access points as far as reasonably practicable for fauna.
- Inspection reports and maintenance record of all wastewater storage will be maintained in accordance with Section 8.7.
- If the total volume of flowback fluid and produced water stored on-site exceeds the allowed capacity of the open and closed tanks (freeboard included with open top tanks), then the well(s) will be shut in. Sweetpea will provide written notification to DEPWS within 48 hrs of exceedance, along with the proposed plan forward to return the tanks to a level where the wells can be operated.

As noted above, all above ground open top tanks that may be used for evaporation will maintain a 1.3 m freeboard during the wetseason. A study to determine the 1:1,000 year ARI was conducted and shown in Section 3.10.5. The wastewater contained in any open top wastewater tank will be transferred to an enclosed top tank at least eight (8) hours before the onset of a significant rainfall event Section 3.10.5.

3.10.4.2 Freshwater Earthen Pits

Earthen pit reservoirs for the freshwater storage will be constructed with an engineered overflow runoff channel into a sedimentary basin or riparian area to eliminate any erosion if the pit were to carry over. The freshwater pit will be fitted with fauna ladders and designed to minimise access points as far as reasonably practicable.

3.10.4.3 Sewerage and Grey Wastewater

There will be up to eight sewerage and grey wastewater treatment systems established on the permit over the program. The sewage and grey wastewater will be treated in an OzziKleen SK25 Sewerage Processing Unit or similar and disposed of onsite within a designated wastewater irrigation area in accordance with the *Code of Practice for On-site Wastewater Management*.

One system will be based at the accommodation camp and the remaining seven systems will be positioned to treat sewerage and grey wastewater produced from the exploration lease pad fly-camp.

3.10.5 Wastewater Storage Considerations

Section C.7.1 of the Code requires that open storage areas have sufficient capacity to provide enough freeboard to accommodate the total rainfall anticipated (based on 1 in 1,000 average recurrence interval (ARI) rainfall rate using Australian Rainfall & Runoff methodologies) for the critical period when there is the greatest risk of overtopping any structures holding wastewater.

To determine the appropriate freeboard allowance, methodology was applied that is used in the determination of peak rainfall events for water storages when assessing failure modes.

This analysis was based on SILO (Scientific Information for Land Owners - <https://www.longpaddock.qld.gov.au/silo/>) for the permit area. SILO assembles a rainfall dataset back to 1889 from available rainfall information for a grid of every 0.05 latitude and longitude across Australia.

The monthly rainfall totals from the SILO data were analysed to determine the appropriate length of wet season to use. From the chart below (Figure 14) it is apparent that a 3-month wet season is appropriate.

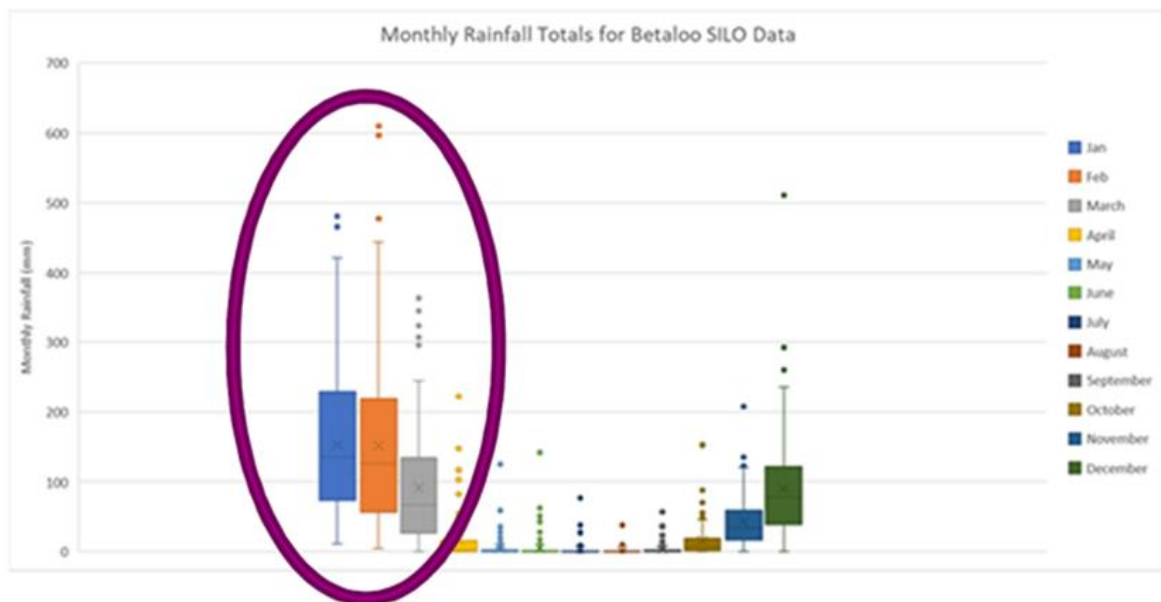


Figure 14 Q100 Monthly Rainfall Totals for Beetaloo SILO Data

From these data, the highest three (3) month rainfall period for every year from 1900 to 2021 was determined. These values were used to fit a Log Pearson III distribution to the data to extrapolate to the 1,000-year, 3-month duration wet season (Figure 15).

The 1 in 1,000-year, three (3) month wet season results in a rainfall estimate of 1,289 mm, however confidence bounds show that this could be between 1,054 mm to 1,675 mm. The graph also suggests the trend for the larger events is toward the lower values.

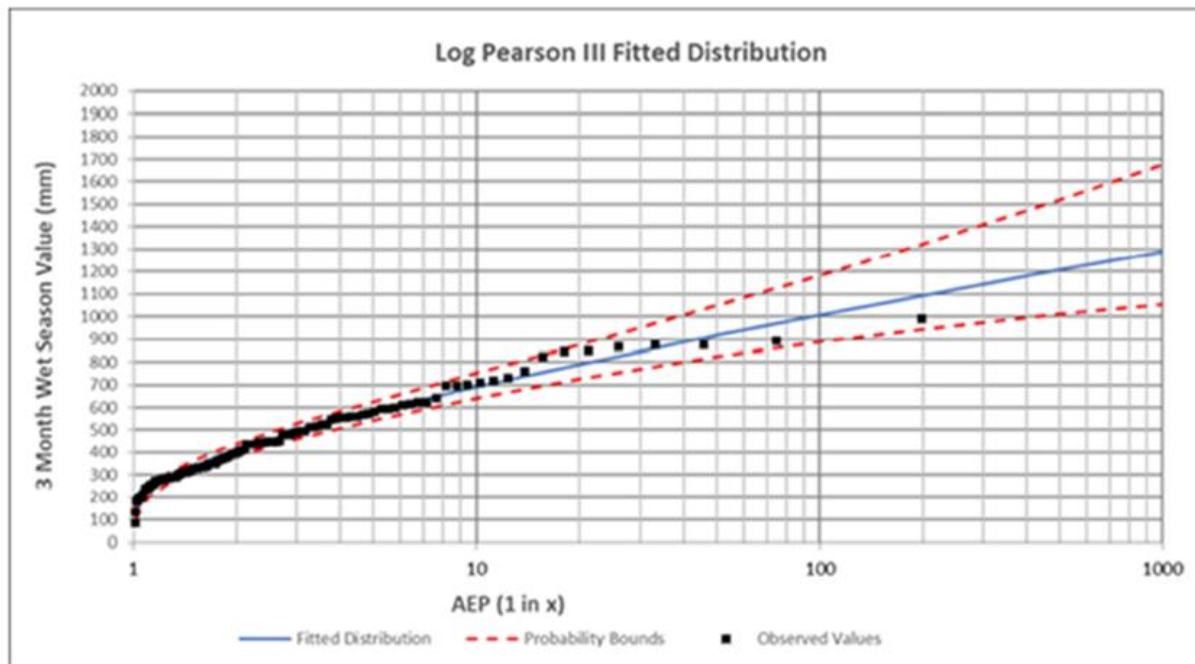


Figure 15 Log Pearson Determination of 1:1,000

Based on the outcome of the assessment, Sweetpea have adopted a freeboard of 1,300 mm (1.3 m) for the 1:1,000 buffer allowance for any open topped wastewater storage. Sweetpea will ensure that the minimum freeboard requirements will be maintained in accordance with the NT Codes of Practice Section C.5.5 (b).

If open top tanks are utilised on a location and the BOM forecast a “significant rainfall event”, then the forecast rainfall will be deducted from the current freeboard to define the new freeboard. If the new freeboard post significant rainfall event is equal to or higher than the 1.3 m freeboard required, then Sweetpea will transfer enough produced and flowback water from the tank in question into an above ground enclosed top tank to ensure the event will not allow the tank to exceed the freeboard requirements of 1.3 m. This transfer will be completed at least 8 hours before the “significant rainfall event” is forecast to start.

3.10.6 Water Reuse/Methodologies

Prior to the use of any water re-use technologies or methodologies an analysis of the environmental impacts and risks associated with the technology or methodology will be performed and proper control measures will be put in place to reduce any risks to a level that is ALARP and acceptable.

Any water re-use equipment used that occurs outside of the enclosed tanks will incorporate the use of spill containment bunds or the like to minimise the risk of wastewater being released on the ground. These bunds and containment measures will meet all requirements set forth in the Code.

3.10.7 Monitoring/Site Water Balance/Reporting

All volumes of water will be recorded and a site water balance will be kept. It will include volumes of wastewater produced from each well(s), daily volumes of each tank, estimated evaporation (updated weekly if evaporating fluids), any water transferred on or off site and its destination, any water transferred between locations by approved methods (to minimise new tank construction and minimise water extraction), and any volumes of wastewater re-used.

The following method is utilised for site water balance requirements:

$$\text{Total Water} = \text{Flowback} - \text{Evaporation} + \text{Rainwater} - \text{Volume transported off location}$$

1. Total Water = volume of wastewater stored on location

2. Flowback = measured volume of produced water from the well through test package or surface flow meter
3. Evaporation = Calculation
 - a. $\text{Evaporation} = \text{Volume 1} + \text{Volume transferred into tank} + \text{Rainwater} - \text{Volume 2}$
 - i. Volume 1 = measured volume of tank at Day 1
 - ii. Volume 2 = measured volume of tank at Day 2
4. Rainwater = Calculation based on surface area of open tank and measured daily rain on location
5. Volume transported off location = measured and recorded volumes.

The primary method of management of flowback fluids is to safely store on location for future dilution and re-use in HFS operations.

Wastewater tracking will be in accordance with legislative requirements and records will be kept as per requirements of the Codes of Practice and other legislative requirements such as those imposed under the *Waste Management and Pollution Control Act 1998* (NT) and the *Radiation Protection Act 2004* (NT). Wastewater reports will be filed as required or available upon request.

Flowback fluid monitoring will follow the requirements as set out in section C.5.4 and C.5.5 of the Code and detailed in the Appendix F WWMP.

Sampling of all wastewater will be in accordance with the regulations and detailed in Appendix F.

3.10.8 Stormwater

Stormwater will be handled as outlined in Appendix B - Erosion and Sediment Control Plan.

3.10.9 Spill Prevention and Response Plan

In case of a spill Sweetpea will follow the Spill Prevention and Response Plan that is outlined in Appendix G.

All chemicals will be stored in designated lined chemical storage areas and have all reasonable and practicable measures in place to prevent or minimise pollution or environmental harm; and reduce waste (refer to Section 7.6 and detailed in Appendix F). The chemical storage areas will be routinely inspected and kept free of spilled material and stormwater. This reduces the risk of contamination under the liner, if a liner was punctured or began to leak.

Refuelling and field servicing will have dedicated spill containment.

Double-lined diesel storage tanks to be used as per AS 1940:2004 *The storage and handling of flammable and combustible liquids*.

3.10.10 Fauna and Bird Access

The use of open top tanks for use in evaporation of wastewater could if consumed be a risk to fauna due to the salinity and chemistry of flowback water. The risk is minimal as the salinity levels itself acts as a deterrent from fauna consuming or interacting with wastewater. Earthen freshwater pits and drilling pits will be fenced in to minimise the chance of animals having any interaction with the contents of the pits whether freshwater or drilling fluids.

Wastewater storage areas will be monitored. Fauna ladders are used on the storage tanks. Any known interaction of wildlife with wastewater will be documented and if needed preventative measures in place will be modified accordingly to further reduce the likelihood of fauna interaction.

3.11 Associated Activities

3.11.1 Accommodation Camp Operations

The Sweetpea central accommodation camp will continue to be maintained for use by staff working on all aspects of the program (water bore, civil construction, well drilling, hydraulic fracture stimulation and well testing) within the permit area. The ongoing camp operations are covered under the approved C&WB EMP, including rehabilitation at practical completion of Sweetpea's exploration activities.

Camp services will continue to be contracted as required for the relevant scope of work on an ongoing basis. The camp may not be used on a full-time basis, therefore the camp (or sections of it) may be demobilised between work periods. The setup and operations of the camp will be in accordance with the *Requirements for mining camps and construction camps in the Northern Territory* provided by the Department of Health Environmental Health Branch.

The camp comprises accommodation units, kitchen and dining facilities, ablutions, site office, waste treatment and storage, potable water tanks, diesel storage and a diesel generator.

The accommodation camp will be supplied by nearby groundwater extraction bore that is suitable for potable water use. Extraction from this bore for potable supply will be under the existing Water Extraction Licence (Section 3.11.2) and with the bore owner's permission (if required). The water supply bore for camp operations will be metered to track water usage during the exploration program.

3.11.2 Water Supply and Use

Any groundwater taken by Sweetpea will be in accordance with the existing water extraction licence (WEL) (Licence - GRF10346) obtained under the *Water Act 1992*. The water extraction licence covers water bore installation, civil construction, and the DST exploration activities from June 2021 through to December 2024 as required.

Water supply for Sweetpea's regulated well activity and associated activities will be provided from licensed established bores planned at each of exploration lease pads. Groundwater will be used to supply potable water, with on-site water treatment used to provide water in accordance with the Australian Drinking Water Guidelines.

A water pipeline is proposed to be installed along the access tracks between the extraction bore and the lease pad sites. The pipeline will be buried on installation to protect from bushfire and vehicles. Water supply pipelines will avoid crossing creeks and other major drainage features where possible. Upon completion of the program water supply pipelines will be decommissioned and the site rehabilitated in conjunction with access tracks as outlined in Section 3.11.5.

Extracted groundwater will be recorded using an approved flow meter with records reported quarterly to DEPWS in accordance with the requirements of the water extraction licence.

Table 15 presents the estimated water usage for Sweetpea's DST program associated with up to seven exploration lease pads.

Table 15 EP136 Estimated Water Usage for DST Exploration Program

Activity	Period	2022 Program		2023 Program		2024 Program	
	Description	No. of Items	Water Use (ML)	No. of Items	Water Use (ML)	No. of Items	Water Use (ML)
Drilling of well		1	3	3	9	3	9
HFS of well		1	154.3	3	195.9	3	201.9
Potable water – Drilling		1	0.5	3	1.5	3	1.5
Potable water – HFS		1	0.12	3	0.36	3	0.36
Potable water – Well Test		1	0.08	3	0.24	3	0.24
Estimated Total Annual Water Use for DST Program		158		207		213	
Total Estimate for DST Water Use		578					

The cumulative impact associated with current and future groundwater take for Sweetpea exploration activities were addressed by Controller of Water Resources in the Water Extraction Licence Decision available here - <http://www.ntlis.nt.gov.au/walaps-portal/report/current/gwel> and addressed in Section 6.2.1.

3.11.3 Greenhouse Gas Emissions

The NTG's recently released *Greenhouse Gas Emissions Management for New and Expanding Large Emitters* Policy which identifies the minimum requirements for the management of greenhouse gas emissions from new or expanding industrial and land use development projects. The Policy has been established in recognition of the Northern Territory's target of net zero greenhouse gas emissions by 2050.

Sweetpea's Greenhouse Gas Abatement Plan (GGAP) is required to demonstrate how Sweetpea will contribute to the Territory's target of net zero emissions by 2050 for the planned exploration activities within EP136. Sweetpea are required to report under the Large Emitters Policy for scope 1 emissions of 100,000 tCO₂-e in any financial year over the life cycle of a project, not counting emissions generated from land clearing directly associated with the project.

Flaring activities will produce the majority of emissions as part of this program, however flaring is required to evaluate the commercial viability of the resource. It is anticipated that combustion of gases via flaring can reduce emissions by 96% when compared to venting.

Sweetpea's GGAP for the well drilling, hydraulic fracture stimulation, well testing and associated activities under this EMP is provided in Table 16.

Table 16 Sweetpea GGAP

Requirement	Sweetpea's GGAP
1. A brief description of the project	Section 1.3 provides project description. A summary includes: • Vegetation clearing and civil construction for camp expansion (increase 1.2 ha). • Camp operations. • Transport on permit. • Exploration activities at up to seven well pads, including: - Vertical and horizontal well drilling. - Hydraulic fracture stimulation. - Production testing and follow up testing, monitoring, and work-over activities, including flaring. - Management of wastewater. - Routine and ongoing maintenance of any infrastructure and or services. - Completions.
2. An estimate of the project's net scope 1 emissions and how these emissions will contribute to the Territory's overall emissions profile	Scope 1 emissions under this EMP are provided in Table 17. Greenhouse gas (GHG) emissions have been estimated to range from 96,242 tCO₂-e per annum in year 1 up to 217,611 tCO₂-e per annum in year 4. Flaring activities produce over 93% of the anticipated emissions as part of the DST program, however it is noted that flaring is required to evaluate the commercial viability of the resource. It is anticipated that combustion of gases via flaring will reduce emissions by 96% when compared to venting. It is also noted that the estimates presented are based on worst case emissions scenario. Flaring will largely be avoidable once pipeline capacity to take gas to markets is constructed.

Requirement		Sweetpea's GGAP
		The potential emissions calculated for Sweetpea's exploration program represents between 0.47% to 1.06% of the total annual GHG emissions reported for the NT by the Commonwealth <i>National Inventory Report</i> (inventory year 2019) of 20.6 million tonnes CO₂-e (Department of Industry, Science, Energy and Resources, 2019). On a regional, national and activity perspective, the emissions from the Gas Industry during Beetaloo exploration are not considered significant and are a critical part of the transition to lower carbon intensity energy and also as an input into many critical elements of the modern economy (e.g. fertilisers). The GISERA life cycle assessment identifies that the current net climate benefits of using natural gas in replacing coal for electricity generation is up to 50% less GHG emissions (Heinz 2019). The IEA Net Zero scenario anticipates substantial gas production will still be critical in 2050, and currently there is a risk that there is insufficient investment to ensure that sufficient gas will be available for domestic and global markets. Gas in the Asia-Pacific can help decarbonise electricity markets and reduce CO₂ emissions and atmospheric pollution providing better air quality to major population centres.
3.	An estimate of the project's net scope 2 emissions and how these emissions will contribute to the Territory's overall emissions profile	No scope 2 emissions are associated with Sweetpea's planned exploration program.
4.	An estimate of the project's scope 3 emissions	Scope 3 emissions are indirect GHG emissions generated in NT that are a consequence of Sweetpea's regulated activities associated with supply of materials and equipment. Scope 3 GHG emissions associated with suppliers in the NT are expected to be limited to liquid fuel (diesel) used for transportation and logistics.
5.	An overarching long-term emissions target for the project that represents a meaningful contribution to the Territory's net zero emissions target	Sweetpea's long-term target within the Beetaloo Sub-basin is to have a scope 1 and scope 2 neutral development.
6.	Regular interim targets that establish a trajectory to achieving the overarching target and the methods that will be applied to achieve the interim targets	Not applicable. Interim targets are not appropriate for exploration and appraisal projects.
7.	An explanation of, and justification for, the proposed long-term and interim targets and how these will make a meaningful contribution to the Territory's emissions target	Interim targets are not appropriate for exploration projects due to the high degree of uncertainty, the requirement to test and produce hydrocarbons to determine technical and commercial viability of a potential development and the inability to beneficially re-use hydrocarbons due to legislative and infrastructure constraints within the NT.

Requirement		Sweetpea's GGAP
		Interim and long-term targets are more appropriate where produced hydrocarbons have the ability to be utilised (i.e. through use or sale of product to minimise flaring) or where a project is in the operating phase where emission certainty is higher.
8.	A demonstration that all reasonable and practical measures have been applied to avoid and mitigate emissions through best practice design, process, technology and management	Greenhouse gas emissions during well testing are required to be generated to prove the commerciality of a potential resource. Well testing data is utilised to generate a well's Estimated Ultimate Recovery (EUR). The EUR determines how many wells are required to be drilled and how often future development wells are required to maintain production levels (i.e. as wells decline over time). The minimum required well testing (or piloting) duration for unconventional gas development varies depending on a number of factors, greater data are required to forecast this. The more test data on production, the lower the commercial risk of a development. The mitigation of emissions has been undertaken through: • Minimising well test durations as far as reasonably practicable to assess data. It is noted that Sweetpea DST EMP propose 60, 90 or 300 day test periods. • Utilisation of the best practice emission management controls outlined in the Code of Practice. It is noted that Sweetpea are not legally permitted to beneficially re-use produced hydrocarbons under an Exploration Permit. This results in flaring being the only technically feasible hydrocarbon management approach to implement for this program. Should this change, Sweetpea would investigate options for beneficial reuse and are actively pursuing early commercialisation to minimise the period where flaring is required.
9.	A description of all strategies proposed to avoid, mitigate and offset the project's scope 1 and scope 2 emissions	Section 7.8 Air Quality and Emissions Subplan provides the mitigations for GHG emissions. The controls include the adoption of the mandatory requirements detailed in the Code of Practice which requires: • The development and implementation of a methane emission management plan (D5.1) (refer Appendix E) • Restrictions on venting (D.5.9) • Use of a Reduced Emissions Completion (REC) (D.5.9) • Implementation of a routine Leak Detection and Repair Program (D.5.3.) • Pressure and gas testing to ensure any leaks are identified and fixed prior to commission (D.5.9) • Flanges, valves and fittings are all API compliant and gas tight (D.5.9) • Equipment is appropriately sized and regularly maintained to minimise diesel wastage (D.5.9) • Routine site inspections and assurance undertaken to ensure equipment is maintained and operated as per manufacturers requirements. • Carbon offset plan for residual GHG emissions.
10.	Flexibility to review mitigation actions and abatement plans so they can be improved and updated to enable further	Sweetpea will continue to look for opportunities to mitigate carbon emissions throughout the project. Given the mandatory controls outlined in the Code of Practice and inability to beneficially re-use produced hydrocarbons at this point in time, additional abatement measures are considered limited.

Requirement		Sweetpea's GGAP
	emissions reductions going forward	Should this change, Sweetpea would investigate options for beneficial reuse of the produced hydrocarbons.
11.	A schedule for periodic public reporting on implementation and progress against the interim and overarching targets and any changes that have had to be made to the strategies proposed in the GGAP to deliver on the targets	Sweetpea is required under condition D.6.2 of the Code of Practice to report its GHG emissions to DEPWS on an annual basis (Section 8.5.1). In this report, Sweetpea will assesses the level of greenhouse gas emissions against its EMP estimated levels detailed in Table 17 to demonstrate it has met its performance standards.
12.	Information about the project's obligations under the Australian Government's <i>National Greenhouse and Energy Reporting Act 2007</i> and any expected baseline determinations	Sweetpea will be required to undertake NGERs reporting where GHG emissions exceed the 25,000 tCO ₂ -e threshold and will be covered by the safeguard mechanism if emissions exceed a 100,000 tCO ₂ -e threshold (during a financial year period). A baseline emission intensity will be generated for Sweetpea's activities.
13.	A timetable for review that is considerate of the project's lifespan and the identified interim and overarching targets	The emissions associated with the project will be reviewed annually.

The GHG emissions estimate for the DST program is presented in Table 17. The emissions have been estimated using tools developed for the National Greenhouse and Energy Reporting scheme and assumptions based on similar exploration programs in the Beetaloo Sub-basin. It is noted that the GHG reporting period is based on financial years.

Table 17 Estimated Greenhouse Gas Emissions for DST Program – FY2022-23 to FY2025-26

Source of GHG Emissions	Assumption	GHG Emissions (tCO ₂ - e)				Total (tCO ₂ -e)
		FY2022-23	FY2023-24	FY2024-25	FY2025-26	
	Number of wells per financial year	1	3	3	-	
Vegetation clearance for camp expansion	1.2 ha of shrubs and trees to be cleared for expansion of camp pad. Based on the FullCAM Model.	92	-	-	-	92
Civil construction activity for camp expansion only (all other construction covered by Seismic EMP and C&WB EMP)	Civil Construction fuel consumption averages 80L/hr (¾ load average) over a 12-hour day (~4.8 KL diesel oil over 5 days to complete camp expansion. Estimate based on the Emissions and Energy Threshold Calculator – 2018. Diesel oil (post-2004 vehicles)	13	-	-	-	13
Diesel combustion- Camp Operations	Camp Operations (est. 240 days per year). Fuel consumption averages 15 L/hr with generator running 24 hours per day. Camp operations carried out over a maximum of 720 days. Estimate based on the Emissions and Energy Threshold Calculator – 2018. Diesel oil (post-2004 vehicles)	234	234	234	294	996
Diesel combustion – transport on permit area	Assumes on Permit transport based on up to 200 L per day (est. 240 days/year for Year 1, Year 2 and Year 3). Estimate based on the Emissions and Energy Threshold Calculator – 2018. Diesel oil (post-2004 vehicles)	131	131	131	131	524
Diesel combustion - horizontal and vertical drilling	Assumes 500 KL of diesel used per well based on Table 2.4.2A Emission and energy content factors - liquid fuels and certain petroleum-based products for stationary purposes - NGERS 2017-18 Technical guidelines for the estimation of greenhouse gas emissions by facilities in Australia – Diesel. Drill 1 well in Year 1, 3 wells in Year 2 and 3 well in Year 3.	1,355	4,065	4,065	-	9,485

Source of GHG Emissions	Assumption		GHG Emissions (tCO ₂ – e)				Total (tCO ₂ -e)
			FY2022-23	FY2023-24	FY2024-25	FY2025-26	
	Number of wells per financial year		1	3	3	-	
Diesel combustion – HFS and completions	HFS spread average fuel consumption is 8,000L/day for 6 days per well plus an additional 4,000 L for completion rig consumption. Estimate based on the Emissions and Energy Threshold Calculator – 2018. Diesel oil (post-2004 vehicles)		229	897	897	-	2,093
Fugitive emissions – Drill Cuttings, Venting and Wastewater Storage	Drill cutting assumed estimated cutting volume by the NGERS Global Warming Potential of 28 tCO ₂ -e/tCH ₄ . Venting assumed 2 completion days per well GHG Emissions Methodologies for the Oil and Gas Industry; American Petroleum Institute (API), 2020-21 NGERS completion factor of 25.9 tCH ₄ per day multiplied by NGERS Global Warming Potential of 28tCO ₂ e/tCH ₄ . Wastewater storage emissions based 10 ML per well multiplied by Table 5-10 produced saltwater tank methane flashing emission factors - Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Gas Industry; American Petroleum Institute (API), 2020-21 emission factor of 0.39 tCH ₄ /ML multiplied by NGERS Global Warming Potential of 28 tCO ₂ -e /tCH ₄ .		2,900	8,702	8,702	-	20,304
Flaring – natural gas emissions during EPT	For the purposes of this EMP, the emission CO2 estimates are based on 2 EPTs up to 300 days, 2 EPTs up to 90 days and 3 EPTs up to 60 days. Estimates are based on forecast success case production rates multiplied by Method 1 section 3.44. GHG reported by financial year, as such 300-day EPT in year 1 is likely to extend over two reporting periods. Two flare rates presented based on 3 mmscfd and 5 mmscfd.	3 mmscf	91,218	104,250	91,218	130,312	416,998
		5 mmscf	152,031	173,749	152,031	217,186	694,997
Total DST Program GHG Emissions based on 3 mmscf			96,242	118,279	105,247	130,737	450,505
Total DST Program GHG Emissions based on 5 mmscf			156,950	187,778	166,060	217,611	728,399

The Methane Emission Plan has been prepared (Appendix E) to detail the measures Sweetpea will undertake to conduct methane emissions monitoring, leak management, detection and reporting over the duration of the exploration program and the requirement of annual reporting as detailed in Section 8.5.1. The requirements of the GGAP are also included in Section 8.5.1.

The cumulative impact associated with current and future GHG emission from Sweetpea exploration activities are addressed in Section 6.2.3.

3.11.4 Routine Lease Pad and Access Track Maintenance

To maintain site infrastructure in a functional, safe and non-polluting state, ongoing maintenance activities will be required over the course of the regulated activity. These activities are covered by the C&WB EMP approval. Overall the maintenance activities will be performed annually or as required as detailed in Section 8.7 Environmental Monitoring.

The types of maintenance activities required while Sweetpea are undertaking the regulated activity include:

- Access track resurfacing and maintenance
- Lease and camp pad resurfacing
- Erosion and sediment control maintenance and repair
- Weed management
- Firebreak maintenance
- Vegetation management
- Water extraction bore maintenance
- Fence and gate repair.

Gravel will likely be required for ongoing maintenance activities, which will be sourced from the existing gravel pits identified in the C&WB EMP.

3.11.5 Rehabilitation

Rehabilitation at the completion of the regulated well activity and associated activities will be undertaken in accordance with the rehabilitation management plans prepared in support of the C&WB EMP and presented in Appendix J. Rehabilitation will only commence once the determination has been made by Sweetpea to decommission the site, including the plugging and decommissioning of the exploration lease pad.

At the completion of activities and before the commencement of decommissioning activities, Sweetpea will discuss any possible residual beneficial use of the assets with the pastoral lessee. Assets may include the well pads, tank pads, access tracks, accommodation camp pads, gravel pits and water infrastructure. If the pastoral leaseholder does request for infrastructure to remain in place, the proposed infrastructure will have ownership transferred following approval by DEPWS and the Pastoral Land Board.

Where assets cannot be beneficially used, the site will be rehabilitated using assisted natural regeneration back to a safe, stable landform consistent with surrounding land use. Once Sweetpea identifies the completion of activities within an area of the permit, rehabilitation will commence within that 12-month period.

4.0 Summary of Existing Environment

The following section presents a summary of the existing environment of the area proposed for the regulated well activity and associated activities.

4.1 Physical Environment

4.1.1 Climate

The climate of EP136 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 and dry season experienced through the year. Approximately 90% of the rainfall occurs during the wet season, and annual totals show moderate variability from year to year. November through to March are dominated by hot and wet conditions, while mild days and cool nights are experienced from May to August (Holt & Bertram, 1981). April and September are transitional months, with occasional rainfall. Drought conditions are known to occur in the region once every ten years (Holt & Bertram, 1981).

4.1.2 Topography

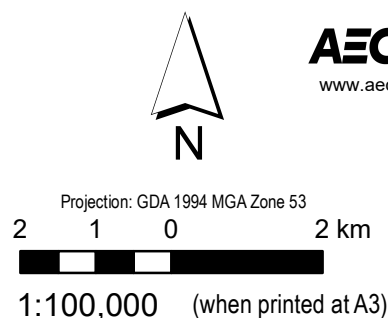
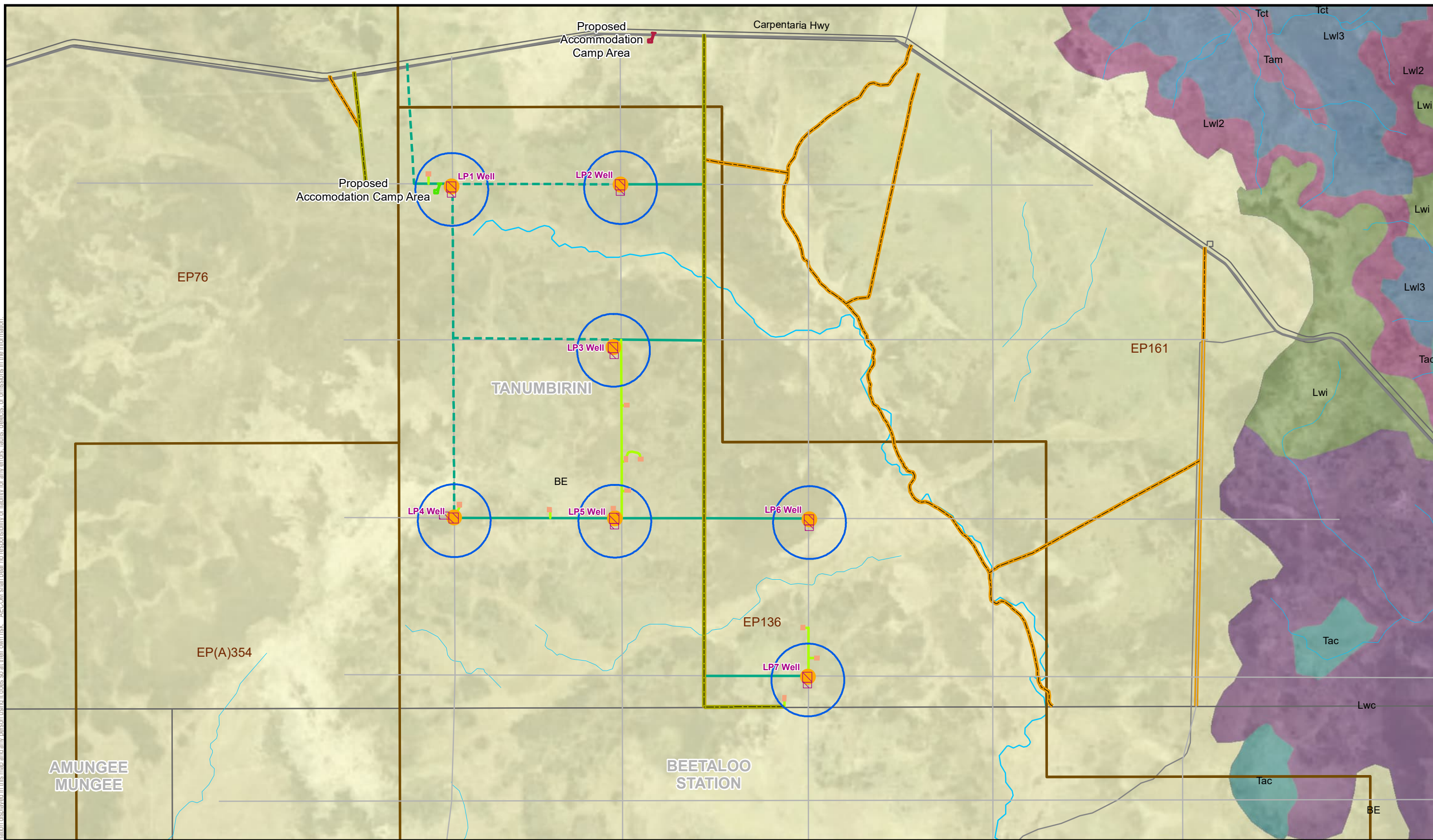
EP136 is predominantly situated on flat laterite plains, which were formed by laterite capping Cretaceous-aged sedimentary rocks (Tickell, 2003). The laterite plains are approximately 250 m to 280 m above sea level and located along the drainage divide that separates inland drainage from the north flowing streams (Nutwood Downs), which lead into the Gulf of Carpentaria. From there, the land gently slopes towards the south and south west.

EP136 lies south of this drainage divide with surface water flow draining in a south westerly direction and discharging into Lake Woods (Tickell, 2003) located approximately 140 km south-west of the permit area.

4.1.3 Land Systems

The northern section of EP136 is situated within the Beetaloo Land System (see Figure 16), which is characterised by gently undulating lateritic plains and rises of lateritic red earths and podzolic soils dominated by *Acacia shirleyi* (Lancewood) forest.

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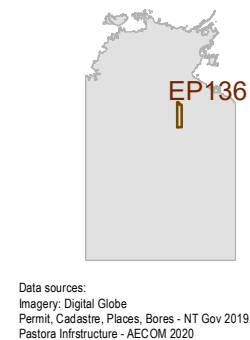


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- Well Site
- Gravel Pit Footprints
- Well Lease Area
- 1 km Bore Buffer
- EP136 Proposed Accommodation Camp Option
- Highway Proposed Accommodation Camp Option
- Petroleum Exploration Permit
- Existing Access

- Gravel Pit Access
- Western Access Option Access Track
- Eastern Access Option Access Track
- Seismic Lines - progressively rehabilitated
- Pastoral Track
- Roads
- Cadastre

- Land Systems**
- Beetaloo (BE)
 - Coolibah (Tac)
 - Cresswell (Lwc)
 - Inacumba (Lwi)
 - Lancewood 2 (Lwl2)
 - Lancewood 3 (Lwl3)
 - McArthur (Tam)
 - Tanumbirini (Tct)



Data sources:
Imagery: Digital Globe
Permit, Cadastre, Places, Bores - NT Gov 2019.
Pastoral Infrastructure - AECOM 2020

**Sweetpea Petroleum Pty Ltd,
Drilling, HFS and Testing EMP**

**Land Systems within
the Civil Construction Program**

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VERSION 1

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**Figure
16**

4.1.4 Geology

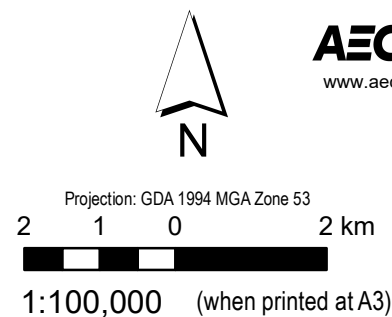
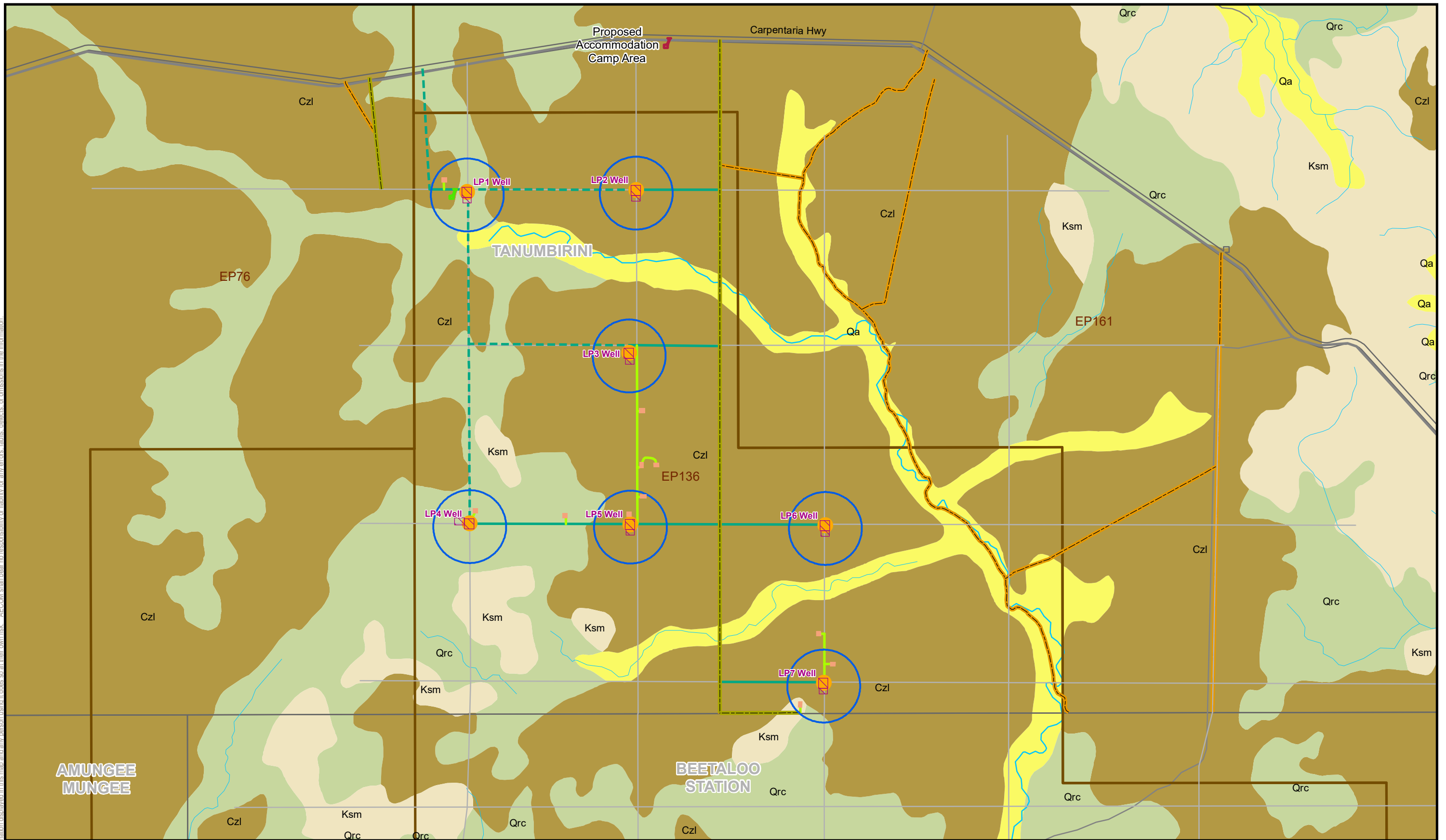
The geology of the project area is complex because it has been shaped by three major phases of geological activity. The oldest is associated with deposition of mudstone and sandstone deposits during the Mesoproterozoic Era (>1,000 Ma) in the Beetaloo Sub-basin (at the western edge of the McArthur Basin). A period of geological deformation in the Neoproterozoic and Palaeozoic Eras resulted in subsidence that formed the Georgina Basin. The basin initially accumulated intermittent deposits of volcanic rocks and sediments that were overlain by deposits of limestone and dolomite (Table 18). Overlying the Georgina Basin deposits are undifferentiated surficial deposits of Jurassic to Cretaceous age. Outcropping geology forms a patchwork of deposits from all three depositional cycles (Figure 17).

The interpreted stratigraphy in the northern portion of EP136 is shown on Figure 18. The target of future petroleum exploration activities is the Amungee Member of the Velkerri Formation, which is vertically separated from the regionally significant Cambrian limestone (CLA) by thick mudstone and shale formations of the Roper Group in the Beetaloo Sub-basin.

Table 18 Inferred stratigraphic sequence at EP136

Age	Group	Basin and Formation	Depth to Top (mbgl)	Thickness (m)
Carpentaria Basin				
Jurassic to Cretaceous	Not Assigned	Undifferentiated surficial sediments	0	100
Georgina Basin				
Cambrian to Ordovician 444 Ma to 541 Ma	Barkly Group	Unnamed Sandstone Formation	N.P?	N.P?
		Anthony Lagoon Formation	100	40
		Gum Ridge Formation	140	140
Palaeozoic, Early Cambrian	Kalkarindji Suite	Antrim Plateau Volcanics	N.P?	N.P?
Neoproterozoic >541 Ma	Kiana Group	Bukalara Sandstone	280	197
McArthur Basin – Beetaloo Sub-Basin				
Mesoproterozoic >1,000 Ma	Roper Group, Maiwok Sub-group	Chambers River Formation including the Hayfield Mudstone	477	562
		Bukalorkmi Sandstone	1039	1,343
		Kyalla Formation	2,382	1,039
		Moroak Sandstone		
		Velkerri Formation		
		Bessie Creek Sandstone	3,421	-
Sources: Geoscience Australia, 2021 and Sweetpea Petroleum Pty Ltd, 2021. Dashed lines indicate the contact is unconformable (a time gap in the depositional history) N.P? – Unit possibly not present				

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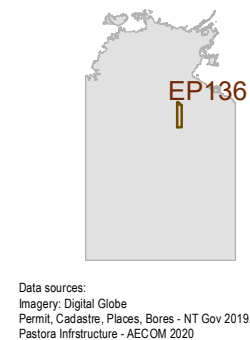


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- Gravel Pit Access Track
- Western Access Option Access Track
- Eastern Access Option Access Track
- Seismic Lines - progressively rehabilitated
- Pastoral Track
- Roads
- Cadastre

Geology

- Czl-lateritic duricrust
- Ksm-sandstone
- Qa-alluvial sediment
- Qrc-sand, gravel



**Sweetpea Petroleum Pty Ltd,
Drilling, HFS and Testing EMP**

**Geology within
EP136 Exploration Area**

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**Figure
17**

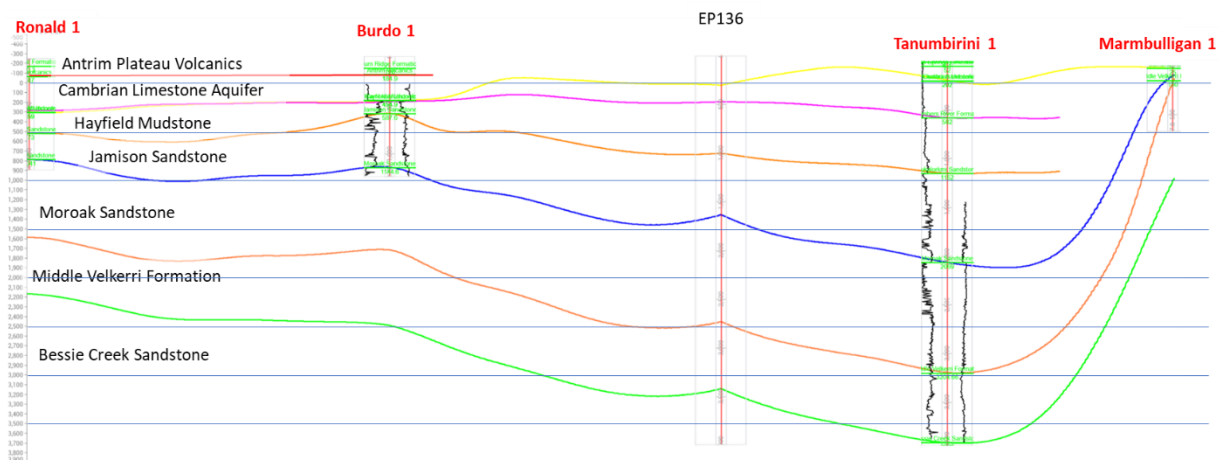


Figure 18 Geological cross section showing local stratigraphic units (after Sweetpea Petroleum, 2021)

Carpentaria Basin

Surficial sedimentary deposits in the order of 80 to 100 m thick blanket the project site (Table 18). These materials have been described in the log of Wendy's Bore (RN041245, located within the project area) as red, brown, and yellow and black clay to 84 m depth overlying limestone and clay. A second bore to the near the Carpentaria Highway intersected brown siltstone and black clay overlying dolomite.

Georgina Basin

The exploration area is inferred to be underlain by about 280 m of indurated sedimentary deposits in the Georgina Basin, one of three basins of Neoproterozoic to Late Devonian age (formed up to about 500 million years ago) that extend across a large part of the Northern Territory and western Queensland (Figure 17).

The Georgina Basin occupies a deep geological trough oriented in a northwest and southeast direction over older sedimentary rocks of Proterozoic age. Recent mapping by the NT Government (Tickell and Bruwer, 2019) describes the basin as being up to about 450 m deep along its centreline which is about 90 km to 100 km southwest the south of the project site.

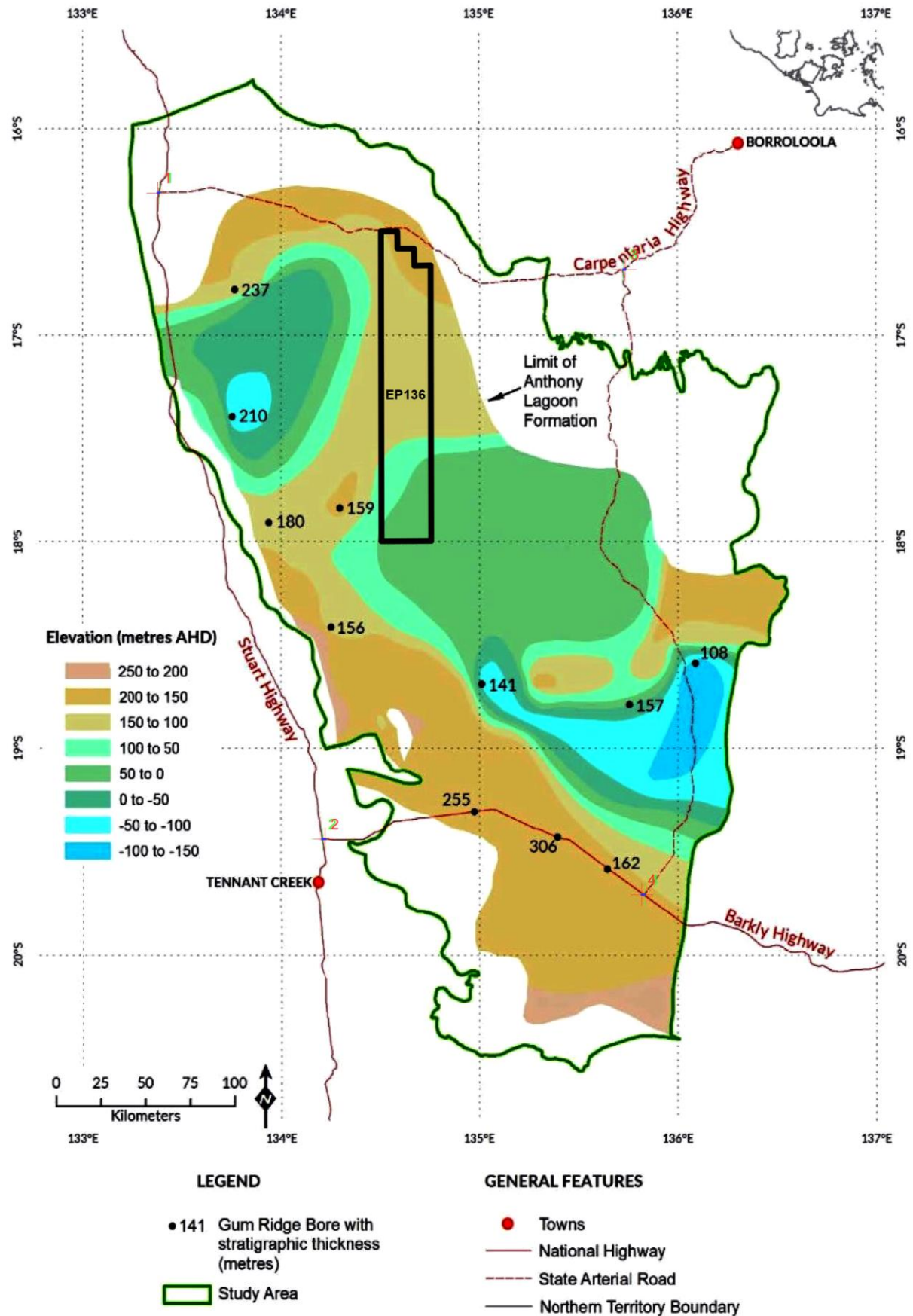
The exploration area is situated near the north-eastern margin of the Georgina basin. This margin is formed by a "bedrock ridge" comprising Roper Group sedimentary rocks that outcrops to the northeast of the project site on Tanumbirini Station. Within the Georgina Basin and at the exploration area are two Cambrian limestone formations that belong to the Barkly Group: the older (and deeper) Gum Ridge Formation, and younger (shallower) Anthony Lagoon Formation (Tickell and Bruwer, 2019). Regional mapping places the margin of the Anthony Lagoon Formation (within the central part of the Georgina Basin) close to Sweetpea's exploration area.

The extent and elevation of the top and base of the Gum Ridge Formation are shown on Figure 19 and Figure 20, respectively, along with the limit of the Anthony Lagoon Formation Figure 19, indicating that both are likely present within the lease area.

The Cambrian limestone units in the Georgina Basin are equivalent to other Cambrian limestone formations in the Daly Basin and Wiso Basin as shown on Table 19. These names are sometimes used generally across this part of the NT which can lead to some confusion.

Table 19 Cambrian Limestone Inter-basin Correlations

Georgina Basin	Daly Basin	Wiso Basin
Anthony Lagoon Formation	Jinduckin Formation	Hooker Creek Formation
Gum Ridge Formation	Tindal Limestone	Montejinni Limestone
Sources: Tickell & Bruwer, 2019 and Geoscience Australia, 2021.		



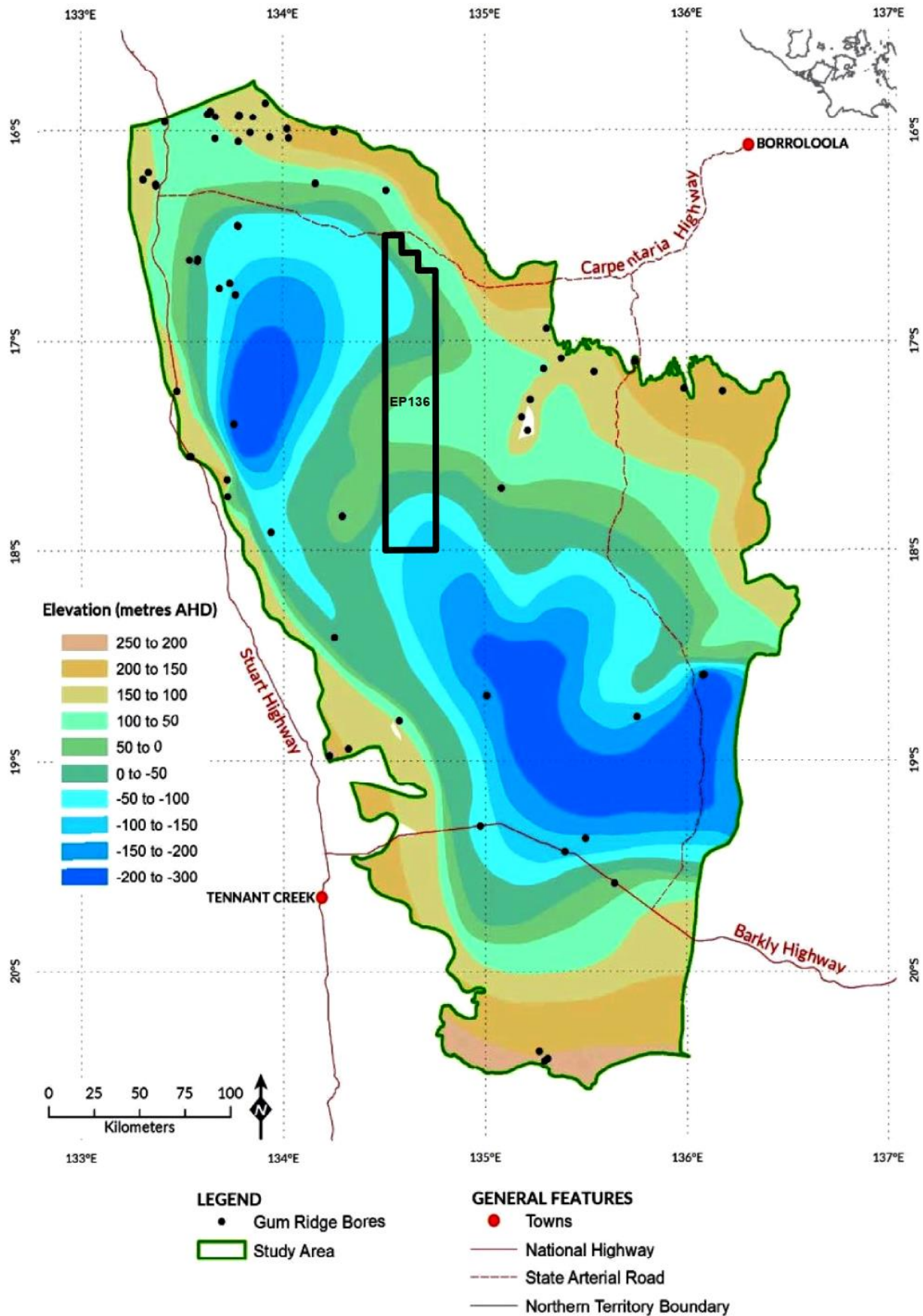


Figure 20 Elevation (m AHD) of the base of the Gum Ridge Formation (Tickell and Bruwer, 2017)

Lithological logs from within the project site (RN031245), to the north (RN037655) and to the south (RN038153) encountered dolomite and limestone, often losing circulation while drilling. None of these logs correlate the intersections with one or the other Cambrian Limestone units.

At the base of the Georgina Basin are two formations that unconformably contact (a time gap in the continuity of deposition) the Barkly Group above and the Roper Group below (Table 20). The upper unit is an Early Cambrian volcanic deposit called the Antrim Plateau Volcanics which is part of the Kalkarindji Suite. This unit is regionally extensive but has not yet been detected by Sweetpea Petroleum at the project site.

Table 20 Lithologies associated with inferred geological units at EP136

Age	Group	Formation	Composition
Carpentaria Basin			
Jurassic to Cretaceous	Not Assigned	Undifferentiated surficial sediments	Clay and siltstone
Georgina Basin			
Cambrian to Ordovician 444 Ma to 541 Ma	Barkly Group	Unnamed Sandstone Formation ²	N.P?
		Anthony Lagoon Formation	Dolomite and dolomitic mudstone and siltstone, evaporites and chert
		Gum Ridge Formation	Dolomitic massive limestone and mudstone
Palaeozoic, Early Cambrian	Kalkarindji Suite	Antrim Plateau Volcanics	Basalt, dolerite and andesite, sandstone, siltstone, limestone, and chert.
Neoproterozoic >541 Ma	Kiana Group	Bukalara Sandstone	Fine to coarse sandstone, minor shale beds with basal conglomerate.
McArthur Basin – Beetaloo Sub-Basin			
Mesoproterozoic >1,000 Ma	Roper Group, Maiwok Sub-group	Chambers River Formation including the Hayfield Mudstone	Well indurated massive to fissile shale and siltstone
		Bukalorkmi Sandstone	Fine to coarse grains quartz sandstone
		Kyalla Formation	Siltstone, mudstone, and very fine-grained sandstone
		Moroak Sandstone	Medium to fine grained sandstone
		Velkerri Formation	Carbonaceous mudstone and siltstone
		Bessie Creek Sandstone	Fine to medium grained quartz sandstone
Sources: Geoscience Australia, 2021 and Sweetpea Petroleum Pty Ltd, 2021. Dashed lines indicate the contact is unconformable (a time gap in the depositional history) N.P? – Unit possibly not present			

The lowest Georgina Basin unit in the project area is the Neoproterozoic Bukalara Sandstone and includes fine to coarse grained sandstone. This unit has been detected in the project area. The northern portion of the Georgina Basin has undergone minimal deformation since deposition. Sediments dip slightly to the south and have undergone gentle folding (Fulton and Knapton, 2015).

Beetaloo Sub-basin

The deposits within the Mesoproterozoic Beetaloo Sub-basin, of the greater McArthur Basin, are predominantly sandstones and mudstones. The Velkerri Formation, of the Maiwok Subgroup, is a carbonaceous mudstone and siltstone with organic-rich intervals in the Amungee Member, which is the target of current exploration.

The Mesoproterozoic Roper Group shows greater deformation than the deposits in the shallower Georgina Basin due to the reactivation of deep-seated structures during the Late Proterozoic (Fulton and Knapton, 2015). The Arnold Arch, a prominent structure that has been present since early in the depositional history of the Beetaloo Sub-basin, is in the northern portion of EP136. There are no major faults observed in the extensive 2D seismic data across the relatively unstructured, deeper parts of the Beetaloo Sub-basin, with major faulting limited to the edges of the Sub-basin.

4.1.5 Hydrogeology

4.1.5.1 Hydrostratigraphy

Within EP136 there are two regionally extensive aquifers the Gum Ridge Group, and the Anthony Lagoon Formation, which are often collectively referred to as the Cambrian Limestone Aquifer (CLA) (Tickell and Bruwer, 2019).

The Anthony Lagoon Formation is a fractured dolomite, dolomitic limestone, and fine sandstone (Tickell and Bruwer, 2019). The Gum Ridge Formation conformably underlies the Anthony Lagoon Formation and is characterised as being fractured and karstic limestone. Typical bore yields and hydraulic properties of the CLA, based on regional assessments, are included in Table 21. Within the Georgina Basin, the CLA is a preferred water supply for pastoral, domestic and industrial (petroleum) (Table 22).

Roper Group formations within the Beetaloo Sub-basin are characterised as hosting local aquifers, separated by regionally extensive aquitards (Table 21). Information on groundwater occurrence in the Roper Group and dependency by bore owners is sparse due to the absence of drilling and testing at the great depths these formations occur. Some data from regional assessments has been included in Table 21 for reference.

Table 21 Hydrostratigraphy of EP136

Age	Group	Formation ³	Aquifer status ¹	Yield (L/s) ¹	Porosity (%) ¹	Hydraulic conductivity (m/day)	Transmissivity (m ² /day) ²
Carpentaria Basin							
Cretaceous	Not defined	Undifferentiated	Local aquifer / aquitard	0.3 - 4	-	-	
Georgina Basin							
Cambrian to Ordovician	Barkly Group	Anthony Lagoon Beds ¹	Regional aquifer	1 - 10	-	-	13 – 8,200
		Gum Ridge Formation ¹	Regional aquifer	0.3 - >20	-	-	5 – 3,030
Early Cambrian	Kalkarindji Suite	Antrim Plateau Volcanics	Regional aquitard	0.3 - 5	-	-	
Neoproterozoic	Kiana Group	Bukalara Sandstone	Local aquifer	0.3 - 5	12 - 21	0.004 - 0.95	
McArthur Basin - Beetaloo Sub-basin							
Mesoproterozoic	Roper Group	Chambers River Formation (Hayfield Mudstone)	Regional aquitard	-	5 - 15 (sandstone)	0.02 (sandstone)	
		Bukalorkmi Sandstone	Local aquifer	-	6 - 18	<0.1	
		Kyalla Formation	Regional aquitard	-	4 (mean)		
		Moroak Sandstone	Local aquifer	0.5 - 5	5 - 15	0.05, 0.23	
		Velkerri Formation	Regional aquitard	-	6 (mean)		
		Bessie Creek Sandstone	Local aquifer	0.5 - 5	<15	0.3	

Notes: 1. Fulton and Knapton, 2015; 2. Tickell and Brewer, 2019; 3. Geoscience Australia, 2021; 4. Thickness based on surface geophysical survey (Sweetpea Petroleum, 2021)

Table 22 Summary of current and historical groundwater bores within 30 km of the proposed drill sites (NTG groundwater database)

Bore ID	Distance (km) from drillsites ¹	Use	Constructed depth (mbgl)	Open interval	Aquifer	Yield (L/s)	Licenced extraction (ML/year)	Depth to Groundwater (mbgl)
RN031245	3.65	Production	144	138 - 143	Gum Ridge Formation	2	-	115
RN005783	7.43	Unknown	134.4	104.9 - 134.4	Gum Ridge Formation	1.25	-	121.9
RN037655	7.68	Production – petroleum industry	155	143 - 155	Gum Ridge Formation	6	299	126
RN041672	8.69	Production	140	132 - 140	Gum Ridge Formation	2.5	-	127.5
RN039573	10.38	Production	168	120 - 126	Gum Ridge Formation	3.5	-	98
RN042213	11.80	Investigation	230	150.7 - 230	Gum Ridge Formation	6	-	124
RN039693	12.31	Production – road construction	144	132 - 144	Gum Ridge Formation	Unknown	-	117.5
RN029025	12.33	Production – road construction	144	125 - 137	Anthony Lagoon Formation	12	-	118
RN025291	13.55	Production	150	132 - 150	Gum Ridge Formation	1	-	103
RN029026	8.6	Historical Production – Road Bore Backfilled	142	133-139	Gum Ridge Formation	2.5	-	128
RN006067	8.6	Historical Production – Road Bore Backfilled	138.6	133-139	Gum Ridge Formation	1.9	-	128
RN041762	8.6	Historical - Decommissioned	152	Not Constructed	Gum Ridge Formation	-	-	-
RN041761	8.6	Historical – Decommissioned	102	Not Constructed	Gum Ridge Formation	-	-	-
RN041760	8.6	Historical - Decommissioned	143	Not Constructed	Gum Ridge Formation	-	-	-

Bore ID	Distance (km) from drillsites ¹	Use	Constructed depth (mbgl)	Open interval	Aquifer	Yield (L/s)	Licenced extraction (ML/year)	Depth to Groundwater (mbgl)
RN040938	13.62	Investigation – petroleum industry monitoring	136	118 - 132	Gum Ridge Formation	1.2	-	117
RN040937	13.63	Production – petroleum industry	276	143.8 - 276	Gum Ridge Formation	7.2	193.5	116.6
RN033608	15.31	Production – pastoral	156	138 - 156	Sandstone	3	-	120
RN037650	15.49	Production – pastoral	185	140 - 185	Gum Ridge Formation	5.5	-	117
RN028316	16.44	Production – domestic	168	156 - 168	Sandstone	4	-	119.7
RN008102	16.59	Production – domestic	137.1	Unknown	Unknown	1.9	-	-
RN006645	18.43	Unknown	103.6	60 - 103.6	Gum Ridge Formation	1.1	-	9.1
RN038153	18.53	Production – pastoral	155	146 - 155	Gum Ridge Formation	2.5	-	107
RN031244	19.02	Production – pastoral	159	153 - 159	Broken Limestone	1.5	-	124
RN029302	19.17	Production – road construction	132	92 - 98.5	Gum Ridge Formation	0.5	-	91
RN029303	19.38	Cathodic protection	122.5	90 - 122.5	Anthony Lagoon Formation	-	-	-
RN005864	19.98	Unknown	91.4	Unknown	Lower Cretaceous	Unknown	-	-
RN007658	20.97	Production	94.5	82.3 - 88.4	Gum Ridge Formation	1.08	-	79.2
RN038154	21.90	Production – pastoral	155	146 - 155	Gum Ridge Formation	3.5	-	104
RN040932	24.67	Investigation – petroleum industry monitoring	168.2	114 - 156.2	Gum Ridge Formation	2.5	193.5	103.2

Bore ID	Distance (km) from drillsites ¹	Use	Constructed depth (mbgl)	Open interval	Aquifer	Yield (L/s)	Licenced extraction (ML/year)	Depth to Groundwater (mbgl)
RN037654	28.34	Production – pastoral	155	143 - 155	Gum Ridge Formation	5	-	114.6
RN038152	29.61	Production – pastoral	155	146 - 155	Gum Ridge Formation	2	-	102

4.1.5.2 Existing groundwater users

A summary of the licensed water allocations in the Beetaloo GBA region and Beetaloo extended GBA Region and is presented in Table 23.

Table 23 Summary of Licensed Water Allocations in the Beetaloo GBA Region

Authorised purpose	Number of licensed bores in Beetaloo GBA extended region	Total entitlement volume for Beetaloo GBA extended region (ML/y)	Number of licensed bores in Beetaloo GBA region	Total entitlement volume for Beetaloo GBA region (ML/y)
Agriculture	26	27,446	1	1,650
Industry	11	309	0	0
Public Water Supply	6	275	0	0
Stock and domestic ^a	Various bores ^b	2,108	Various bores ^b	540
Total volume (ML/y)	-	30,138	-	2,190

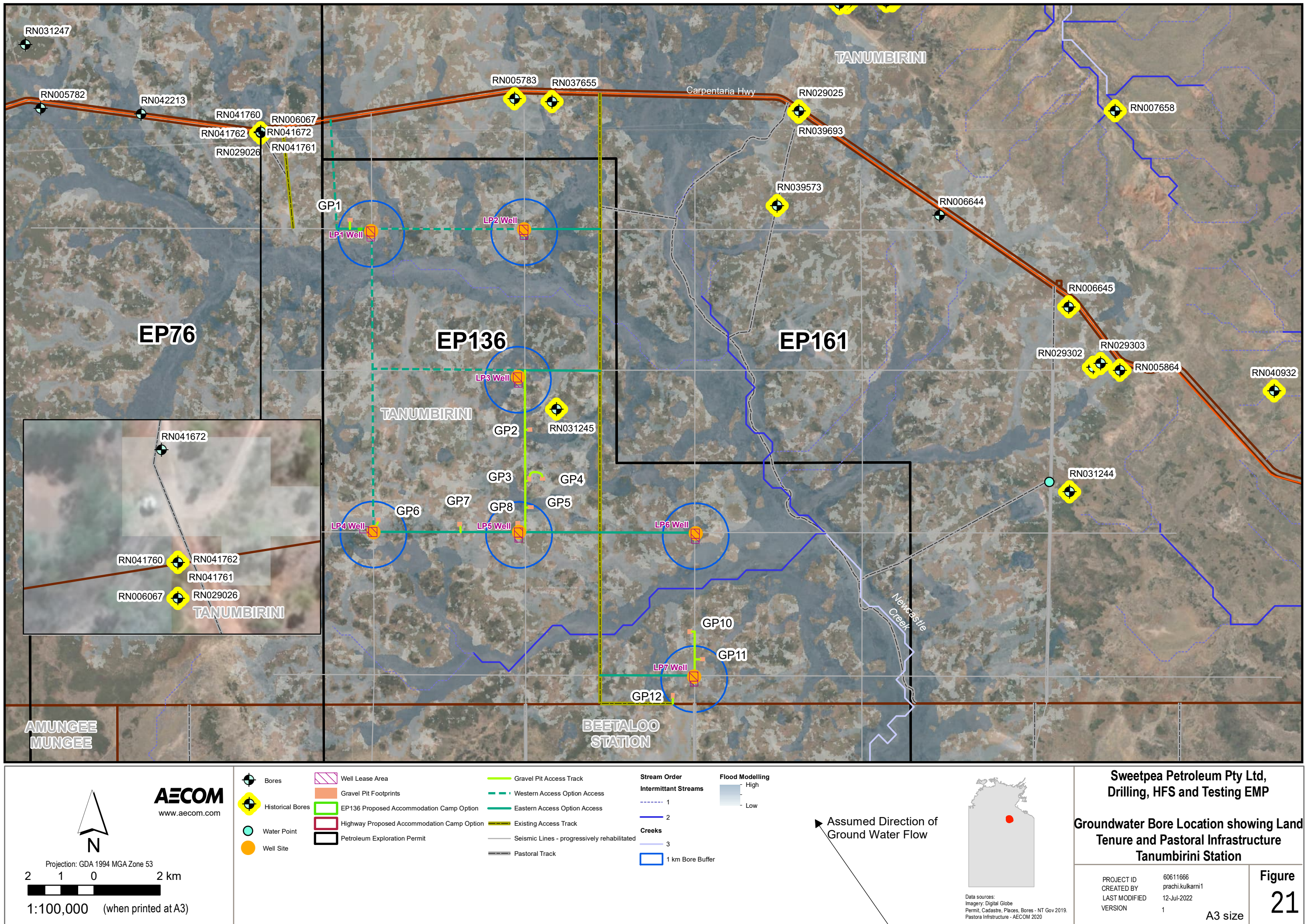
^a volumes as reported in water allocation plans,

^b There are 1153 and 343 stock and domestic bores located within the Beetaloo GBA extended region and the Beetaloo GBA region, respectively; however, the actual number of bores used for extraction is unknown.

Extract from Huddleston-Holmes et al. 2020 (*Data from Department of Environment and Natural Resources (2019b)*)

A search of the NTG Groundwater database identified groundwater users near the exploration area. The search identified 26 existing registered bores and five historical bores (decommissioned) within 30 km of the exploration areas (Table 22). Review of bore logs indicated that most of these bores were screened across the CLA (Table 22). Stabilised water levels (post-drilling) typically ranged from 80 to 127 metres below ground level (mbgl). Groundwater yield was variable, ranging from 0.5 to 12 L/s (median 2.5 L/s), which is consistent with regional assessments (Tickell and Bruwer, 2019).

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4.1.5.3 Groundwater quality

Average groundwater quality data compiled from data included in the NTG groundwater database is presented in Table 24. Water quality data for the CLA sampled from bores located within 150 km of the project site, indicates the predominant water type in this aquifer is calcium-magnesium-bicarbonate (Figure 22 after Wilkes *et al.*, 2019).

Electrical conductivity (used as a measure of salinity) in the CLA is typically fresh and on neutral pH making it a preferred source of water. EC data from the Roper Group sediments suggest groundwater in the Beetaloo Sub-basin is saline to hypersaline (Table 24).

Table 24 Regional groundwater quality (after Tickell and Bruwer, 2019; Fulton and Knapton, 2015)

Aquifer	Average Electrical Conductivity ($\mu\text{S/cm}$)	Average pH
Undifferentiated	1,780	7.5
Anthony Lagoon Beds	1,590	7.6
Gum Ridge Formation	1,390	7.5
Antrim Plateau Volcanics	910	7.9
Bukalara Sandstone	1,030	7.4
Hayfield Mudstone	32,000	-
Jamison Sandstone	138,000	-
Kyalla Formation	-	-
Moroak Sandstone	131,000	-
Velkerri Formation	-	-
Bessie Creek Sandstone	-	-

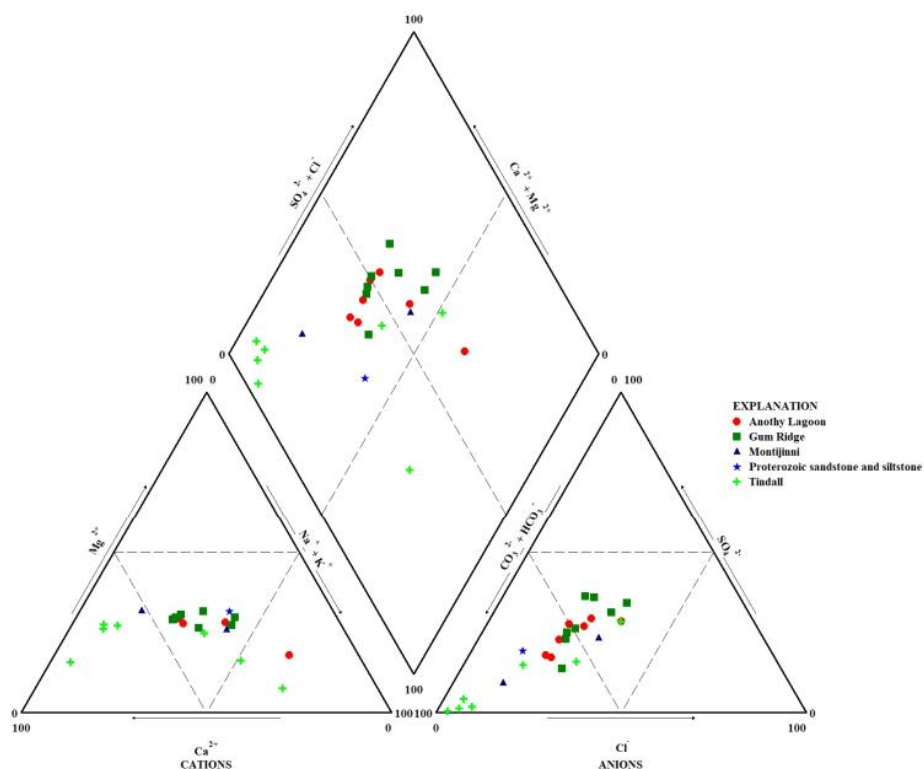


Figure 22 Piper diagram showing water type for the CLA (Wilkes *et. al*, 2019)

Following a baseline assessment for the original Exploration EMP developed for EP136 (HLA, 2005), in 2015 AECOM undertook a gap analysis of available water quality data for the permit area and to undertake sampling where a baseline water quality condition could not be established.

On 15 April 2015, groundwater samples from two groundwater bores located within EP136 to reference against the 2005 baseline water quality data. Groundwater data for these two locations are shown in Table 25. Baseline water quality in the exploration area is consistent with regional data.

Table 25 Groundwater quality sampling from two baseline bores within EP136 (AECOM, 2015)

Parameter	Sample Reference		Baseline (HLA, 2005)
	RN037655	RN031245	NTG Database (min-max)
Aquifer	Gum Ridge Formation	Gum Ridge Formation	Regional
Date Sampled	15/04/2015	15/04/2015	-
Temperature °C	31.7	30.6	-
pH	6.8	6.5	4.7 – 8.3
Turbidity (NTU)	2.3	2.8	2 - 15
E.C. (µS/cm)	1,432	1,376	0 – 2,500
Dissolved Oxygen (%Sat)	43.5	26.7	85 - 120
Redox (mV)	221	100	-
Sulfate as SO ₄ (mg/L)	151	99	1 - 979
Chloride (Cl ⁻) (mg/L)	104	112	3 - 518
Calcium (Ca ²⁺) (mg/L)	126	99	6 - 303
Magnesium (Mg ²⁺) (mg/L)	53	48	1 - 95
Sodium (Na ⁺) (mg/L)	76	66	3 - 348
Potassium (K ⁺) (mg/L)	10	8	1 - 57
Bicarbonate Alkalinity as CaCO ₃ (HCO ₃ ³⁺) (mg/L)	426	395	2 - 632

4.1.5.4 Groundwater levels and flow

Regional levels and flow

Regional groundwater flow in the Gum Ridge Formation is toward the northwest (Tickell and Bruwer, 2019) (Figure 23). Gradients are typically low, in the order of 10 m per 100 km. Flow along the northern edge of the aquifer is controlled by a groundwater divides in outcropping rocks from the Roper Group in the east, along with the presence of the lower permeability Antrim Plateau Volcanics in the west.

Regional mapping by Tickell and Bruwer observed that there are no groundwater discharge features within the Georgina basin. Their review of the available groundwater level data suggested some separation of groundwater between the two CLA formations due to a minor hydraulic gradient. They concluded that the two aquifer units are likely to be connected and that groundwater from the Anthony Lagoon Formation may be flowing to the Gum Ridge Formation and ultimately discharging to the Roper River at Mataranka.

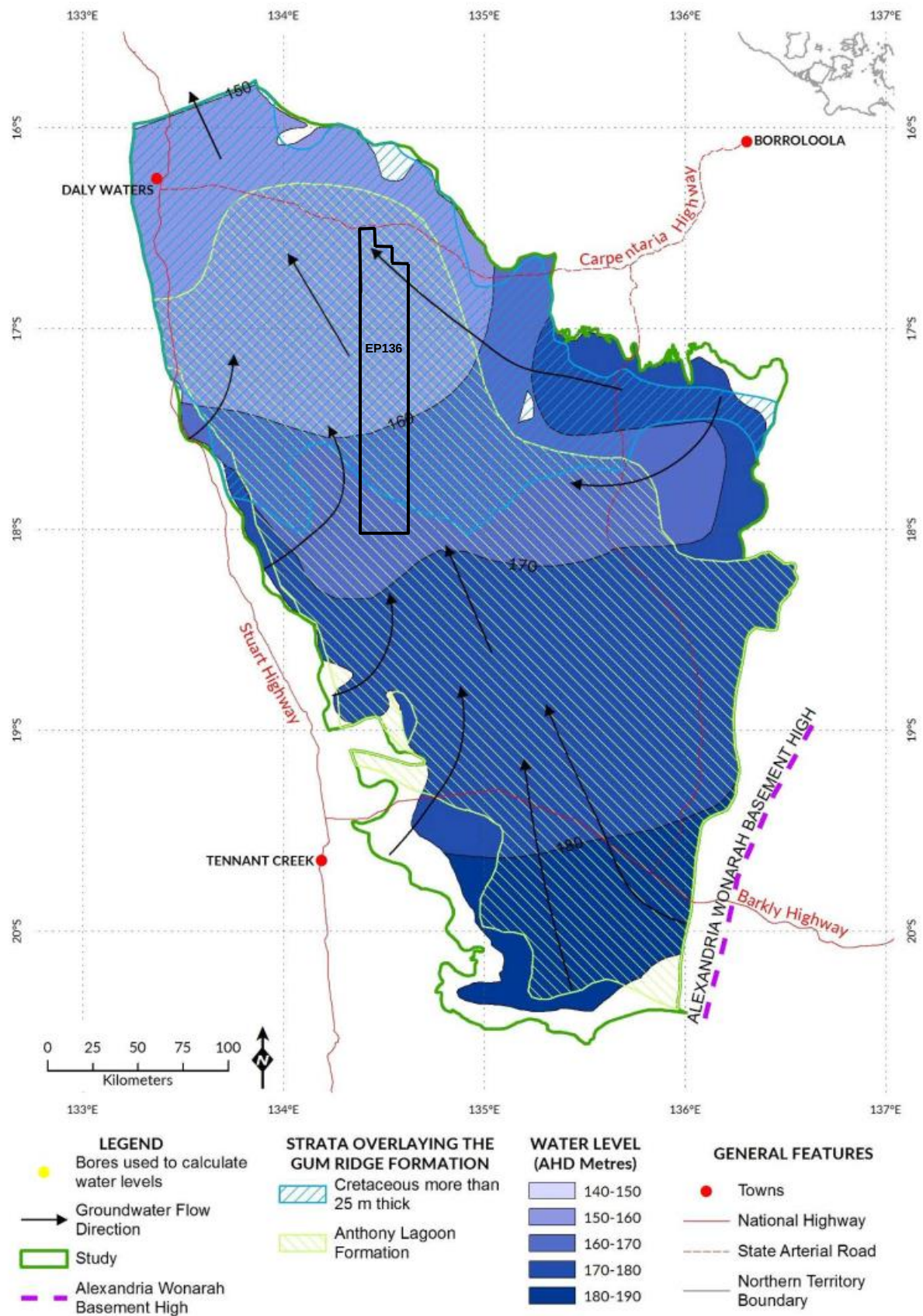


Figure 23 Regional groundwater levels and flow within the Gum Ridge Formation (after Tickell and Bruwer, 2019)

4.1.5.5 Local levels and flow

Groundwater flow at a local scale in the CLA and other aquifers in the project area are poorly understood, due to the absence of discrete groundwater level readings in each unit. Groundwater levels within a 30 km radius of the exploration area range between 79.2 mbgl to 127.5 mbgl averaging 116.8 mbgl (Table 22). One site (RN006645 on Tanumbirini Station) was recorded as having a groundwater level of only 9.1 mbgl within shallow carbonate rock, probably near the outcrop of one of the CLA units.

An assessment by AECOM (2017) for Beetaloo Joint Venture identified shallow groundwater was present in EP98 at the Amungee Mungee NW-1H site. Unlike regional studies that focus on groundwater in the CLA, this study identified:

- fresh groundwater in a potential shallow water table in sandy clay deposits within 1 to 2 m below the surface
- the water table about 3.9 km to the west was about 109 mbgl suggesting this may be perched groundwater
- the water table varied by about 2 m at the end of the 2016 and 2017 wet seasons suggesting recharge and rates of leakage to the regional water table in the CLA units is variable
- there may be local dependence on the perched water by groundwater dependent ecosystems (GDEs).

These findings may be relevant to the EP136 exploration area because in this area, seasonal recharge may also accumulate in clayey soils beneath Newcastle Creek. If they do, it will also be perched as at EP98 since the water table in the CLA is about 115 mbgl (RN031245). To the south of the project area bore RN038154, which is located close to Newcastle Creek, had a groundwater level of 104 mbgl when it was drilled in 2013.

Long term monitoring data indicate that the water levels in the Cambrian Limestone Aquifer vary gradually with long-term trends, not on a seasonal basis in response to heavy or light individual wet seasons. Time-series water level data were obtained from the NT Water Data Portal for bores generally around the margins of the Beetaloo Basin, and for monitoring bores installed on Tanumbirini Station within EP161, immediately adjacent to EP136. All of the bores monitor the Cambrian Limestone Aquifer.

The data show:

- A general rise in water levels over the period for which data are available, with the rate of rise slowing since 2019, which corresponds to years of poorer wet seasons. The maximum total water level rise is in the order of 0.3 m (30 cm). This is consistent with the long-term rising trends identified in CloudGMS (2020).
- Short term perturbations in water level of less than 0.1 m (10 cm) overprinted on the long-term rising trend, mostly occurring at the end of the wet season. These often appear as a water level decline and may relate to seasonal barometric pressure changes rather than the effects of the wet season.
- The trends are generally consistent with long-term water level trends in the semi-arid zone (upgradient) bores presented in CloudGMS (2020), which show limited response to episodic recharge and thus limited seasonal variation. CloudGMS infers that the data are indicative of an unsaturated zone within the aquifer that allows water levels to rise. Those bores that show clear seasonality are all located within the Daly Basin and are within the wet-dry tropical zone (generally in the immediate vicinity of Mataranka), where groundwater levels reflect the variation in rainfall year to year and the hydrographs have a “fill-and-spill” response to the wet season. In this zone the aquifer has no significant unsaturated capacity (CloudGMS, 2020).

Given the CLA data show a deep, gradually changing water table, whereas the water holes associated with the Newcastle Creek are ephemeral and associated with the wet season (i.e. shallow and highly variable water level) we can conclude, to the extent possible based on currently available hydrogeological data, that there is no connection between the CLA and the water holes (refer to Figure 24). This is an important conclusion as it provides confidence to all water users of the CLA (interest holders as well as pastoralists) that extraction from the CLA will not impact important sacred sites identified in AC2020/072.

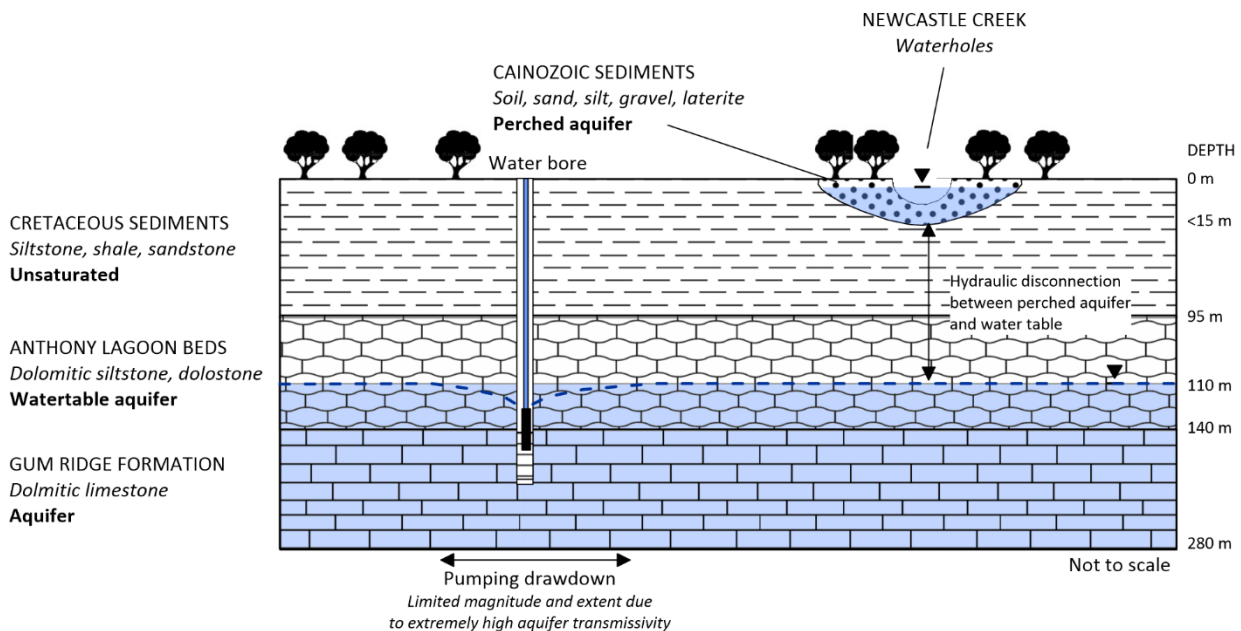


Figure 24 Preliminary Conceptual Site Model Newcastle Creek Water Holes and CLA

(prepared for Sweetpea by Groundwater Enterprise Pty Ltd, April 2022)

Sweetpea have directed our third-party, consultant hydrogeologist (who has deep experience in this area) to engage an NT based hydrogeological expert (at arm's length from Sweetpea) to provide an independent hydrogeological risk assessment of the potential for any connection between the CLA and water holes in the EP136 area. Sweetpea will provide this report to stakeholders once final.

4.1.5.6 Groundwater recharge and discharge

At a regional scale, recharge to the CLA occurs along basin margins, where the unit outcrops or subcrops (Figure 25). Recharge across the Georgina Basin is generally sporadic due to a complex interplay between climate, soil type and extent, vegetation, and topography (Tickell and Bruwer, 2019; Fulton and Knapton, 2015).

Recharge to aquifers within the Georgina Basin typically occurs via the following mechanisms (Fulton and Knapton, 2015; Santos, 2019):

- Infiltration via sinkholes and soil cavities (main mechanism for the CLA).
- Direct recharge via vertical percolation of precipitation where the CLA units' outcrop or subcrop.

Along the north-eastern edge of the Georgina Basin, the outcropping Gum Ridge Formation near the project area, Tickell and Bruwer (2019) inferred to have a recharge rate of 1.2 to 12.2 mm/year based on chloride mass balances. They also estimated recharge rate for the Anthony Lagoon Formation is 1.9 mm/year.

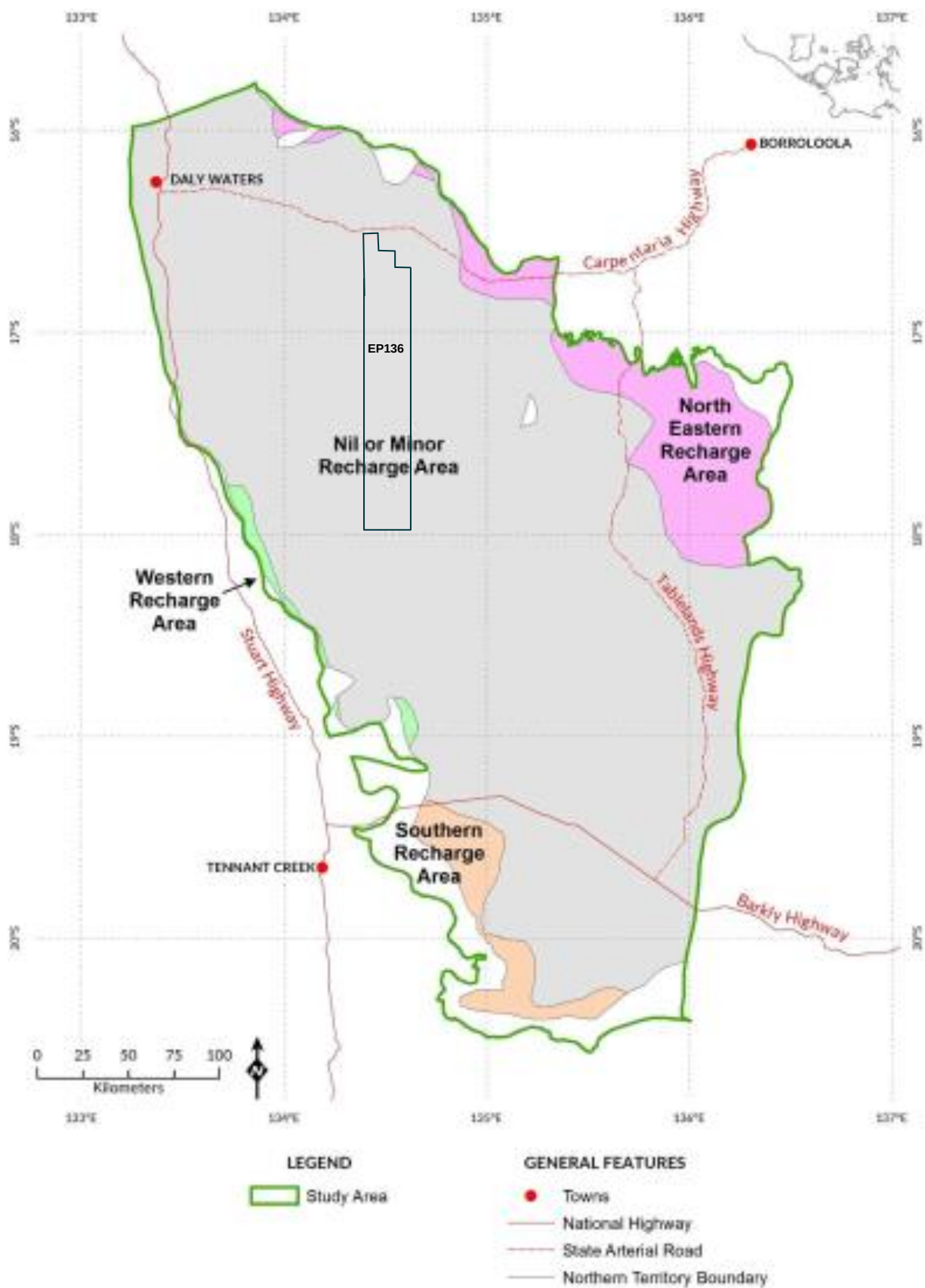


Figure 25 Potential recharge zones for the Gum Ridge Formation (after Tickell and Bruwer, 2019)

4.1.6 Hydrology

EP136 is located within the Wiso Basin which is drained by the Georgina River and its major tributaries (Ranken, James, Buckley and Woodroffe Rivers).

Newcastle Creek and several small ephemeral creeks are located within the EP136. Access tracks have been designed to utilise a main existing station track which crosses Newcastle Creek twice at two existing crossings. The secondary station track to access Lease Pad 1 and all other tracks to access the lease pads do not cross any major creek or drainage lines (refer Figure 27).

Newcastle Creek and the small drainage depressions only flow for short periods during the wet season, with waterholes forming at the beginning of the dry season. EP136 drains via Newcastle Creek towards Lake Woods, which is located 140 km south-west near Newcastle Waters Station. The area of Lake Woods is 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 (HLA, 2005). Lake Woods is described as a major quasi-permanent surface water body in the region, although some semi-permanent and many ephemeral waterholes are located across the exploration area (HLA, 2006a).

The extent of inundation within EP136 depends on the severity of the wet season and can range from remaining completely dry to widespread flooding. A preliminary assessment of the 1% Annual Exceedance Probability (AEP) flood levels was completed for the seven proposed lease pads (Figure 26).

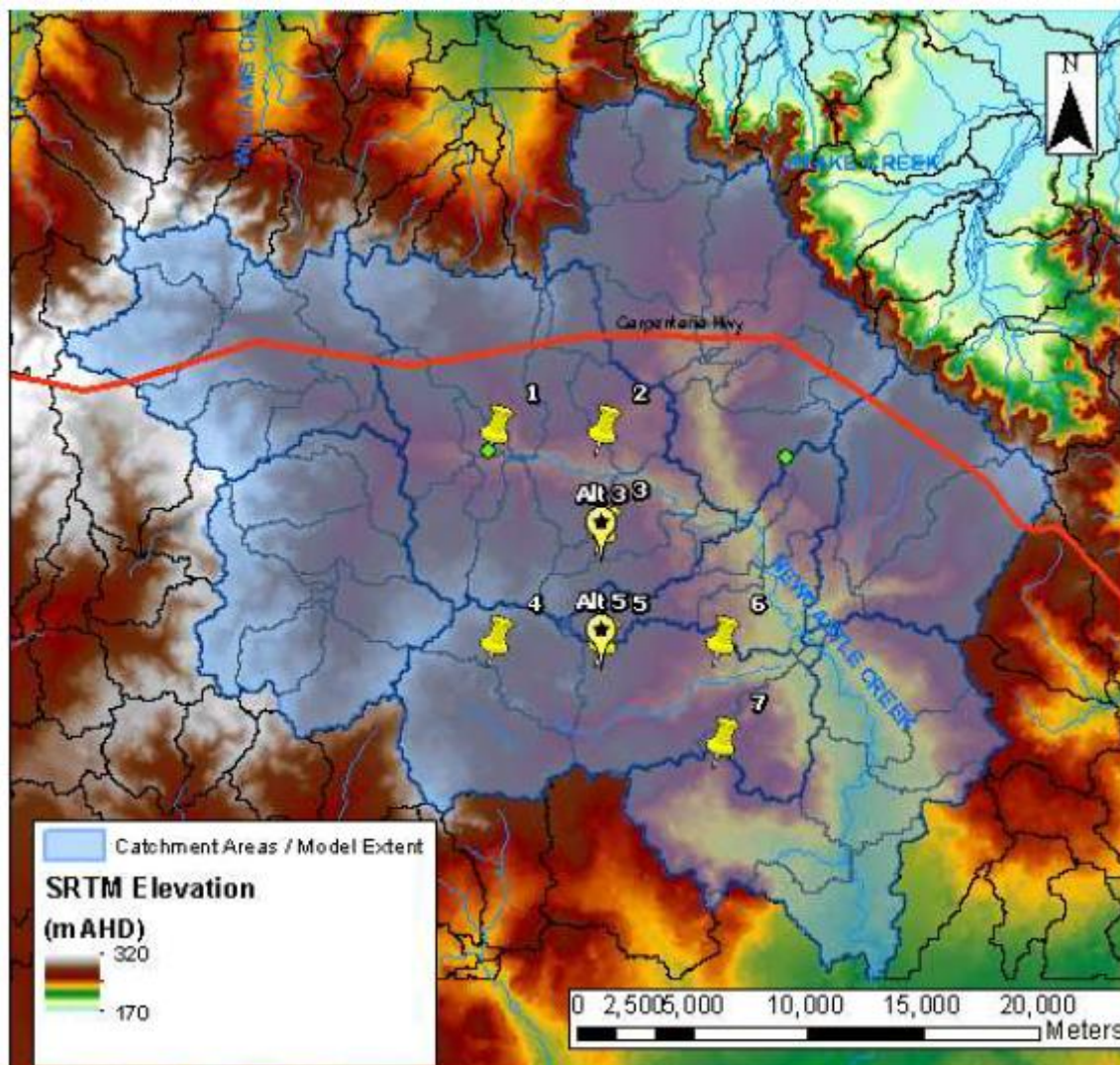
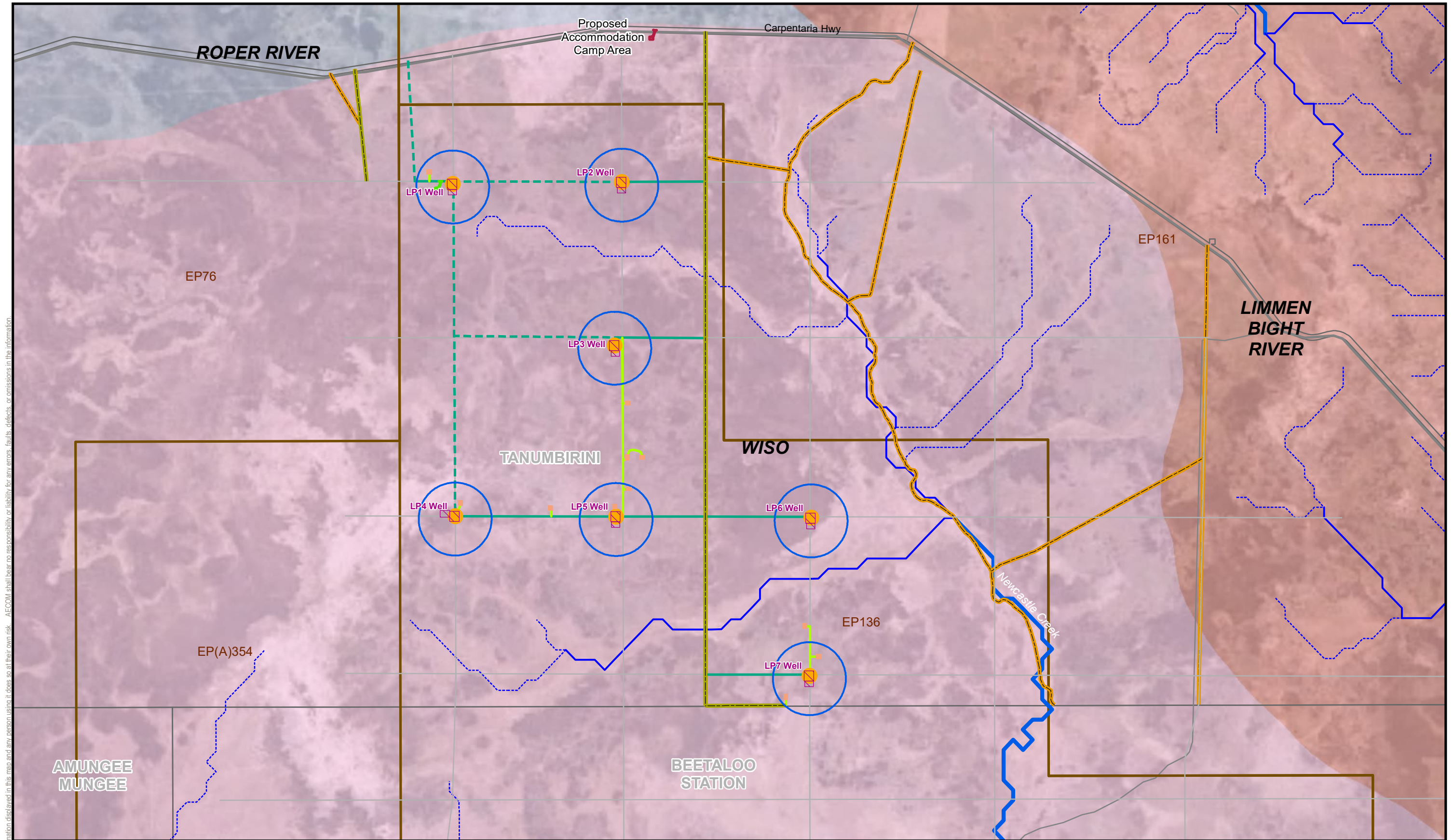


Figure 26 1% AEP Model Extent



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Projection: GDA 1994 MGA Zone 53

2 1 0 2 km

1:100,000 (when printed at A3)

www.aecom.com

- Well Site
- Gravel Pit Footprints
- Well Lease Area
- 1 km Bore Buffer
- EP136 Proposed Accommodation Camp Option
- Highway Proposed Accommodation Camp Option
- Petroleum Exploration Permit
- Cadastre

- Existing Access
- Gravel Pit Access
- Western Access Option Access Track
- Eastern Access Option Access Track
- Seismic Lines - progressively rehabilitated
- Pastoral Track
- Roads

Stream Order

Intermittant Streams

- 1
- 2

Creeks

- 3

River basins

- Limmen Bight River
- Roper River
- Wiso

Data sources:
Imagery: Digital Globe
Permit, Cadastre, Places, Bores - NT Gov 2019.
Pastora Infrastructure - AECOM 2020

**Sweetpea Petroleum Pty Ltd,
Drilling, HFS and Testing EMP**

**Location of Proposed Access
Track Creek Crossings within
the Civil Construction Program**

PROJECT ID 60611666
CREATED BY prachi.kulkarni1
LAST MODIFIED 12-Jul-2022
VERSION 1

**Figure
27**

A3 size

The method used in the assessment of the flood levels at the lease pad locations involved:

- Catchment delineation using available aerial photography and Shuttle Radar Topography Mission (SRTM) ~1s (30 m) topographic data (refer Figure 26).
- Development of a 30 m grid 2D TUFLOW model with direct rainfall-on-grid applied (Table 25).
- Determination of the 1% AEP rainfall inputs to the 2D TUFLOW model based on ARR 2019 guidelines, including adoption of 10 temporal patterns and 2016 Bureau of Meteorology.
- Intensity-Frequency-Duration inputs.
- Simulation of all storm durations and temporal patterns at the 1% AEP.
- Verification of the 1% AEP peak catchment discharge using the rational method based on guidance given in the Queensland Urban Drainage Manual (QUDM) 2017.
- Model sensitivity analysis varying Manning's 'n' roughness assumptions and reduced catchment infiltration losses.
- 2D Mapping of maximum flood depth, flood elevation and flood hazard for the 1% AEP flood event.
- A high-level topographic assessment of ground levels at the drill site and in the flood plain to assess the likelihood that the drill pad may be flooded during regional flood events.

Table 26 1% AEP Results for each Lease Pad

Model Feature	Status	Notes
Global		
Current Model Status:	Unverified and uncalibrated	No calibration data available.
Coordinate Reference System:	GDA1994 MGA 53	
Software Platform:	TUFLOW HPC GPU	No 1D elements
Version:	2020-AB	
Model Extent:	Whole catchment to ~15km upstream of Newcastle Creek junction with Yaroo Creek	Refer catchment extent shaded blue on Figure 25.
Events Simulated:	1% AEP, all durations and TPs	9h TP10 and 24h TP02 critical for sites of interest
Model Calibration:	No data available	
Model Verification:	Verify catchment outflow vs rational method.	For critical duration only.
Hydrologic Model		
Hydrologic Model:	Rain on mesh, RORB for verification	ARR 2019. Median pre-burst.
Infiltration model:	Initial = 10mm Continuing = 5 mm/h	Chosen values are slightly lower than ARR2019 recommended values based on experience. Sensitivity analysis (zero losses) undertaken.
Hydraulic Model		
Overland Flow		
Topographic representation:	1s (~30m) grid hydrologically enforced SRTM data	No zsh enforcement. Carpentaria Highway not well refined in DEM to allow this.
Hydraulic Roughness:	Global value of n=0.06. Sensitivity to n=0.035 tested for critical duration.	

Model Feature	Status	Notes
Downstream Model Boundary:	HQ	Ponding occurs at some locations but does not impact focus sites.
Cut-off Depth	0.1 m for depth map outputs	
Map Outputs	d_Max, H_max, V_Max, Hazard.	Reference hazard table AEMI 2014 H1-H6.
Constructed Drainage Features		
Pipe Representation	No data available	Unlikely to significant, or be key at 1% AEP
Structures	No data available	

The assessment approach considered the magnitude of flood events from regional flooding (defined as a large event over many catchments, possibly with rainfall at a great distance from the site) as well as local flooding (rainfall immediately over the area draining to each site). The overall purpose of the flood modelling was to provide indication that the pads are located outside the significant flood areas and inform the site selection of pads taking into consideration the topography potential for sites to flood and the engineering controls.

The results from the mapped outputs of the maximum flood extent for the 1% AEP flood event are presented in Figure 26 and presented in Table 27. For the purpose of the assessment, the flood extent results were filtered to remove all water depths below 0.1 m depth. To assess the likelihood that each drill pad may be flooded during a 1% AEP flood event, ground levels were taken from the SRTM topographic data at the lease pad locations and compared with maximum water depths and the nearest creek 'channelised' water surface elevation from the hydraulic model.

Table 27 1% AEP Results for each Lease Pad

Lease Pad	SRTM Ground Elevation (m AHD)	Maximum Water Depth (m)	Maximum Elevation at Nearest Channel (m AHD)
Lease Pad 1	271.2	<0.1	268.2
Lease Pad 2	269.5	<0.1	269.2
Lease Pad 3	277.7	<0.1	277.4
Lease Pad 4	285.2	<0.1	284.1
Lease Pad 5	282.2	<0.1	282.2
Lease Pad 6	266.3	0.15	266.5
Lease Pad 7	273.4	<0.1	273.4

Except for Lease Pad 6, all other lease pads had a maximum water depth of below 0.1 m. This means that the local catchment sheet flow is likely to predominate over concentrated (channelised) flow.

Therefore, overland sheet-flow is the dominant mechanism of flooding for the identified lease pad areas. It is considered unlikely that the seven lease pad areas will be subject to inundation from regional flooding from Newcastle Creek. The local catchment runoff from major storm events will be the considering factor for the establishment of lease pad finish levels and the lease pad designs have taken this into consideration for the final placement in the landscape and the specific controls detailed for diverting external flows around the sites and in the buffers for the liquid storage areas (refer Appendix B).

4.1.7 Groundwater Dependent Ecosystems

A search of the National Groundwater Dependent Ecosystems (GDE) Atlas was conducted in February 2021. The dataset expresses 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. It is not anticipated that the activities associated with this EMP will significantly impact on these units.

Subterranean GDEs (e.g. stygofauna) are likely to be present in the karstic systems such as the Gum Ridge Formation aquifer where water level is less than 100 m below ground level (Imperial, 2020). Stygofauna are a form of GDE that inhabit the interstitial spaces of the cavities of alluvial, sedimentary and karstic aquifers. Recent studies by the Gas Industry Social and Environment Research Alliance (GISERA) program have identified and characterised stygofauna assemblages in the CLA units of the Beetaloo Sub-basin. Data is available that can provide an indication of the likelihood of stygofauna presence, with Hose, GC., *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 are 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 rarely found more than 100 m below ground level (Hose, GC *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.

(Origin, 2021)

Based upon the above information, the presence of significant assemblages of stygofauna in the exploration area is considered limited and impacts considered unlikely.

Further understanding of the GDE will be confirmed as part of the groundwater monitoring program. The monitoring program will inform baseline conditions of the permit area, although measures to minimise impacts to GDE's has been considered further in Section 6.0 and Section 7.1.

4.1.8 Soils

EP136 falls within the Sturt Plateau bioregion which comprises of undulating plains on sandstones, with mostly neutral sandy red (Tenosol) and yellow earth (Kandosol) soils. Cracking clay soils (Vertosols) occur in the southeast of the bioregion (ANRA, 2008). The soils within the Sturt Plateau have been derived from ancient rock formations and ancestral soils that were formed during earlier weathering cycles.

The soils have been deeply weathered, leached and are relatively infertile because they have not been enriched by any recent geological events (Orr & Holmes, 1984). 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.

The lateritic plains, which encompass the Area, are classed as very strongly leached soils of the Tertiary land surface. Two main soil types are:

- Tertiary Lateritic Red Earths (Red Kandosols), which occur on the gently undulating topography
- Tertiary Lateritic Red Sands (Red Tenosols), 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.

In summary, the soils across the permit area can be described as:

- poorly drained clay (Vertosol) soils and brown earths (Kandosol), frequently with ironstone gravels

- generally, slightly acidic to neutral, with soil pH ranging from 5 to 7
- erosion risk primarily related to soil type (clays result in higher risk) and rainfall (higher risk)
- bulldust formation is the erosion pathway for most areas, higher where repeated disturbance (usually grasslands) occurs
- erosion risk at creek crossings
- the majority of the Area has a proportion of bare ground cover of 0%-20%, indicating healthy vegetation cover.

4.1.9 Bushfire

Fire is an intrinsic part of the Australian environment and has shaped the evolution of most natural ecosystems within it, however since European settlement, fire regimes have changed leading to corresponding changes in vegetation structure, composition and flammability.

Bullwaddy and Lancewood communities, which occur throughout the DST program area are fire sensitive and vulnerable to frequent or high intensity fires. High intensity fires can also reduce habitat quality for a variety of flora and fauna species, with research suggesting that fauna diversity may be adversely impacted by high intensity fires, particularly diurnal reptiles (Legge *et al.*, 2008).

Historically, most higher intensity fires have occurred to the north of the program area. Field investigations indicated that fire disturbance varies throughout the region, with most sites showing evidence of fire occurring within the last 1-3 years. Fire scars were usually less than 1 m, and occasionally 1-4 m, indicating low to moderate fire intensity. However, some trees and shrubs had been killed by fire at four sites suggesting that higher intensity fires do sometimes occur.

4.2 Natural Environment

4.2.1 Bioregions

EP136 is situated in the Sturt Plateau bioregion which comprises undulating plains on sandstone, with predominantly neutral sandy red and yellow earth soils. The dominant vegetation is eucalypt woodland (mainly variable-barked bloodwood *Eucalyptus dichromophloia*) with spinifex understorey, as well as extensive areas of Lancewood (*Acacia shirleyi*) -Bullwaddy (*Macropteranthes kekwickii*) vegetation association 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 (Baker et al, 2005).

4.2.2 Vegetation Communities

EP136 is typically dominated by *Corymbia* spp. and *Eucalyptus* spp. open woodlands and tall shrublands and woodlands of Bullwaddy and Lancewood with open grassland understorey. On alluvial plains and in drainage areas, *Eucalyptus chlorophylla*, *E. microtheca* and *E. pruinosa* low woodlands predominate, while on the plains *Corymbia dichromophloia* and *E. leucophloia* woodlands are more dominant.

Lancewood forests are the most extensive acacia-dominated communities across northern NT. The Lancewood/Bullwaddy communities typically have a dense shady shrub layer, including vines and creepers, and a sparse grass understorey. This compares to the sparse canopy and tall grass understorey of other tall dense grasslands (PWCNT, 2005). Lancewood/Bullwaddy communities are fire sensitive and inappropriate fire regimes may result in a change from Bullwaddy-dominated vegetation through Lancewood to a Eucalypt dominated open woodland (PWCNT, 2005). This process may be accelerated by the invasion of exotic pasture grasses such as Buffel Grass (*Cenchrus ciliaris*) which increases the flammability of the vegetation and hence the frequency and severity of fires.

No threatened vegetation communities are listed as likely to occur within EP136.

4.2.3 Native Flora

Database searches found that no Commonwealth-listed threatened plant species have been identified as potentially occurring within the Area. *Ipomoea argillicola*, listed as Near Threatened under the *Territory Parks and Wildlife Conservation Act 1976* (TPWC Act), could potentially occur within EP136 as it has previously been recorded within the Bullwaddy Conservation Reserve and at locations surrounding the Area.

4.2.4 Weeds

Database searches identified 17 regional weed species known or likely to occur within EP136, including four Weeds of National Significance (WoNS) and six species declared under the *NT Weeds Management Act 2001*.

No weeds were encountered within the DST area during the November 2019 or May 2020 field surveys, however the surveys have identified weeds nearby to the activity area. Hyptis (Class B and Class C weed under the *Weeds Management Act 2001*) was recorded within the seismic exploration area east of the program area during the May 2020 survey. Additional regional weed records were collected during a survey undertaken in 2019 at Hayfield Station to the west of the program area. This survey identified weeds in low abundance including three listed species, *Parkinsonia aculeata* (Parkinsonia), *Hyptis suaveolens* (Hyptis) and *Calotropis procera* (Rubber Bush). Parkinsonia is considered a Weed of National Significance (WoNS), which are weed species that are the focus of national management programs for restricting their spread and/or eradicating them from parts of Australia.

4.2.5 Native Fauna

Previous surveys and database searches indicate that EP136 supports a diverse array of fauna. Database searches (NR Maps) provide records for 69 species of birds, 21 species of reptiles, six species of mammal and one amphibian.

The following of which are listed under the *Territory Parks and Wildlife Conservation Act 1976* (TPWC Act):

- Australian Bustard (*Ardeotis australis*)
- Mulga Snake (*Pseudechis australis*)
- Speckled Hare-wallaby (*Lagorchestes conspicillatus*)
- Northern Nailtail Wallaby (*Onychogalea unguifera*)
- Two species were listed as data deficient:
- Common Blue-tongue (*Tiliqua scincoides*)
- Spotted Tree Monitor (*Varanus scalaris*)

A total of 21 listed fauna species under either the EPBC Act or TPWC Act may potentially occur in the Area. These include ten birds, eight mammals and three reptiles. The likelihood assessment of species occurrence based on the availability of suitable habitat within the permit area was conducted as part of the Land Condition Assessment. The following species were identified as 'possibly' occurring in the Area and are known to occur in the wider landscape of EP136:

- Gouldian Finch *Erythrura gouldiae* (Endangered EPBC Act, Vulnerable TPWC Act)
- Grey Falcon *Falco hypoleucos* (Vulnerable TPWC Act)
- Crested Shrike-tit (northern) *Falcunculus frontatus whitei* (Vulnerable EPBC Act, Near Threatened TPWC Act)
- Painted Honey Eater *Grantiella picta* (Vulnerable EPBC Act, Vulnerable TPWC Act)
- Yellow-spotted Monitor *Varanus panoptes* (Vulnerable TPWC Act)

The DAWE Protected Matters database indicated the potential presence of 20 Migratory and Marine listed species within the permit area.

4.2.6 Feral Animals

Feral animals likely to occur within the region include (PWCNT, 2005; ANRA, 2008):

- Domestic Cattle (*Bos taurus*)
- Water Buffalo (*Bubalus bubalis*)
- Cane Toad (*Bufo marinus*)
- Wild Dog (*Canis lupus familiaris*)
- Donkey (*Equus asinus*)
- Horse (*Equus caballus*)
- Feral Cat (*Felis catus*)
- House Sparrow (*Passer domesticus*)
- Black Rat (*Rattus rattus*)
- Pig (*Sus scrofa*).

Unsurprisingly, surveys undertaken in November 2019 found evidence of cattle grazing within the past year, or previous 1-2 years was observed at the majority of assessment sites. The only exceptions were at one very rocky site (NL18) and one Corymbia woodland site (NL6). Spinifex grass (*Triodia* sp.) was the dominant grass at both these sites, which is generally not favoured by cattle for food. At sites that were damaged approximately 5-25% of ground cover was impacted by cattle at seven sites, while damage was less than 5% at seven sites. Cattle showed a preference for grazing on *Chrysopogon fallax* (Golden Beard Grass).

The Cane Toad is known to be present in the permit area and the Commonwealth DAWE recognises this species as a 'key threatening process' related to their impacts on biodiversity through predation, competition, land degradation and poisoning. In the Northern Territory, the Cane Toad has been implicated in the decline of several species including several reptiles such as the King Brown Snake and water monitors (Smith & Phillips, 2006).

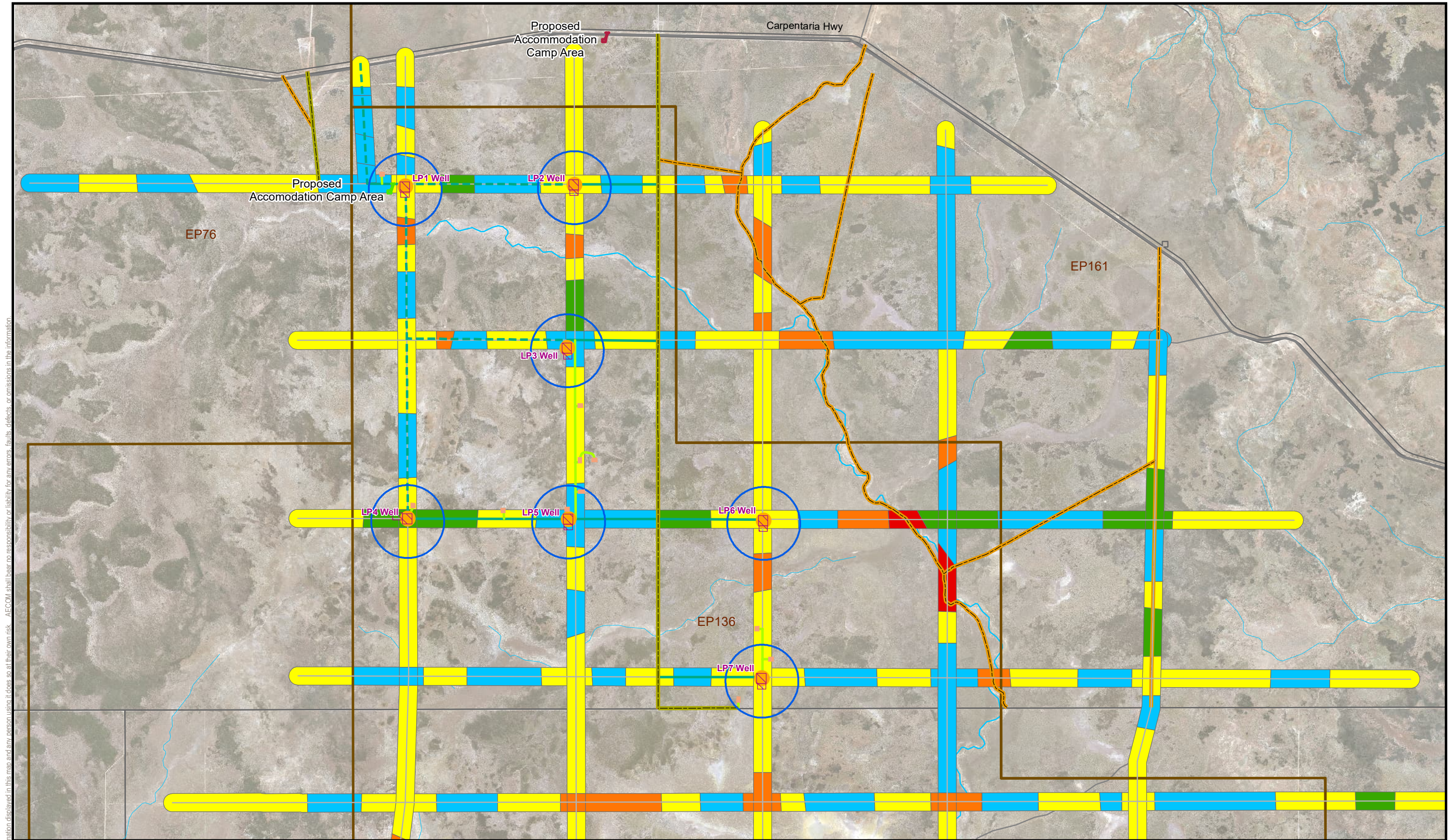
Pest predators such as the Cat are most likely common although their abundance is difficult to assess due to their cryptic nature. Introduced predators such as Cats can impact many vertebrates (Dickman, 2009 & 1996). One of the primary concerns of introduced predators in the site is the impact on EPBC listed species such as reptiles, and ground-dwelling birds. Feral cats are believed to be one of factors that have led to the decline of threatened ground-dwelling bird the Partridge Pigeon (Woinarski, 2006).

4.2.7 Land Condition

Land Condition Assessments were undertaken for the exploration area during November 2019 and May 2020 field surveys. The land condition scores were determined from aerial dashcam footage and are mapped and presented in Figure 28.

Land condition nearby to creeks and cattle watering points within EP136 were generally classed as Poor or Disturbed due to evidence of erosion, bare soils and vegetation impacts. Areas displaying obvious fire impacts to vegetation structure and condition were also considered to be Disturbed. Areas of intact land and vegetation were scored either Good or Excellent. Large patches of Lancewood (*Acacia shirleyi*) were classed as Excellent in the northern exploration area.

Land condition assessment sites were also recorded in the field and the location of land assessment sites are presented on Figure 28. A land condition overview for exploration lease pads are presented in Table 28.



AECOM does not warrant the accuracy or completeness of information displayed in this map and any person using it does so at their own risk. AECOM shall bear no responsibility or liability for any errors, faults, defects, or omissions in the information.



Projection: GDA 1994 MGA Zone 53

2 1 0 2 km

1:100,000 (when printed at A3)



- Well Site
- Gravel Pit Footprints
- Well Lease Area
- 1 km Bore Buffer
- EP136 Proposed Accommodation Camp Option
- Highway Proposed Accommodation Camp Option
- Petroleum Exploration Permit

- Existing Access Track
- Gravel Pit Access Track
- Western Access Option Access Track
- Eastern Access Option Access Track
- Seismic Lines - progressively rehabilitated
- Pastoral Track
- Roads
- Cadastre

- Land Condition Assessment**
- Very Poor
 - Poor
 - Disturbed
 - Good
 - Excellent



EP136

Data sources:
Imagery: Digital Globe
Permit, Cadastre, Places, Bores - NT Gov 2019.
Pastora Infrastructure - AECOM 2020

**Sweetpea Petroleum Pty Ltd,
Drilling, HFS and Testing EMP**

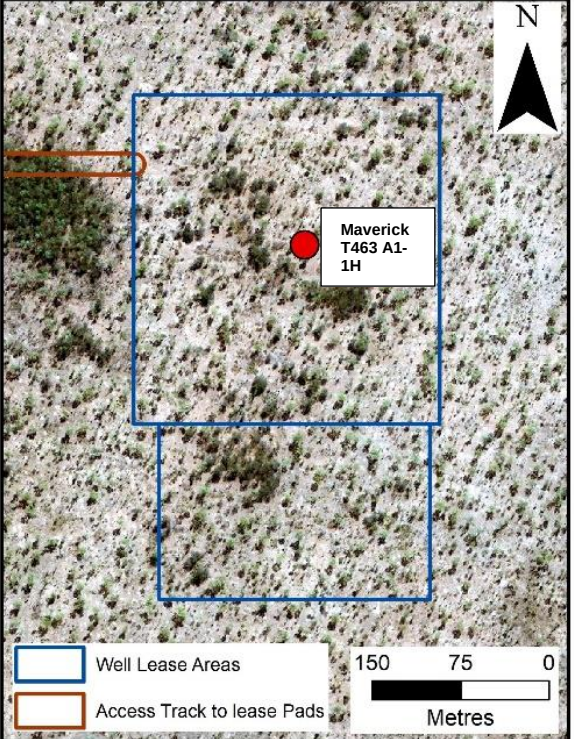
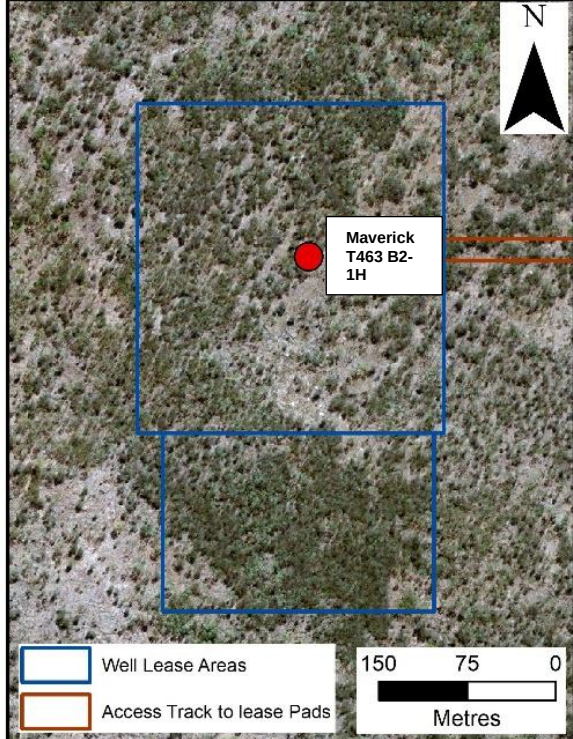
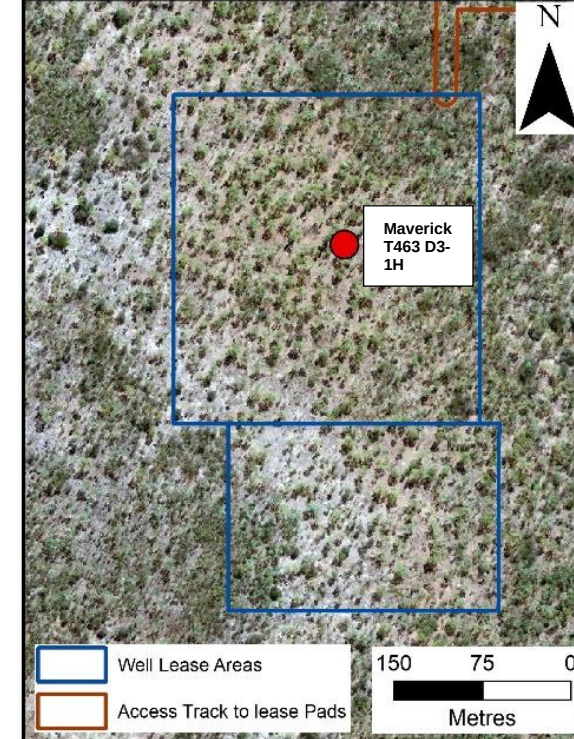
**Land Condition Assessment within
the Civil Construction Program**

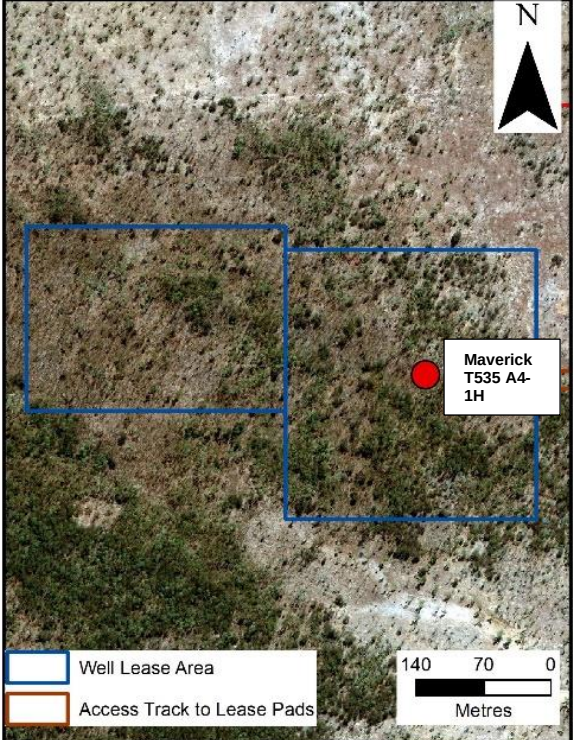
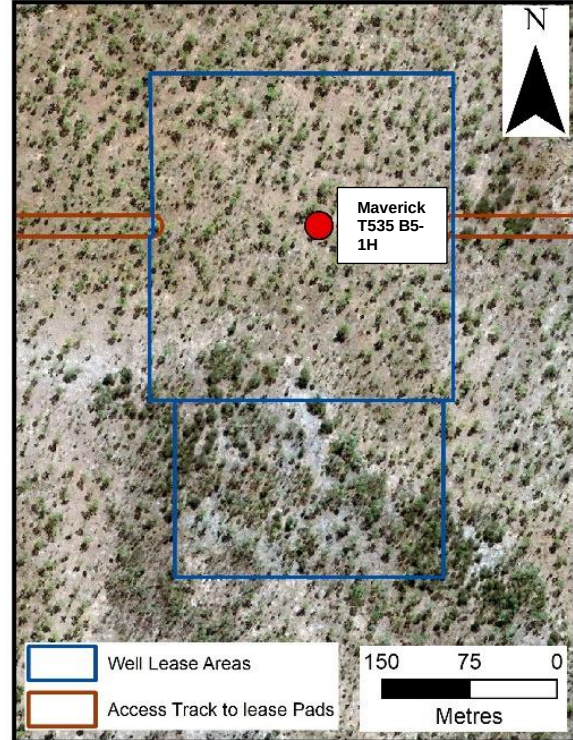
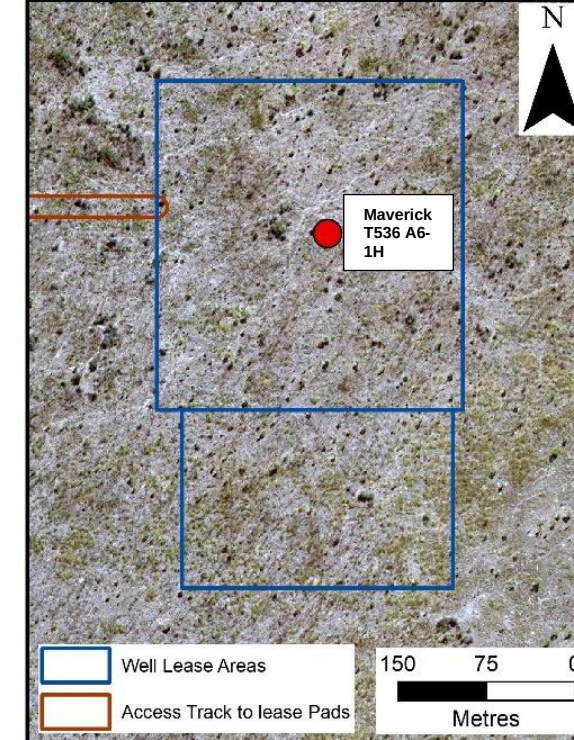
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LAST MODIFIED	12-Jul-2022
VERSION	1

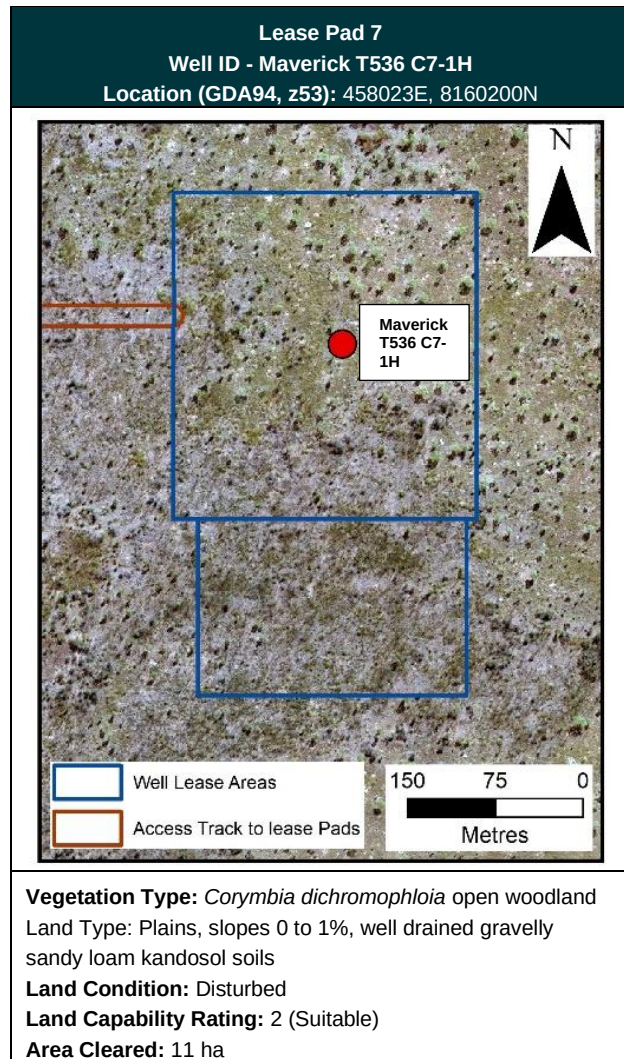
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**Figure
28**

Table 28 Pre-development Land Condition Assessment for Lease Pad Areas

Lease Pad 1 Well ID - Maverick T463 A1-1H Location (GDA94, z53): 448242E, 8173682N	Lease Pad 2 Well ID - Maverick T463 B2-1H Location (GDA94, z53): 452878E, 8173732N	Lease Pad 3 Well ID - Maverick T463 D3-1H Location (GDA94, z53): 452685E, 8169262N
		
Vegetation Type: <i>Corymbia dichromophloia</i> open woodland Land Type: Plains, slopes 0 to 1%, well drained gravelly sandy loam kandosol soils Land Condition: Disturbed Land Capability Rating: 2 (Suitable) Area Cleared: 11 ha	Vegetation Type: <i>Acacia shirleyi</i> open forest Land Type: Plains, slopes 0 to 1%, moderately well drained sandy loam kandosol soils Land Condition: Disturbed Land Capability Rating: 2 (Suitable) Area Cleared: 11 ha	Vegetation Type: <i>Corymbia dichromophloia</i> open woodland Land Type: Plains, slopes 0 to 1%, well drained gravelly sandy loam kandosol soils Land Condition: Good Land Capability Rating: 2 (Suitable) Area Cleared: 11 ha

Lease Pad 4 Well ID - Maverick T535 A4-1H Location (GDA94, z53): 448309E, 8164578N	Lease Pad 5 Well ID - Maverick T535 B5-1H Location (GDA94, z53): 452721E, 8164565N	Lease Pad 6 Well ID - Maverick T536 A6-1H Location (GDA94, z53): 458069E, 8164527N
		
Vegetation Type: <i>Acacia shirleyi</i> open forest Land Type: Plains, slopes 0 to 1%, moderately well drained sandy loam kandosol soils Land Condition: Excellent Land Capability Rating: 2 (Suitable) Area Cleared: 11 ha	Vegetation Type: <i>Corymbia dichromophloia</i> open woodland and <i>Macropteranthes kekwickii</i> shrubland / open woodland (southern sections) Land Type: Plains, slopes 0 to 1%, well drained gravelly sandy loam kandosol soils Land Condition: Good Land Capability Rating: 2 (Suitable) Area Cleared: 11 ha	Vegetation Type: <i>Acacia shirleyi</i> open forest Land Type: Plains, slopes 0 to 1%, moderately well drained sandy loam kandosol soils Land Condition: Disturbed Land Capability Rating: 2 (Suitable) Area Cleared: 11 ha



4.3 Social and Cultural Environment

4.3.1 Socio Economic Summary

Sweetpea's exploration activities occur within the Barkly Regional Council Area. The Council covers an area of 323,500 km² and has a total residential population of over 8,500 (Barkly Regional Council, 2015; ABS, 2016).

The major townships in the vicinity of the exploration area are Tennant Creek, Elliott, Daly Waters, Newcastle Waters, Mayfield and Dunmarra. The region also contains various pastoral stations and Aboriginal communities.

Analysis of the 2016 Australian Bureau of Statistics (ABS) census suggest that the statistical subdivision of Barkly (extending from Ampilatwatja in the south to Dunmarra in the north) has high unemployment, low levels of income and a very low score on the Index of Relative Socio-Economic Advantage/Disadvantage.

The area primarily supports pastoral operations. There are no other major industries within EP136, however it is surrounded by other petroleum exploration permits. EP136 is considered remote and there are no known tourism operators in the vicinity of the proposed program of works.

4.3.2 Land Use and Sensitive Receptors

A range of land-uses and sensitive receptors exists in the proposed program area. Approximate separation distances to the nearest environment or community receptors are shown in Figure 29 and with separation distance presented in Table 29.

A summary of the surrounding landuse and sensitive receptors is provided below:

- Perpetual Pastoral leases, including the Tanumbirini directly impacted and neighbouring leases including Beetaloo Station and Amungee Mungee Station (refer Section 1.5.2).
- Homestead and Indigenous community outstations.
- Oil and gas exploration in surrounding permit areas (refer Section 4.3.4).
- Other resource extraction operations.
- Road and track networks including the Carpentaria Highway. In addition, there are numerous internal gravel roads, tracks, fence lines and fire breaks.
- Water production bores that supply water for surrounding pastoral activities and towns.
- The Carpentaria Gas Pipeline which runs parallel to the Carpentaria Highway and will be crossed by the DST vehicles during the works program.
- The Alice Springs to Darwin Railway line which runs to the west of the Stuart Highway, and does not affect EP136.
- The townships of Daly Waters and Dunmarra are closest to EP136. Daly Waters is located approximately 123 km west and Dunmarra is approximately 180 km south-west from the permit area access located on the Carpentaria Highway.
- Conservation areas including the Bullwaddy Conservation Reserve, which lies 20 km to the west of the exploration area.
- Historic and Aboriginal Heritage Sites (Section 4.3.6).

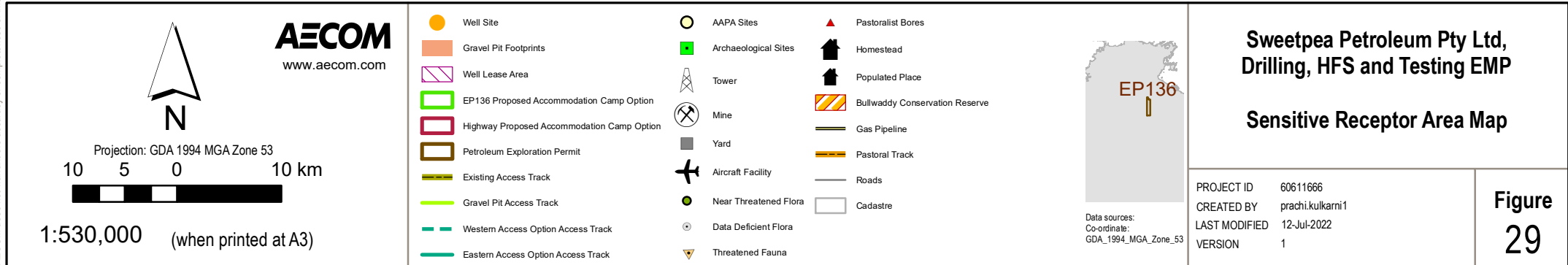
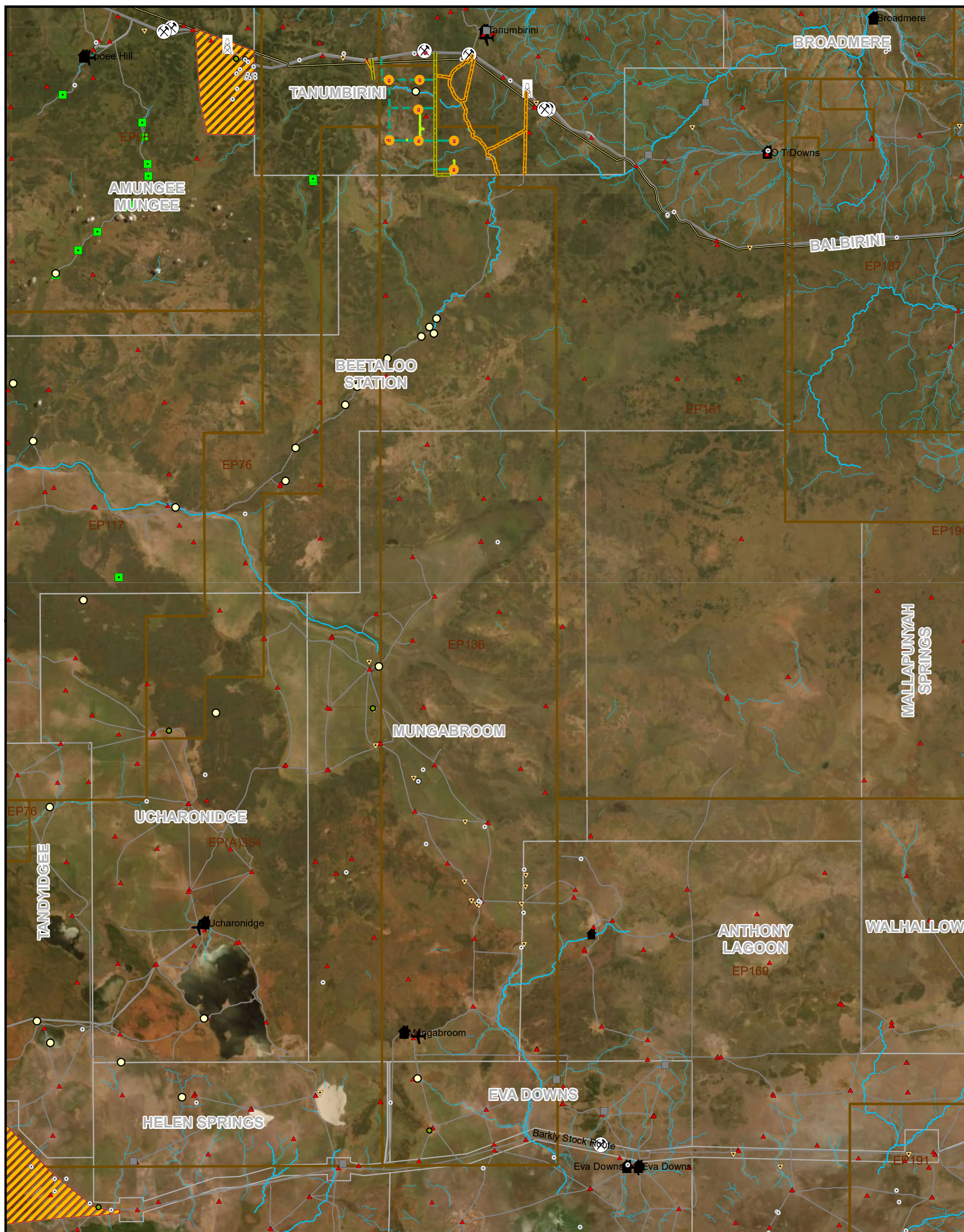


Table 29 Sensitive Receptor Separation Distances to Exploration Lease Pads

Receptor	Lease Pad 1	Lease Pad 2	Lease Pad 3	Lease Pad 4	Lease Pad 5	Lease Pad 6	Lease Pad 7
Closest Pastoralist Bore	4.4 km North West	7.27 km North East	2.7 km South East	3.7 km North	3.9 km North East	4.2 km North West	8.14 km North West
Nearest Homestead – Tanumbirini Station	15.9 km North East	11.9 km North East	15.2 km North East	21.5 km North East	19.0 km North East	16.8 km North	20.9 km North
Nearest Community – Daly Waters	125 km West	130 km West	131 km West	128 km West	132 km West	137 km West	139 km West
Stuart Highway	125 km West	130 km West	129 km West	124 km West	129 km West	134 km West	132 km West
Carpentaria Highway	3.5 km South	4.1 km South	8.5 km South	12.6 km South	13.1 km South	13.2 km South	17.5 km South
Bullwaddy Conservation Reserve	20.2 km West	24.8 km West	24.6 km West	20.2 km West	24.6 km West	30 km West	30.4 km West
Lake Woods	169 km	171 km	168 km	162 km	165 km	168 km	165 km
Nearest Watercourse (Newcastle Creek)	1.1 km South West	1.8 km South	2.4 km North	7.7 km South	6.4 km South West	2.9 km East	5.9 km East
Aboriginal Protected Area – Sacred Site Restricted Work Area	0.8 km South East	1.5 km South	2.05 km North	7.44 km North	6.7 km South	2.2 km East	5.3 km East

4.3.3 Pastoral Activity

EP136 is located within the Tanumbirini PPL and Beetaloo PPL. Pastoralism is a major economic driver in the Northern Territory, and it is estimated the cattle industry generates more than 85% of the NT's primary production value (NTCA, 2020).

Tanumbirini Station (NT Por 701 Tanumbirini PPL) is 5,001 km² in size with a carrying capacity of approximately 35,000 cattle. The station was established prior to 1908. The Carpentaria Highway passes through the southern section of the property.

4.3.4 Oil and Gas Exploration History of the Beetaloo Sub-basin

Sweetpea has a long history of oil and gas exploration within the Beetaloo Sub-basin. Sweetpea was formed by the Bayless Group in 1996 to explore the Beetaloo Sub-basin after recognising the potential of this vast underexplored area, with prospective source rocks. In 2005 Sweetpea became the first acreage holder in the Beetaloo having been granted EP's 76, 98, 99 and 117.

In 2006, Petrohunter acquired Sweetpea and carried out a 600 km 2D seismic survey and drilled the first unconventional exploration well, the Shenandoah-1 vertical well. In 2007, Falcon Oil & Gas acquired EPs 76, 98, 99 and 117 from Petrohunter and deepened the Shenandoah-1 well. In 2011, Hess farmed into all the EP's and carried out a further 3,490 km 2D seismic survey, which to date is the largest onshore 2D seismic program in Australia (Falcon Oil and Gas, 2020). Hess withdrew from the permit area in 2013, which resulted in Origin farming into Falcon's EP's 76, 98, 99 and 117 in 2014.

Origin is now the operator of the EPs as part of the Beetaloo Joint Venture (JV), and has drilled several exploration wells, including Amungee NW-1H, the first horizontal well in the basin. Based on a

discovery in EP98 in 2017, Origin announced material gas resource in the Velkerri B Shale following a fracture-stimulation test. These EPs are on the western side of Sweetpea's current permit area EP136.

To the north of EP136, Santos operates EP161 where they completed a 1,000 km 2D seismic survey and in 2014 drilled the Tanumbirini-1 exploration well which was subsequently hydraulically fractured and tested in November 2019.

The Beetaloo Sub-basin is still in the early stages of exploration with further exploration planned by Origin, Santos, Empire and Sweetpea.

4.3.5 Native Title

A Native Title determination (NTD33/2012 Tanumbirini PPL) has been finalised for the Area. This determination grants native title rights to the Kinbinningu and Bamarrngganja groups

4.3.6 Sacred Sites and Restricted Work Areas

On 23 October 2020, Sweetpea received an Aboriginal Areas Protection Authority Certificate (reference RA2020/14) which provides the conditions for petroleum exploration to occur. Three recorded Aboriginal Area Protection Authority (AAPA) sacred sites occur within close proximity to the exploration area. The AAPA sacred sites relate to:

- AAPA sacred site 5864-1 associated with a waterhole and lancewood trees.
- AAPA sacred site 5864-34 associated with a waterway (being the entire length of Newcastle Creek)
- AAPA 5864-32 associated with a waterhole.

All the recorded sacred sites identified within the regulated activity area are associated with Newcastle Creek. Sweetpea can conduct activities to avoid the sacred sites and meet the conditions stipulated for Restricted Work Area (RWA) 1 and RWA2 (Newcastle Creek). The only interaction of Sweetpea activities will be on RWA 2 which is associated with the two existing Newcastle Creek crossings that are required to access the lease pads.

4.3.7 Archaeological Assessment

An archaeological assessment, comprising searches of the NT Heritage Register and Australia Heritage Database, review of archaeological survey reports, and a targeted field inspection using predictive modelling for the permit area, was carried out by AECOM heritage specialist, Perri Braithwaite between 5 and 7 November 2019. A follow up survey was conducted by Dr.Silvano Jung between 26 and 30 May 2020 (AECOM 2020).

Most previous archaeological investigations near the permit area have been associated with either linear infrastructure in the vicinity of the Carpentaria Highway, or other exploration activities. No other assessments have been conducted within the boundaries of the current proposed impact areas.

AECOM's predictive archaeological model confirms that evidence of Aboriginal archaeological cultural heritage is typically associated with the identified sensitive landforms including:

- Non-flood prone areas adjacent to established watercourses.
- Areas with distinctive vegetation patterning, such as those areas associated with *Macropteranthes kekwickii* (bullwaddy)
- Adjacent to flood plains where a noticeable change in vegetation is identified.
- On the periphery of lagoons and 'chain of ponds' features.

A total of 25 areas were inspected during the field programs. Of these 20 target areas associated with culturally sensitive landforms were inspected, with 14 containing evidence of Aboriginal archaeological sites (80%). No expressions of Aboriginal cultural heritage were identified at the additional four inspection areas that were not associated with any form of sensitive landforms.

Twenty-five Aboriginal archaeological sites were located during the survey at targeted inspection sites within or immediately adjacent to the seismic lines and lease pad areas. Of these sites, only one site was determined to be of high significance (BT-19-AS7 – artefact scatter), two sites were determined to

be moderate significance (BT-19-AS16 – artefact scatter and BT-20-AS02 – artefact scatter), with the remaining sites determined to be of low significance. All three sites are located away from the activity area (refer Figure 30).

The archaeological finds associated with the investigations are predominantly artefact scatters composed of raw material commonly found in the immediate area (quartz, silcrete and quartzite). One stone arrangement has also been recorded (HLA, 2007b).

4.3.8 Historic Heritage

Explorer John McDougall Stuart was the first European to penetrate the NT interior area in 1860. The first written descriptions of the area come from Stuart during his second attempt to cross the continent from south to north (HLA, 2005). Pastoral development began in the area following the completion of the Overland Telegraph Line in 1873, although these early attempts were largely unsuccessful due to the density of the Lancewood-Bullwaddy vegetation and lack of surface water.

Daly Waters was recognised as one of the last watering stops on the Murrniji 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 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.

In recent years oil and gas exploration and tourism has supplemented the primarily pastoral economy.

A search of the Australia Heritage Database (125 km x 125 km search area) did not identify any listed heritage places within EP136 or statutory listed heritage places. The NT Heritage Register identified 18 Aboriginal archaeological sites and no historic heritage sites within EP136.

5.0 Stakeholder Engagement

Community and stakeholder engagement is a fundamental obligation in relation to the proposed work programs within EP136. The *Petroleum (Environment) Regulations 2016* Reg 7(1) requires stakeholder engagement to be carried out during the preparation of the EMP.

Sweetpea has carried out extensive consultation with pastoral leaseholders and stakeholders who may be directly affected by its proposed seismic exploration, civil construction and water bore drilling program and the DST program (Reg7(3)a). Sweetpea have informed the stakeholders of the intended exploration program over the course of the EMP development (Reg 7(1) and (2)).

Sweetpea's stakeholder and community engagement for the DST program commenced in July 2019 with the Northern Land Council (NLC) who represent the Traditional Owners and Aboriginal People on whom the activities may impact and in August 2019 with the pastoralists on whose land the activities occur (and their delegates).

The following section focuses on Sweetpea's stakeholder engagement. Sweetpea is committed to ensure that those persons and/or groups that have an interest or are likely to be impacted/affected by the exploration activities under this EMP have received Sweetpea's full attention. Appendix D presents the communications log of the emails, meetings and telephone conversations held throughout the preparation of the EMP.

5.1 Identified Stakeholders

The identified stakeholders, as defined by *Reg 7(3)(a) definition of a stakeholder*, specific to the DST program activities include:

- The perpetual pastoral lessee owner and their delegates for Tanumbirini Station, on whose pastoral lease the activities will be undertaken upon.
- The Traditional Owners and Aboriginal People who represent the Native Title Holders for the area on which the regulated activities will occur. Consultations have been facilitated through the Northern Land Council (NLC).
- Gas pipeline operators, OSD Pipelines, where Sweetpea will require works approval to allow DST equipment to cross over the buried pipeline.
- Mineral exploration licence holder, Pennant Resources Pty Ltd, which coincides with EP136.
- Northern Territory Government departments including:
 - Transport and Civil Services Division of DIPL for access to road corridor permits and if intend to extract from NTG road bores.
 - DITT for access authority to areas outside the permit, specifically to allow access to supporting infrastructures, accommodation camp and use of access tracks.
 - Water Resources Division of DEPWS as relates to water extraction licence.
 - Aboriginal Areas Protection Authority as relates to the conditions and restricted work areas within EP136.

As Sweetpea's activity in the permit area increases over the coming years, further stakeholders may be identified and will be engaged with as required. Sweetpea have maintained records of interactions and communications with relevant stakeholders and will continue to do so over the life of the proposed exploration activities.

5.2 Summary of Engagement and Consultation Undertaken

Sweetpea has endeavoured to clearly communicate to all interested parties via telephone calls, emails and face-to face meetings wherever possible during all stages of exploration within EP136. Sweetpea have requested feedback from stakeholders on draft EMPs and comments have been, where appropriate, incorporated into the planning of activities.

The following sections provides a summary of the identified stakeholders. A list of the key stakeholders and their contact details are provided in Appendix D.

5.2.1 Pastoral Leaseholders

Although EP136 covers both Beetaloo and Tanumbirini stations, the regulated petroleum exploration activities under this EMP are proposed to be undertaken on Tanumbirini PPL only

During August 2019 Sweetpea met with the owners of Tanumbirini Station in London to discuss the proposed exploration activities to be undertaken on the station over the next two years, including the seismic exploration program and future exploration drilling, fracture stimulation and testing programs, and associated civil works. The owners outlined plans for installation of cattle watering infrastructure on the area of EP136. Arrangements were made for accessing the station during the planned environmental surveys that were to be conducted between October/November 2019.

In September 2019 Sweetpea met with both the Beetaloo and Tanumbirini station managers, introducing Sweetpea; presenting an outline of the exploration activities proposed on EP136 over the next 2 years; discuss the baseline environmental and heritage surveys required to develop an or some Environmental Management Plan(s) for the proposed work programs; and, to discuss access arrangements to the permit area to undertake the baseline surveys. Formal letters were then sent to the station managers detailing the area that will be covered and the communication protocols to be implemented.

During the environmental and heritage surveys in November 2019, station managers were kept informed daily on when the field teams were entering and exiting the property boundaries.

In March 2020, Sweetpea provided an updated summary of the proposed exploration activities to the pastoral stations with copies of the previous draft Seismic EMP. In addition, Sweetpea requested access on 7-9 March 2020, for the prospective seismic contractor to scout the proposed survey area. Tanumbirini Station provided their approval, however, Beetaloo Station indicated that ground conditions were too wet and would not provide access. Following this correspondence, Sweetpea delayed the scouting work by the contractors with the intention for the LCA and CHA (which were scheduled for the following week) to capture the information for the contractors.

COVID-19 restrictions caused postponement of the additional baseline LCA and CHA to be conducted in March. All stakeholders were informed of this postponement while Sweetpea worked through how activities would be managed under COVID-19 conditions.

In May 2020, Sweetpea had a COVID-19 management plan in place and informed its pastoral leaseholders of the plan to recommence the baseline surveys. Further information was provided on the baseline surveys and 2020 work program activities with a copy the draft Seismic EMP for consultation and review.

Sweetpea responded to a range of comments and queries from Tanumbirini Station and their delegates, with the baseline scouting work being completed between 26 to 30 May 2020.

At the end of June 2020 feedback on the draft Seismic EMP was received from all the pastoral leaseholders. Sweetpea provided a copy of the draft Civil Construction and Water Bore EMP on 2 February 2021 to Tanumbirini Station and Beetaloo Station for information and comment. The draft EMP provided a full description of the anticipated environmental impacts and risks of the activity, and the proposed environmental outcomes in relation to the activity.

At the beginning of January 2021, Sweetpea provided a proposed Work Program schedule for 2021 to all the EP136 Pastoral Leaseholders. The details of the subsequent and ongoing engagement with Tanumbirini Station (Rallen Australia) are included in Appendix D, the engagement with Rallen ultimately resulted in unsuccessful attempts to negotiate a LACA (or Access Agreement) and the parties entered into Alternative Dispute Resolution and then Northern Territory Civil and Administrative Tribunal (NTCAT) proceedings in accordance with relevant sections of the *Petroleum Act 1984* and the *Petroleum Regulations 2020*. The NTCAT proceedings were completed on 4 May 2022 when the NTCAT issued orders and determined an Approved Access Agreement (AAA).

Sweetpea provided a final draft of EMP SWP3-1 to the Tanumbirini Station leaseholders in January 2022, which provided a complete summary of the proposed well drilling, hydraulic fracture stimulation and well testing scope covered in this EMP. Sweetpea had previously provided descriptions of the locations, program and scope. Sweetpea subsequently provided links to reputable scientific studies that provide further information (including the Final Report of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory; other Australian inquiries; US EPA's study of potential impact on drinking water resources; CSIRO review of community concerns about onshore gas development) to inform the Pastoral Lessees of the regulated activity, anticipated environmental impacts and risks, environmental outcomes and consequences for the pastoralist's activities.

Sweetpea withdrew EMP SWP3-1 in March 2022 on the basis that there was not agreement from a key stakeholder that providing information in parallel to NT Government agency assessment process was acceptable and met the Petroleum (Environment) Regulations. Sweetpea withdrew the EMP in the interests of improving the working relationship with the particular stakeholder in question, and to decrease the risk of Judicial Review of an EMP approval. Sweetpea maintain that the provision of information in parallel to the extensive NT Government assessment process is in keeping with the intent and letter of the Petroleum (Environment) Regulations, given that the EMP remains "...in preparation..." up until all the formal feedback from DEPWS, the NT EPA, and other NT Government agencies is incorporated into a final EMP that is capable of submission to the Minister for approval. Regardless of Sweetpea's view, the EMP was withdrawn and this EMP is submitted to seek approval for the proposed exploration and appraisal program covered herein.

Sweetpea recognise there is always room for improving mutual understanding of pastoral business and exploration activities, and endeavour to actively engage and listen to stakeholder concerns and work to address those concerns. Sweetpea recognises that there will likely be some impact on pastoral business in the process of undertaking exploration activities. Sweetpea will engage experts and seek guidance from pastoralists on how impacts can be avoided or minimised.

Sweetpea is preparing this EMP and seeking other regulatory approvals on the basis that any Approved Access Agreement determined by NTCAT will allow exploration activities to proceed. Sweetpea will continue to seek two-way engagement with Rallen Australia, or its nominated representatives, to help with planning that will minimise disturbance related with Sweetpea's proposed exploration activities.

Sweetpea is committed to attempting to keep open lines of communications with the Tanumbirini leaseholder throughout the program, however, actual communications frequency and method will be primarily a function of the leaseholder's preferences and directions.

5.2.2 Traditional Owners and Aboriginal People

The NLC is the Native Title representative body for the Traditional Owners of the land covered by EP136. Under the Exploration Agreement for EP136 with the NLC and Native Title Party, Sweetpea is required to present an Annual Work Program to the NLC and consult with the TO's identified by the NLC as the Native Title Parties on any works proposed on the permit, principally via on-country Work Program Meetings.

Two rounds of Work Program Meetings have been held for the proposed exploration activities as follows:

- The 2020/2021 Work Program Meeting was held between 10 August and 14 August 2020 at Tennant Creek, Elliott and Mataranka which covered Sweetpea's intended exploration program over the next 5 years. A focus of this meeting was on seismic program, but also covered water bore drilling and monitoring and future exploration drilling.
- The 2021/2022 Work Program Meeting was held between 27 October and 29 October 2021 at Katherine, Elliott and Tennant Creek.
- Other meetings regarding the completion of an AA9 application have also occurred over the period of engagement regarding proposed work program (that AA9 is now circulating for execution having been fully agreed and endorsed at an early 2022 meeting of the relevant Prescribed Body Corporate).

The NLC organised and facilitated all the work program meetings and coordinated with the Native Title Parties to attend and consult.

The following provides a summary of the two work program meetings:

- Background and objectives:
 - Four (4) work program meetings were held with Native Title Parties in three community locations in 2020 and another three (3) meetings were held in 2021 in three community locations.
 - Representatives of all Native Title Parties attended the meetings ~ 60 Traditional Owners present over the three days of meetings.
 - Meeting objective was to provide information, listen, consult, engage and answer any questions the Native Title Parties and Individuals may have on the proposed exploration activities and future activities.
- What was presented:
 - History of Sweetpea and introduction of Tamboran and the vision and future exploration activities.
 - 2020/2021 work program of seismic surveys and water monitoring bore installation.
 - 2021/2022 civil construction and exploration drilling and testing.
 - Environmental management and protection plans and rehabilitation plans.
 - Sacred site and cultural heritage management and protection.
 - Employment and contracting opportunities.
- Key issues, concerns and outcomes:
 - Disturbance of land, animals and birds; contamination (gas) of water (aquifers) via cracks from drilling/testing, earthquakes; rehabilitation/restoring the land and wildlife; working in the wet season; soil and sediment erosion; and creek crossings.
 - Sweetpea was well received, “with good clear honest information”, appreciation of video-link to company management and experts. NLC advised Sweetpea that the meetings were good meetings given COVID-19 restrictions.
 - The Traditional Owners want job opportunities; and Sweetpea commit to employing Cultural Managers during the exploration phases of the project (assuming NLC advise this is appropriate given Covid19 restrictions). Ongoing training and employment opportunities will be limited during the exploration phase, but if a development project is sanctioned then longer-term training and employment opportunities will be identified and supported to ensure any Native Title Party, or broader Traditional Owners, can seek employment with the project.
 - The NLC received several nominations for Cultural Managers and for those to provide cultural inductions.

The 2021 and 2022 Work Programs have been provided to the NLC, along with a copy of the C&WB EMP and EMP SWP3-1 (which covered the same program of work as covered under this EMP). Work program meetings will continue over the duration of Sweetpea’s exploration program to provide updates to the Traditional Owners.

5.2.3 Gas Pipeline Operator

A gas pipeline runs across the northern extent of the exploration activity area between the boundary of EP136 and the Carpentaria Highway on Tanumbirini Station. Access into the civil and water bore construction program area requires crossing at one location along the gas pipeline. Sweetpea has engaged with ODS Pipelines, the operator of the gas pipeline in regard to crossing the line.

It is noted that based on the current assumptions, the following conditions were stipulated by OSD pipelines:

- A 25 mm steel plate (3 m x 5 m) must be installed over the pipeline at locations where the trucks wish to cross.
- Do not place the steel plates at locations where erosion is visible.
- Only the vehicle specified by Sweetpea has permission to cross the MRM pipeline.
- Report any issues found in the field to OSD Asset Services team.
- Sweetpea shall notify OSD Asset Services one week prior to mobilisation.
- An OSD technician must mobilise to site to locate the pipeline and confirm the placement of the steel slabs. The cost of this mobilisation must be paid for by Sweetpea.
- All camps and office demountable shall be placed at least 300m from the pipeline centreline (outside the pipeline radiation contour).
- The pipeline easement shall not be used as a stockpiling, storage, laydown or parking area.

Sweetpea will comply with the conditions specified by OSD. Ongoing communication will be required with OSD prior to activities commencing. Where relevant these conditions will be left in place or reapplied.

5.2.4 Neighbouring Exploration Permit Holders/Operators

Engagement with the neighbouring exploration permit holders/operators for access/ingress permissions including:

- EP161 - Santos Ltd to the north and east
- EP76 - Origin Energy Pty Ltd to the west
- EP(A)354 - DITT to the west. The EP is still under application. It is not yet granted.

Ongoing engagement will continue as Sweetpea activities in the permit area begin to ramp up.

5.2.5 Mineral Exploration Licence Holders

Sweetpea have commenced engagement with Pennant Resources Pty Ltd who have mineral exploration licences within EP136. Sweetpea will continue to provide updates to Pennant Resources Pty Ltd in relation to Sweetpea's exploration activities.

5.2.6 Northern Territory Government Departments

Sweetpea have engaged with the relevant NTG departments for specific permits, approvals and advice as relates to the following:

- Transport and Civil Services Division of DIPL for access to road corridor permits and if intend to extract from NTG road bores.
- DITT for access authority to areas outside the permit, specifically to allow access to the accommodation camp and access tracks (Access Authority 9 application in progress).
- Water Resources Division of DEPWS as relates to water extraction licencing.
- Soil Branch of DEPWS as relates to requirements for erosion and sediment controls.
- AAPA as relates to the approved Authority Certificate.

5.3 Assessment of Merit of Stakeholder Claims and Objections

Objections to the proposed exploration have been received from Rallen Australia and their delegates, as well as other Stakeholders through the public review process of Sweetpea's SWP3-1 EMP (withdrawn in March 2022 after public review) and on the updated SWP4-1 EMP. Sweetpea also provided draft copies of EMP SWP3-1 and SWP4-1 directly to the key stakeholders such as Rallen Australia and the NLC for further comment.

A total of 88 issues have been raised after public review period (48 issued in relation to SWP3-1 and an additional 40 issues in relation to SWP4-1).

Table 30 provides the assessment of merit of stakeholder comments, claims and objections and how Sweetpea have responded or intends to respond. We value the feedback provided and have made a number of modifications or clarifications within the EMP as a result, in general there have not been distinct changes to the impact on the anticipated environmental outcomes as a result of these changes but the management plans and mitigations in place are now more clearly articulated in a number of instances.

Table 30 Assessment of Merit of Stakeholder Comments, Claims and Objections from SWP3-1 and SWP4-1 that have been considered in finalisation of the DST EMP (SWP4-2)

(RA: Rallen Australia, LTG: Lock the Gate, CAFFA: Central Australian Frack Free Alliance, NU: Nurradalinji, PCA: Protect Country Alliance)

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
SWP3-1 Original Comments, Claims and Objection Response		
1-3, 44, 47	Stakeholder: RA Topic: Stakeholder Engagement Comments, Claims and Objections: RA States that “...no stakeholder engagement communication has been made from Sweetpea to Rallen on the impacts, risks and outcomes pursuant to Petroleum (Environment) Regulations 6 and 7...” and comments on withdrawal of SWP3-1.	Environmental Impact: no impact on environmental outcomes. Response: 1-3; Sweetpea provided a draft of the DST EMP (SWP3-1) to Rallen in January 2022, which provided a full and thorough description of the impacts, risks and outcomes of the proposed exploration and appraisal activity. Sweetpea had previously provided descriptions of the location, program and scope. Sweetpea subsequently provided links to reputable scientific studies that provide further information (including the Final Report of the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory; other Australian inquiries; US EPA’s study of potential impact on drinking water resources; CSIRO review of community concerns about onshore gas development) - links are provided below. Sweetpea remains of the view that while the EMP was under assessment by DEPWS it remained in preparation and that feedback and/or objections from Rallen could be incorporated into the EMP. However, Rallen did not share this view and requested that the EMP was withdrawn. Sweetpea respects the views of stakeholders and, despite not sharing the same view as Rallen Australia, withdrew the EMP such that the information provided in January could form the basis of the requirement to “...give each stakeholder information about: ...the anticipated environmental impacts and environmental risks of the activity; and ...proposed environmental outcomes in relation to the activity...”. RA requested a relatively extended period of time (at least 6 and preferably 9 months) to review EMP SWP3-1 and ‘...engage experts to assess...’ it. The locations of the proposed activities, and the broad scope of activities, have been consistently communicated to the pastoralist since 2019. Information relating to the environmental impacts, risks and outcomes has been with the pastoralist since January 2022. Rallen Australia have provided a substantial volume of objections in the period since January, these objections are addressed in this table of EMP SWP4-1. Sweetpea will endeavour to meet the request of the leaseholder to provide as much detail as possible in relation to planned activities six to nine months in advance of that activity, and then keep the leaseholder informed of any changes that arise due to changes in circumstances.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
		44; Sweetpea have also made changes to the references to the "...range of measures to minimise impacts..." to pastoralists, to recognise that there could be impacts on pastoral business (as well as the direct impacts on the pastoral lease that are already compensated for) and to advise that Sweetpea will engage expert advice to minimise any impacts and seek guidance from the pastoralist so that Sweetpea can better understand the pastoralist business. 47; Sweetpea are in ongoing discussions with Rallen Australia regarding access and compensation. The EMP approval process, however, is not tied to compensation negotiations. Sweetpea accept that compensation is required and has negotiated compensation for direct impact in good faith. Sweetpea also accept there could be further economic impact and are prepared to assess that on an actuals basis, in accordance with the Petroleum Regulations and <i>Petroleum Act</i>, and work with Rallen to minimise losses. Sweetpea have offered, and will continue to offer, to further engage on the information provided and are always open and available to discuss EMPs or any aspects of proposed activities. US EPA: EPA's Study of Hydraulic Fracturing for Oil and Gas and Its Potential Impact on Drinking Water Resources US EPA Other Australian Inquiry Reports: Other Australian inquiries Fracking Inquiry Fracking Inquiry (nt.gov.au) CSIRO: CSIRO Research Publications Repository - A review of community concerns about onshore gas development
4	Stakeholder: RA Topic: Interference with pastoral operations Comments, Claims and Objections: RA states that "<i>Sweetpea's proposed activities will have a significantly adverse economic impact on Rallen's pastoral operations...</i>"	Environmental Impact: no impact on environmental outcomes. Response: In Sweetpea's experience exploration and appraisal activities can be undertaken without substantial adverse impacts on pastoral operations. Sweetpea are committed to minimising impacts wherever possible and engaging with pastoralists to understand their business and operations in accordance with the <i>Petroleum Act</i> and Petroleum Regulations. Sweetpea accept there could be adverse economic impacts, however, significant impacts can generally be avoided based on prior experience in similar operating environments. Sweetpea will engage in good faith compensation discussions under the Petroleum Regulations and <i>Petroleum Act</i> as needed.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
5	Stakeholder: RA Topic: EPA referral Comments, Claims and Objections: Suggested that EPA referral is appropriate.	Environmental Impact: no impact on environmental outcomes. Response: This is a decision for DEPWS and NT EPA, Sweetpea will continue to comply with environmental regulations and any other legislative requirements. A self-assessment of potential environmental impacts has been completed as summarised in the Executive Summary and Section 2.1 of this EMP.
6	Stakeholder: RA, LtG, PCA Topic: Stygofauna impacts Comments, Claims and Objections: Three stakeholders provided feedback regarding the potential impact on Stygofauna of the proposed activities.	Environmental Impact: no impact on environmental outcomes. Response: Section 4.1.7 provides a discussion of GDE and Stygofauna risk of the project. Appendix A assessed the risk and indicated the presence of significant assemblages of stygofauna in the exploration area is considered limited and impacts considered unlikely because of the following: • Sweetpea's methodology requires the protection of aquifers for drilling and well construction in accordance with Section B.4.2 of the Code. The well design will ensure barriers are appropriately designed, constructed and validated prior to HFS activities to ensure aquifer protection. • Sweetpea will monitor groundwater in the IMBs as per Section 3.4 and use control data from the CMBs to ensure aquifers remain isolated. • Sweetpea's program will use water-based drilling fluids and biocide additives will be avoided where possible. Biocides are not planned to be added to drilling fluids in the surface hole where losses are considered likely drilling through the CLA. The Chemical Risk Assessment (Appendix C) indicates that all chemicals assessed were of low concern. In addition, studies of Stygofauna have been completed by the CSIRO (Rees et al. 2020) with the following noted: • Stygofauna sampling identified the same species across the full extent of the CLA overlying the Beetaloo Sub-basin, thus it is unlikely that any localised impact to stygofauna would be considered significant. • Stygofauna predominantly found in aquifers with large pore spaces. • Abundance and diversity of stygofauna decreases with depth below ground, with fauna rarely found more than 100 m below ground level (Hose, GC et al 2015). • 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.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
7	Stakeholder: RA Topic: Water extraction Comments, Claims and Objections: RA expresses a concern that insufficient assessment of Gum Ridge capacity has been undertaken.	Environmental Impact: no impact on environmental outcomes. Response: Aquifer capacity is covered in the Statement of Reasons that supports the award of Sweetpea's water extraction licence.
8	Stakeholder: RA, PCA Topic: Groundwater monitoring Comments, Claims and Objections: RA state that Sweetpea's proposed groundwater monitoring is not compliant with the NT CoP.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea have provided further clarification in Section 3.4 that outlines how Sweetpea's monitoring plan is compliant with the Code.
9	Stakeholder: RA, PCA Topic: Groundwater drawdown impacts Comments, Claims and Objections: RA express a concern regarding draw down in Rallen water bores and PCA similarly express concern that there could be threats to the ongoing use of groundwater for the region.	Environmental Impact: no impact on environmental outcomes. Response: Aquifer capacity is covered in the Statement of Reasons that supports the award of Sweetpea's water extraction licence. Furthermore, evidence provided by Origin to the Scientific Inquiry into Hydraulic Fracturing in the Northern Territory (https://frackinginquiry.nt.gov.au/?a=424842 - pages 87-88) demonstrates the robust nature of the Cambrian Limestone Aquifer and the lack of drawdown even after multiple months of continuous water extraction.
10	Stakeholder: RA Topic: Regulatory and legislative reform Comments, Claims and Objections: RA requests an amendment of s117AAD of the <i>Petroleum Act</i> .	Environmental Impact: no impact on environmental outcomes. Response: This is a matter for the NT Government to consider.
11	Stakeholder: RA Topic: Regulatory and legislative reform Comments, Claims and Objections: RA points out the absence of trigger levels or fixed maximum allowable levels.	Environmental Impact: no impact on environmental outcomes. Response: This is a matter for DEPWS to consider. However, it is noted that Sweetpea have committed to using the set of nationally consistent investigation levels (<i>National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM)</i>) to assess risks to the environment, human health and fauna (including Stock). In addition, the baseline assessment will provide background concentrations that will also be used to establish site specific trigger levels.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
12	Stakeholder: RA Topic: Regulator action Comments, Claims and Objections: RA discusses data from outside of EP136.	Environmental Impact: no impact on environmental outcomes. Response: This is a matter for DEPWS to consider.
13	Stakeholder: RA Topic: Regulator action Comments, Claims and Objections: RA discusses stakeholder engagement of other operators and regulator assessment.	Environmental Impact: no impact on environmental outcomes. Response: This is a matter for DEPWS to consider.
14	Stakeholder: RA Topic: Other operator Comments, Claims and Objections: RA discusses operations outside of EP136.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea has no comment on this matter.
15	Stakeholder: RA Topic: Other operator Comments, Claims and Objections: RA discusses operations outside of EP136.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea has no comment on this matter.
16	Stakeholder: RA Topic: Wastewater Comments, Claims and Objections: RA shares views on wastewater storage and treatment.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea will follow all relevant legislation and regulations in relation to wastewater storage and management.
17	Stakeholder: RA Topic: Schedule and HFS activity Comments, Claims and Objections: RA requests that no HFS activity is scheduled from 1 October to 30 April.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea will conduct all activities in line with regulations and approval conditions, covered storage far in excess of expected volumes will be available to ensure any risks are ALARP regardless of season.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
18	Stakeholder: RA, LtG, PCA Topic: Chemical use Comments, Claims and Objections: RA and PCA both raise objections regarding chemicals. Specifically, RA address “<i>hydrotreated light petroleum distillate and acrylamide acrylate copolymer</i>” and state they are bioaccumulative. PCA raise broader objections about chemical use and suggest that certain chemicals are banned in the NT.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea’s Chemical Risk Assessment included in EMP SWP3-1 (Appendix C1) did not provide misleading or false statements. The screening assessment indicated that the Tier 1 chemicals were of low concern. Refer to section 3.6.7. The Tier 1 screening indicated that most chemicals (24 from SW, 30 from Hybrid and 25 from HVFR) were identified to require a Tier 2 assessment. It is to be noted that none of these chemicals were identified to be PBT (i.e to be Persistent AND Bioaccumulative AND Toxic). Specifically: - Hydrotreated light petroleum distillate (CAS # 64742-47-8) and Acrylamide acrylate copolymer (CAS # 25987-30-8) are not considered to be PBT chemicals, specifically they are not considered to be persistent AND bioaccumulative AND toxic chemicals. - Acrylamide acrylate copolymer (CAS # 25987-30-8), was assessed by NICNAS via the IMAP Tier 1 assessment framework which identified this chemical to be a polymer of low concern and thus no further assessment was warranted for this chemical. - Hydrotreated light petroleum distillate (CAS # 64742-47-8) was assessed as a Tier 2 chemical due to its potential toxicity and bioaccumulation properties, however the Tier 2 assessment resulted in an individual hazard quotient (HQ) below 1 and as such this chemical was considered low concern for workers. It is noted that the assessment of PBT is consistent with Australian risk assessment methodologies, if the HQ is less than or equal to 1, then no adverse health effects are likely associated with exposures. However, if the total HI is greater than 1, adverse health effects may be possible and therefore the assumptions inherent in the risk characterisation process warrant further evaluation. All chemicals assessed with below 1 meaning no further evaluation required. In relation to the PCA concerns regarding contamination, we would direct the PCA to again review the Final Report of the Scientific Inquiry into Hydraulic Fracturing in the NT and other literature regarding well integrity that clearly demonstrates how chemicals/fluids/materials used during HFS are isolated from aquifers. Broader PCA concerns regarding bans of certain chemicals is a matter of consideration for the NT Government, but we would say is unwarranted given the rigorous chemical risk assessment process that is already required.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
19	Stakeholder: RA Topic: Rehabilitation of Bullwaddy and Lancewood Comments, Claims and Objections: RA express concern that the Bullwaddy and Lancewood community will not rehabilitate successfully.	Environmental Impact: no impact on environmental outcomes. Response: This matter is assessed in two prior, and approved Sweetpea EMPs, with the Flora and Fauna Division of DEPWS noting that "...Bullwaddy and Lancewood are not a significant or sensitive vegetation type and the clearing of small areas is unlikely to have an overall impact on regional biodiversity". Activities have been planned to minimise impact on Bullwaddy and Lancewood and the activities do not intend to interrupt connectivity to any reserves or wetland. We acknowledge that there will be an impact on Bullwaddy and Lancewood, but that the environmental risks and impacts are ALARP through the mitigation measures outlined in this and prior EMPs (primarily around avoidance of these species where possible and limiting grading during seismic line preparation).
20	Stakeholder: RA, LtG, Nurr dalinji Topic: Cumulative impact Comments, Claims and Objections: Stakeholders express concerns about cumulative impacts of exploration and appraisal activities.	Environmental Impact: no impact on environmental outcomes. Response: The cumulative impact of all of Sweetpea's activities, and indeed other operators in the Beetaloo Sub-basin, remains minor given the limited amount of activity occurring during the exploration and appraisal phase. DEPWS and NT EPA are in a position to assess cumulative impact holistically. Sweetpea will follow all relevant regulation and legislation in relation to assessing cumulative impact and greenhouse gas emissions, furthermore Sweetpea's parent company Tamboran does not currently have any other EMPs approved or under assessment elsewhere in the Beetaloo Sub-basin (or anywhere else) and there are no efforts to shirk responsibility for any related corporate entities.
21	Stakeholder: RA Topic: GISERA findings Comments, Claims and Objections: Comments regarding unspecified GISERA research.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea are not aware of the specific research referenced by RA. We do, however, note that at this point there are no pipelines formally proposed or under assessment, and there is no road 'network' associated with exploration and appraisal activities in the Beetaloo Sub-basin.
22A	Stakeholder: RA Topic: Social licence Comments, Claims and Objections: RA express concerns regarding Sweetpea's dealings and approach to compensation.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea aspires to have cooperative and constructive relationships with all stakeholders, particularly pastoralists and Traditional Owner's and their representatives. Sweetpea has no further public comment regarding interactions with RA.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
22B	Stakeholder: LtG, PCA Topic: Social licence Comments, Claims and Objections: Stakeholders share their opinion regarding social licence and; Traditional Owner consultation; economic benefits; and stakeholder engagement.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea has engaged extensively with the Northern Land Council (NLC) and through the NLC has consulted with the recognised Native Title Holders where activity is proposed in EP136 under this EMP. The NLC has confirmed that the consultation has occurred in accordance with the Exploration Agreement in place between Sweetpea, the NLC and Native Title Holders. Sweetpea looks forward to working with the NLC and other community groups to engage a broader group of Traditional Owners who have concerns about onshore gas development, HFS, or any other aspects of our proposed activities – Sweetpea recognises this is a broader issue than any one operator's activities. In addition to consultation and engagement through the NLC, Sweetpea has engaged AAPA to ensure all activities are assessed as to their relevance to sacred sites and to ensure sacred sites are identified and appropriately protected. Sweetpea has no further comment on the economic benefits to the region beyond what is covered off in a number of publicly available studies. We would make the point that millions of dollars are spent within the NT by each operator in each campaign on everything from generators, ATVs and light towers to car rental, hotels, meals and fuel.
23	Stakeholder: RA Topic: Pastoral bore access Comments, Claims and Objections: RA states that no consent is granted to access pastoral bores on Tanumbirini Station.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea have no current proposal to access water from pastoral bores.
24	Stakeholder: RA Topic: Gravel access Comments, Claims and Objections: RA states that no consent is granted to access gravel from Tanumbirini Station.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea has sought and received approval from DEPWS in two prior EMPs to extract gravel from gravel pits for the purposes of constructing roads and exploration lease pads and other ancillary purposes. This is a right granted to exploration interest holders. Sweetpea will comply with all conditions of approval and any conditions that are part of any access agreement either negotiated or determined through the NTCAT process; and, further, will seek to engage the pastoralist regarding proposed construction activities.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
25	Stakeholder: RA Topic: Proposed and approved scope Comments, Claims and Objections: RA lists a number of issues in relation to a) the number of wells proposed, b) the number of HFS stages per well, c) wastewater, d) truck movements, and e) the time to drill wells.	Environmental Impact: no impact on environmental outcomes. Response: a) This EMP covers what Sweetpea consider a 'reasonable' scope of wells to progress the exploration and appraisal to a point where the potential for development can be assessed; we have accepted feedback from DEPWS and NT EPA that more comprehensive EMPs are preferred. b) The specific HFS that is optimal for any given well is a technical decision where flexibility must be retained and given that there are numerous conditions in relation to well integrity testing, well acceptance criteria, WOMPs, EMPs, water extraction licences, the Code of Practice, and other legislation it is not necessary to specifically limit HFS design during the EMP process. c) All relevant regulations and legislation regarding wastewater will be adhered to. d) We commit to providing updates to the pastoralist and any other relevant stakeholders regarding matters such as truck movements as part of our future and ongoing stakeholder engagement. e) All estimates of schedule are best estimates made at the time with the information and plans to hand.
26	Stakeholder: RA Topic: Activity outside of EP136 Comments, Claims and Objections: RA states that it will not provide consent for access outside of EP136 and/or to the Tanumbirini airstrip.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea will abide by the terms of approved exploration permits or access authorities, and by the terms of any negotiated or determined access agreement.
27	Stakeholder: RA Topic: Schedule Comments, Claims and Objections: RA point out that the schedule included in EMP SWP3-1 has not been met.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea recognises that the schedule of activities has changed since the submission of EMP SWP3-1 and have updated the schedule in this EMP, SWP4-1.
28	Stakeholder: RA via H2onestly Topic: Groundwater monitoring Comments, Claims and Objections: Review of groundwater monitoring across Tanumbirini Station	Environmental Impact: no impact on environmental outcomes, but good suggestions to be incorporated into Sweetpea's groundwater monitoring plan. Response: Sweetpea's groundwater monitoring will be undertaken in accordance with the Guideline. H2onestly's report raises some points that align with Sweetpea's thinking/planning regarding groundwater monitoring:

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
		- Ensuring IMBs are downgradient of wells: although the regional groundwater flow direction is known to be from southeast to northwest, local groundwater flow directions may deviate from this. Our understanding will improve as we drill more waterbores, and we plan to drill the camp bore and both CMBs, accurately surveying them and (re)assessing groundwater flow direction, before finalising the location of any IMBs. - Establishment of baseline conditions (1): it is possible that early monitoring data is affected by the drilling process, particularly with air drilling and lost circulation conditions (this will be true of all waterbores and is not unique to bores drilled in support of exploration and appraisal activity). Bores will be developed after drilling, by pumping, to re-establish “representative background” water quality as quickly as possible. - Establishment of baseline conditions (2): There are sufficient regional monitoring data to show that there is negligible seasonality and temporal variability. Sweetpea will commence groundwater monitoring immediately upon completion of the CMBs prior to the start of exploration drilling (target 8 samples over 1-2 months). This monitoring is in addition to the CoP mandated six months of monitoring prior to the commencement of HFS activities and not in lieu of such monitoring. - Action thresholds: this issue is not unique to the Beetaloo but highlights a challenge in many regulatory environments regarding specific values for protection. Sweetpea are finalising a groundwater monitoring plan, however, require further engagement with stakeholders to determine which (if any) regional bores may be accessible for sampling and monitoring. The plan will detail: - Locations, parameters, frequencies etc for monitoring - Procedures for collection of samples from CMBs and IMBs - What constitutes “baseline” for each parameter - A procedure for the review of monitoring data, both pre-petroleum activity and post-activity - Action triggers - A follow up response when “triggers” are exceeded.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
29	Stakeholder: LtG, CAFFA Topic: Greenhouse gas emissions Comments, Claims and Objections: Stakeholders raise a number of concerns regarding CO₂ and CH₄ emissions; 1) CH₄ emissions from venting; 2) fugitive emissions; 3) veracity of estimates; 4) 300-day test period; 5) climate change impacts.	Environmental Impact: no impact on environmental outcomes. Response: 1) Sweetpea does not anticipate substantial venting, it is typically required only for a very short period after initial flow-back commences prior to being able to put the well stream through a separator. It is implied in the feedback that Sweetpea may need to revert to venting as a normal part of the testing process, this is not anticipated to be the case. 2) Fugitive emissions from wells and infrastructure during exploration and appraisal is not anticipated to be an issue – there are no gas processing facilities or scale developments. 3) GHG estimates – Sweetpea have assessed emissions from the proposed activities covered by this EMP using the tools developed for the National Greenhouse and Energy Reporting scheme and other Industry guidance. The emissions were based on the activities proposed and the anticipated schedule at the time of the estimate calculations. Under this EMP (SWP4-1), Sweetpea have reassessed the GHG emissions based on the schedule changes presented in Section 3.1. The overall difference between operators' estimates can be contributed to the individual exploration activities covered by their EMP and direct correlation may not be achieved due to a range of factors such as the extent of vegetation clearing required for a lease pad, the estimated quantity of fuel and length of time it will be used, as well as the planned extended production testing (EPT) days per location. The bulk of the emissions under this EMP are associated with flaring activities (>93% of emissions) and are dependent on the number of days of the EPT. Sweetpea have identified possible production testing over 60, 90 or 300 days. Sweetpea's operations will be managed to minimise the release of gas to the atmosphere. The gas produced during flowback operations will be directed through a separator and sent to a completion combustion device (flare) equipped with a continuous ignition device. It is anticipated that combustion of gases can reduce emissions by 96% when compared to venting. The Methane Emission Plan (Appendix E) presents the measures Sweetpea will undertake to conduct methane emissions monitoring, leak management, detection and reporting over the duration of the exploration program and require annual reporting as part of requirements as detailed in Section 8.5.1. 4) Of the seven wells proposed in this EMP, only two are anticipated to require extended production testing out to 300 days. During this early phase of appraisal, it is critical to acquire sufficient data to ensure that appropriate decisions regarding future activity can be well informed.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
		5) Gas is a critical part of the transition to lower carbon intensity energy and also as an input into many critical elements of the modern economy (e.g. fertilisers). The IEA Net Zero scenario anticipates substantial gas production will still be critical in 2050, and currently there is a risk that there is insufficient investment to ensure that sufficient gas will be available for domestic and global markets. Gas in the Asia-Pacific can help decarbonise electricity markets and reduce CO emissions and atmospheric pollution providing better air quality to major population centres. Understanding the potential of the Beetaloo Sub-basin is also critical in determining Australia's energy and industrial future – in the absence of success in the Beetaloo or other new plays it is likely that eastern Australia will become a gas importer and a higher CO2 footprint on a comparative basis.
30	Stakeholder: LtG, PCA Topic: Wastewater management Comments, Claims and Objections: Stakeholders raise a number of matters; 1) use of flowlines; 2) water re-use; 3) open-top tank use; 4) solid waste management.	Environmental Impact: no impact on environmental outcomes. Response: 1) Sweetpea have no current proposal to move HFS flow-back fluids between exploration lease pads, hence, any flowlines relate to movement of fluids on an exploration lease pad to allow level management and ensure freeboard and/or storage is optimised. 2) Water re-use for subsequent HFS operations is considered likely to be achievable without further water treatment; however, this will require testing of flow-back fluids once the HFS phase is completed and flow-back is underway. Clearly the testing of fluids can't be completed until the fluids are recovered. 3) Storage of bore-water, drilling fluids and waste-water or HFS flow-back fluid will be in accordance with the CoP and any relevant regulations and legislation. 4) The volume and composition of any residual/solid material will be assessed to determine the appropriate disposal technique. Any solid waste produced will be disposed of in a manner which does not cause risk to public health or safety or cause contamination of water or land not specifically designated to waste disposal. Waste disposal records are required to be maintained for audit purposes.
31	Stakeholder: LtG Topic: Biodiversity impact Comments, Claims and Objections: The materiality of the impact of the proposed program is questioned by LtG.	Environmental Impact: no impact on environmental outcomes. Response: The EMP will require assessment and approval by DEPWS and NT EPA, Sweetpea maintain, as per the EMP, that the environmental risks and impacts are ALARP.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
32	Stakeholder: LtG Topic: Pepper inquiry recommendations, CO2 offsets, water allocation plans Comments, Claims and Objections: LtG state various concerns regarding any exploration and appraisal activity until all 135 recommendations of the “Pepper Inquiry” are fully implemented	Environmental Impact: no impact on environmental outcomes. Response: These are ultimately matters for the NT Government to consider. However, we would say that the conclusions and recommendations of the Final Report of the Scientific Inquiry into Hydraulic Fracture Stimulation in the Northern Territory explicitly state that not all recommendations need be completed for the continuation of exploration and appraisal activities and that many recommendations are focused on development and production activities.
33	Stakeholder: CAFFA Topic: Groundwater regulations Comments, Claims and Objections: CAFFA raise concerns regarding various risks matters including flowback fluids, wastewater storage tanks, chemicals used, aquifer protection, and Beetaloo water allocation plans.	Environmental Impact: no impact on environmental outcomes. Response: The issues raised are comprehensively covered by existing regulations. Sweetpea will minimise risks to ALARP by complying with the rigorous NT regulations.
34	Stakeholder: CAFFA Topic: Inquiry recommendations and SREBA Comments, Claims and Objections: CAFFA raise concerns regarding the speed of the implementation of the recommendations of the Scientific Inquiry and around the SREBA.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea have no comment on these matters, which are not within the remit or control of Sweetpea.
35	Stakeholder: Nurrdalindi Topic: Consultation and consent Comments, Claims and Objections: Nurrdalindi raise a number of concerns relating to consultation with Native Title Holders.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea has followed the process required by the NT Government in terms of consultation via the NLC with Native Title Holders and for sacred site protection via the AAPA. Sweetpea has consulted with Traditional Owners multiple times regarding the proposed exploration activities as per the Exploration Agreement between Sweetpea, the NLC and the Native Title Holders. Sweetpea is committed to engagement with Traditional Owners and looks forward to an opportunity to meet with representatives of Nurrdalindi to discuss proposed exploration and appraisal activities. Other concerns raised by Nurrdalindi, such as employment opportunities, are not attempted to be addressed in the EMP, but do remain under discussion with the NLC as the representative group of the Native Title Holders.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
36	Stakeholder: Nurrdalinji Topic: Cultural heritage Comments, Claims and Objections: Nurrdalinji questions whether an Authority Certificate has been granted and Sweetpea's commitment to the role of cultural monitors.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea has outlined some of the details of the comprehensive AAPA Authority Certificate that was issued in October 2020 in this EMP. On Country consultations have been completed by both NLC and AAPA. An EMP approval would not be possible without the support of a valid AAPA AC. Regarding cultural monitors or cultural managers, Sweetpea is working with NLC to engage cultural managers and have been advised that availability of cultural managers will depend on the Covid19 situation at the time of operations and other factors. Sweetpea welcomes the involvement of Traditional Owners as cultural managers, or other relevant roles, in our operations.
37	Stakeholder: PCA Topic: Well integrity and corrosion risks Comments, Claims and Objections: The potential for bacteria to impact well integrity is raised.	Environmental Impact: no impact on environmental outcomes. Response: Mortar is not used for cementing operations in the oil and gas industry (noting that the PCA reference to "...mortar specimens in a corroded sewer system..." is used as evidence of an unassessed risk). Sweetpea are planning to use Class G cement and Class GP (A) on all casing cement jobs (the former as a 'tail' slurry and the latter as a 'lead' slurry). Class "G" oil well cement is a specialty cement made for oil and gas industry, it has special behavioural properties for high temperature and pressure applications. It is highly resistant to sulphate and can be blended with a variety of additives to modify behaviour under unique well conditions.
38	Stakeholder: PCA Topic: Amphibian safety Comments, Claims and Objections: The risks to amphibians of water storage are raised.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea have considered the risks associated with use of open top tanks for evaporation of wastewater which could attract fauna and if wastewater is consumed it could be a risk to fauna due to the salinity and chemistry of flowback water. The overall risk to impact on fauna species (including avian and amphibians) is considered minimal due to the salinity levels itself acting as a deterrent from fauna consuming or interacting with wastewater. It is also noted that no EPBC Act or TPWC Act listed amphibian species have been identified within Sweetpea's exploration area. A number of controls are detailed in Section 7.9 and Appendix F, including monitoring of wastewater storage areas, include fauna ladders in storage tanks and where known interaction of wildlife with wastewater has occurred, will be documented and if necessary additional preventative measures employed. The wastewater storage is proposed to be in above-ground tanks with tall, vertical wells which will limit the access to amphibians. Entrapment and breeding of amphibians in wastewater is therefore unlikely.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
39	Stakeholder: RA Topic: HFS chemical transport Comments, Claims and Objections: RA state that Sweetpea have not provided sufficient detail in the EMP.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea will comply with all regulations and sufficient details are provided in the EMP.
40	Stakeholder: RA Topic: Drilling waste disposal Comments, Claims and Objections: RA state an objection to onsite disposal.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea will comply with all regulations and will assess the volume and composition of any drilling waste products before finalising disposal plans as per the EMP. Overall environmental impact is minimised by in-situ disposal if materials are non-hazardous to the environment.
41	Stakeholder: RA Topic: Produced water and flowback fluid disposal Comments, Claims and Objections: RA reference requirements of the "Pepper Inquiry" in relation to disposal of flowback fluids.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea will comply with all regulations and will assess the volume and composition of any flowback fluids before finalising disposal plans as per the EMP.
42	Stakeholder: RA Topic: WOMP Comments, Claims and Objections: RA share a view regarding the role of the WOMP in the approval process.	Environmental Impact: no impact on environmental outcomes. Response: DITT and DEPWS control the review of material required under the regulations, not Sweetpea.
43	Stakeholder: RA Topic: AAPA Authority Certificate Comments, Claims and Objections: RA share a view that AAPA AC2020/072 should be included with the EMP.	Environmental Impact: no impact on environmental outcomes. Response: DEPWS and the Minister will assess the completeness of the EMP, not Sweetpea. There has also been further clarification of AC2020/072 in this EMP.
44	See Issue 1-3 (Row 1 this table)	

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
45	Stakeholder: RA Topic: Cumulative impact (water extraction) Comments, Claims and Objections: RA state that the number of HFS stages must be specified by Sweetpea.	Environmental Impact: no impact on environmental outcomes. Response: The optimal number of HFS stages per well is something that can be determined accurately only after a well is successfully drilled. There are a number of technical and commercial/strategic considerations that impact the final number of stages selected for stimulation. Regardless of the combination of wells and stages, Sweetpea will use only water allocated under the approved water extraction licence, which clearly articulates in its statement of reasons how the CLA will not be adversely impacted by Sweetpea's proposed activities.
46	Stakeholder: RA Topic: Sacred site protection Comments, Claims and Objections: RA raise issues relating to sacred sites identified in AC2020/072.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea entirely agree that protection of sacred sites, as identified in AC2020/072, is critical. Sweetpea will ensure compliance with the conditions of the Authority Certificate to ensure sacred sites are protected. Hydrogeological evidence shows a clear separation between the CLA and the ephemeral water holes of the Newcastle Creek, such that extraction from the CLA does not pose a risk to the sacred sites.
47	See Issue 1-3 (Row 1 this table)	
48	Stakeholder: RA Topic: Airfield use Comments, Claims and Objections: RA do not provide consent for use of the Tanumbirini Station airfield	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea note this objection and do not propose to use the airfield during course of normal operations.
SWP4-1 Comments, Claims and Objection Response		
49	Stakeholder: RA Topic: Scope of work Comments, Claims and Objections: RA states that "...there needs to be a specified number of stages in the EMP..."	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea will comply with limits of the approved Water Extraction Licence and conditions of any EMP approvals that dictate any scope limits.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
50	Stakeholder: RA Topic: Access and AAPA AC conditions Comments, Claims and Objections: RA states that there is "...no way of crossing Newcastle Creek without breaching AAPA certificate..."	Environmental Impact: no impact on environmental outcomes. Response: The contention that the area south of Newcastle Creek can't be accessed without breaching AAPA AC 2020/072 is incorrect. The relevant part of this AC is Restricted Work Area 2 (RWA2), the proposed Western Access Track (WAT) is entirely constructed to the west of RWA2 and its buffer zone. Access to the south of Newcastle Creek will be via the constructed Western Access Track that is approved under the Civil and Water Bore EMP SWP 2-3. No new tracks will be created within RWA2, and no works will be undertaken within RWA2. The Western Access Track option is comprehensively covered in the approved Civil & Water Bore EMP. This EMP has been updated in Sections 3.2 to reflect the access track constructed under the r22 of SWP 2-3.
51	Stakeholder: RA Topic: AAPA AC conditions Comments, Claims and Objections: RA shares their view on the AAPA conditions	Environmental Impact: no impact on environmental outcomes. Response: This matter is already thoroughly addressed in this EMP and is a decision for the regulator and Minister. We note, however, that a further AAPA AC is being progressed specifically in relation to this matter.
52	Stakeholder: RA Topic: Impacts on pastoral business Comments, Claims and Objections: RA shares their expert's view on the financial impact of proposed activities	Environmental Impact: no impact on environmental outcomes. Response: This is a matter of access and compensation, not of environmental management. The Rallen contention does not make the EMP statement that assessing impacts to a pastoral business requires an in-depth understanding of that business – presumably Rallen provided such insights to their third-party expert to reach that value.
53, 63	Stakeholder: RA Topic: Gravel Extraction Comments, Claims and Objections: RA reiterates that they have not given Sweetpea permission to extract gravel	Environmental Impact: no impact on environmental outcomes. Response: Precedence and legal advice to Sweetpea is that gravel extraction for the purposes of supporting approved activity is lawful.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
54-55	Stakeholder: RA Topic: Access and AAPA AC conditions Comments, Claims and Objections: RA revisits the issue of the AAPA AC conditions and access tracks	Environmental Impact: no impact on environmental outcomes. Response: The approved Civil and Water Bore EMP and Seismic EMP both cover this issue thoroughly. Sweetpea will not breach the AAPA AC conditions and the EMPs would not have been approved if the activity were to breach the AAPA ACs. We note, however, that a further AAPA AC is being progressed specifically in relation to this matter at the specific location of the intersection between the existing pastoral track and RWA2.
56-58	Stakeholder: RA Topic: AA9 Comments, Claims and Objections: RA states that Sweetpea have conducted regulated activities outside EP136	Environmental Impact: no impact on environmental outcomes. Response: The AA9 has now been executed and is on foot. However, the contention by Rallen in this objection ignores the explicit language of Section 65 of the <i>Petroleum Act</i> , which grants an interest holder "...a right to construct a road or carry out other work to ensure access to the exploration permit or licence area by the shortest practicable route to a road...".
59	Stakeholder: RA Topic: Maps in EMP Comments, Claims and Objections: RA states that Figure 5 and Figure 6 require updating.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea have updated required figures in this EMP.
60-62	Stakeholder: RA Topic: Wastewater management Comments, Claims and Objections: RA states that they do not consent to any disposal of waste materials on its property.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea will abide by all relevant approvals, laws and regulations in undertaking its activities.
63	Stakeholder: RA Topic: Gravel extraction Comments, Claims and Objections: RA reiterates that they have not given Sweetpea permission to extract gravel.	Environmental Impact: no impact on environmental outcomes. Response: refer to Issue #53, #63.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
64-66	Stakeholder: RA Topic: AAPA and access tracks Comments, Claims and Objections: RA re-states their concern around AAPA AC 2020/072 and RWA2.	Environmental Impact: no impact on environmental outcomes. Response: refer to Issue #50.
67	Stakeholder: RA Topic: Water Extraction Licence Comments, Claims and Objections: RA re-states their concern around the validity of the Water Extraction Licence.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea will amend the Water Extraction Licence with the registered bore numbers of water bores it uses for water extraction and is not proposing to extract water from any pastoral water bore.
68-69	Stakeholder: RA Topic: AAPA and access tracks Comments, Claims and Objections: RA re-states their concern.	Environmental Impact: no impact on environmental outcomes. Response: refer to Issue #50.
70	Stakeholder: RA Topic: AAPA, access tracks and Newcastle Creek Comments, Claims and Objections: RA re-states their concern and states that Sweetpea has no authority to cross the creek.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea will comply with the AAPA AC as stated above. RA conflate RWA2 and Newcastle Creek in a way that AAPA have not. AAPA is the appropriate authority, not RA. The point made in this section of the EMP is that the existing pastoral track, which does cross Newcastle Creek within RWA2, does not significantly alter the waterway.
71	Stakeholder: LtG Topic: Stygofauna Comments, Claims and Objections: LtG re-state their concern regarding Stygofauna.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea provided a detailed response to prior comments on this matter in this EMP (refer Issue #6 for detailed response). Sweetpea stand by their assertions in this EMP that the regulated activity will not impact on stygofauna because the hydraulic fracturing activities will not interact with groundwater at levels where subterranean biodiversity is likely to occur. Specific measures described in the EMP provide for further protection of groundwater.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
72	Stakeholder: LtG Topic: Chemicals Comments, Claims and Objections: LtG re-state their concerns regarding chemicals.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea updated the CRA to reflect the finalisation of the HFS contractor and has followed the established protocols for independent risk analysis and compilation of the CRA.
73	Stakeholder: LtG Topic: Climate change impacts Comments, Claims and Objections: LtG allege Sweetpea's response is "merely rhetoric".	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea have prepared a GGAP as part of the ongoing approval process of this EMP. Natural gas is a critical part of an orderly energy transition, and the fact that many parts of the world, including Australia, still get the majority of their baseload power generation from coal (and in the case of SE Australia – brown coal) proves that there is a need for gas now and for decades to come. If this is not the case, Sweetpea will have no market for their gas and Sweetpea accepts this commercial risk.
74	Stakeholder: LtG Topic: Biodiversity Comments, Claims and Objections: LtG re-state their concerns on impacts of biodiversity.	Environmental Impact: no impact on environmental outcomes. Response: This EMP involves very minimal further clearing. These comments relate to previously approved EMPs.
75	Stakeholder: CAFFA Topic: As per original submission plus GGAP Comments, Claims and Objections: CAFFA re-state that they hold concerns as per their feedback to EMP SWP 3-1 and note absence of a GGAP.	Environmental Impact: no impact on environmental outcomes. Response: Previous response to CAFFA is summarised in Issue 29, 33-34 under SWP3-1. In addition, Sweetpea have since completed the GGAP as part of the ongoing approval process of this EMP.
76	Stakeholder: NurrDALinji Topic: AAPA and access tracks Comments, Claims and Objections: NurrDALinji state their concern around AAPA AC 2020/072 and RWA2.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea has made its operational plans around the advice of AAPA and the conditions of AAPA AC 2020/072. The Western Access Track (WAT) proposed by Sweetpea avoids RWA2 altogether. The Civil and Water Bore EMP would never have otherwise been approved. Sweetpea have confirmed this recently with AAPA who have had contact directly from and with NurrDALinji.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
		Sweetpea will ensure no works are carried out within RWA2 as per the conditions of the AC. There will be no use of explosives as in the case of the Juukan Gorge disaster. And another distinguishing factor from that disaster is the ongoing engagement with the NLC and AAPA recognised Native Title Parties who have authority to speak for this area. It is not for Sweetpea to determine who has the right to speak for Country.
77	Stakeholder: Nurrdalinji Topic: AAPA and water use Comments, Claims and Objections: Nurrdalinji state their concern around AAPA AC and water extraction.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea has covered this issue extensively and transparently in this EMP and would again note that a further AAPA AC is being progressed specifically in relation to this matter.
78	Stakeholder: Nurrdalinji Topic: Lack of consultation and informed consent Comments, Claims and Objections: Nurrdalinji state their concern around consultation.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea is looking forward to the opportunity to engage directly with Nurrdalinji and is in email contact to arrange this. Sweetpea in no way meant offence or intended to insult Nurrdalinji by stating that we interpreted the “ongoing use” of water bores to involve water extraction under an approved water extraction licence and EMP. There is no intent to minimise the concern of any stakeholder. AAPA have confirmed that the engagement referred to by Sweetpea in this EMP has occurred during May. We do not list AAPA’s independent engagements and consultations in the Sweetpea stakeholder log – hence the confusion regarding this point. Sweetpea has trusted in the process set out by the NT Government and regulators to engage with the NLC and AAPA in relation to all sacred site identification matters and work program meetings – this process has been followed thoroughly.
79	Stakeholder: PCA Topic: Groundwater Comments, Claims and Objections: PCA restate a number of concerns in relation to SREBA, Stygofauna and groundwater protection.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea is of the view that no new matters are raised in this section in relation to Sweetpea’s proposed activities.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
80	Stakeholder: PCA Topic: Climate change Comments, Claims and Objections: PCA restate concerns regarding climate change.	Environmental Impact: no impact on environmental outcomes. Response: refer to response in Issue #73.
81-82	Stakeholder: PCA Topic: Corrosion Risk and Chemical Use Comments, Claims and Objections: PCA restate concerns regarding casing corrosion.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea will abide clause B.4 of the Code which requires, all onshore shale gas wells (including exploration wells constructed for the purposes of production testing) have mandatory requirements for well construction, with cementing extending up to at least the shallowest problematic hydrocarbon bearing, organic carbon rich or saline aquifer zone. The EMP outlines the controls identified in the Well Operations Management Plan (WOMP) that will be implemented for the drilling program design to ensure isolation of the Gum Ridge Formation, aquifer protection and overall petroleum well integrity is achieved.
83	Stakeholder: PCA Topic: Biodiversity Comments, Claims and Objections: PCA restate concerns regarding biodiversity.	Environmental Impact: no impact on environmental outcomes. Response: This matter has been covered extensively in this EMP and is covered by the Code of Practice. Sweetpea will comply with the relevant regulations in relation to wastewater storage. Sweetpea have undertaken detailed surveys of the permit area over course of the development of its EMPs (Seismic, Civil & Water Bore and DST) and the assumption that this was a desktop review is incorrect.
84	Stakeholder: PCA Topic: Wastewater tanks Comments, Claims and Objections: PCA restate concerns regarding wastewater storage.	Environmental Impact: no impact on environmental outcomes. Response: This matter has been covered extensively in this EMP and is covered by the Code of Practice. Sweetpea will comply with the relevant regulations in relation to wastewater storage.
85	Stakeholder: PCA Topic: Amphibians Comments, Claims and Objections: PCA restate concerns regarding amphibians.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea provided a response on SWP3-1 on similar concerns raised by PCA in relation to risk of activities on amphibians (refer Issue #38 response). The response considered the risks associated with use of open top tanks for evaporation of wastewater which could attract fauna and if wastewater is consumed it could be a risk to fauna due to the salinity and chemistry of flowback water. The overall risk to impact on fauna species (including avian and amphibians) is considered minimal due to the salinity levels itself acting as a deterrent from fauna consuming or interacting with wastewater.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
		It Is also noted that no EPBC Act or TPWC Act listed amphibian species have been identified within Sweetpea's exploration area. A number of controls are detailed in Section 7.9 and Appendix F, including monitoring of wastewater storage areas, include fauna ladders in storage tanks and where known interaction of wildlife with wastewater has occurred, will be documented and if necessary additional preventative measures employed. The wastewater storage is proposed to be in above-ground tanks with tall, vertical walls which will limit the access to amphibians. Entrapment and breeding of amphibians in wastewater is therefore unlikely.
86	Stakeholder: PCA Topic: Waste Disposal Comments, Claims and Objections: PCA restate concerns regarding waste disposal.	Environmental Impact: no impact on environmental outcomes. Response: This matter has been covered extensively in this EMP and is covered by the Code of Practice. Sweetpea will comply with the relevant regulations in relation to wastewater storage.
87	Stakeholder: PCA Topic: Social Licence Comments, Claims and Objections: PCA restate concerns regarding social licence.	Environmental Impact: no impact on environmental outcomes. Response: Sweetpea spent substantial time and effort attempting to engage Rallen regarding all aspects of the proposed work program. Particularly in relation to appropriateness of access points and tracks and ways that Sweetpea and Rallen could cooperate. Information regarding environmental risks, impacts and outcomes has been provided, in addition to further resources. And genuine offers to meet and discuss concerns have not been accepted. In relation to indigenous groups, Sweetpea have engaged with the recognised Native Title Parties through the NLC, as is appropriate for an interest holder. Sweetpea is open to engaging all stakeholders and community members that hold concerns, but we cannot undermine the position of NLC and AAPA who determine and advise interest holders in relation to their commitments under approved Exploration Agreements. Recent media coverage by the National Indigenous Times make it clear that there is not only opposition to onshore gas development, but also support.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
88	Stakeholder: Emanate Topic: Scope Comments, Claims and Objections: Emanate make a spurious claim that this EMP somehow approves activity on Beetaloo Station.	Environmental Impact: no impact on environmental outcomes. Response: A. On 1 February 2022 Sweetpea wrote to Beetaloo Station "...to let you know that we've been able to re-design the near-term exploration drilling program to stay north of Beetaloo Station...", i.e. it was made clear to Beetaloo Station that this EMP is not intended to have any scope that could occur on Beetaloo Station. This is also clearly stated in this EMP. Beetaloo Station acknowledged the communication confirming that the update was well received. 6-10. The Emanate Report attempts to show that a horizontal well could potentially enter Beetaloo Station. This is not Sweetpea's intent and Sweetpea has not sought approval for this – having unequivocally stated that activity is not going to occur on Beetaloo Station (and our view is that drilling under Beetaloo Station without an EMP that explicitly approved that would not be lawful). We have edited Section 1.5.2 of the EMP to clearly identify that no horizontal drilling covered by this EMP will progress across the Tanumbirini-Beetaloo border. The Report also purports that horizontal drilling outside of EP136 is being approved by this EMP. This is not the case and the regulator can condition Sweetpea if it feels so compelled. The Report also conflates subsurface extent of a well with surface location of a well, there is no regulation that requires the subsurface footprint of a well to be >1 km from a Regulated Bore. 11-12. Stakeholder Engagement: Despite the Emanate Report stating that it is unclear as to where activity may occur, their own quoting of the EMP "...the regulated petroleum exploration activities under this EMP are proposed to be undertaken on Tanumbirini PPL only" – demonstrates it couldn't be much clearer that there are no activities proposed for Beetaloo Station. Regardless, it is not true that there was "no stakeholder engagement" – Beetaloo Station were provided with copies of EMP SWP 3-1 and also advised that they would not be directly impacted stakeholders. 13-17. Assessment of Environmental Impacts: The Report raises a number of issues that are outside the scope of an exploration and appraisal EMP. The contention that there was no on the ground assessment is also incorrect. 18-19. Cumulative Effects: Section 6.2 of the EMP provides cumulative impact assessment of the regulated activities. Given the footprint of the overall exploration program, the small and temporary nature of the project and the level of activities in surrounding areas, remoteness of the permit area, the cumulative impacts of this nature are expected to be negligible. 20. Aboriginal Areas Protection Authority (AAPA) Authority Certificate: See 3 above.

Issue #	Stakeholders Topic Comments, Claims and Objections	Assessment and Response
		Appendix B: ESC Assessment: i. Climate change discussions – out of scope of this EMP. ii. Full field development discussions – out of scope of this EMP. iii. Faulting discussions – major faults will be identified on 2D seismic, if present. Sub-seismic faults will be identified during drilling and/or well evaluation, and if of sufficient magnitude to require adjustment to the plans for HFS that decision can be made with the benefit of the data acquired from drilling and evaluation operations. iv. Induced seismicity discussion – general commentary, no matters that require response or action. v. Well integrity discussion – the author is suggesting changes to the Preliminary Guideline for Groundwater Monitoring.

5.4 Future Stakeholder Engagement

Sweetpea will continue to engage with Stakeholders, in particular pastoral leaseholders and Traditional Owners in the lead up and during the current and future DST programs. Sweetpea is committed to attempting to keep open lines of communications with the Tanumbirini leaseholder throughout the program, however, actual communications frequency and method will be primarily a function of the leaseholder's preferences and directions from their legal representatives.

Sweetpea 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 health, safety and environmental performance standards).

Sweetpea has further committed to ongoing engagement with the relevant Traditional Owners, including annual work plan meetings and provision of draft work programmes for future years of activity.

As Sweetpea ramp up their presence within the Region, additional engagement activities will commence, pending agreement from stakeholders, including:

- Pastoralist:
 - Regular briefings with the host Pastoralist when activities are occurring within the PPL
 - Monthly scheduling update via email to the Pastoralists and/or representative
 - Annual consultations with Pastoralists and/or representatives regarding planned activities over next 12 months
- Native Title Holders:
 - Project status updates to the Northern Land Council (NLC) regarding progress of the exploration activities
 - Annual Work Program meetings with Native Title Holders, facilitated by the NLC, advising of previous 12 months activities and the next 12 months.

6.0 Environmental Risk Assessment

Several potential risks have been identified as part of the regulated well activity and associated activities. The relative likelihood and consequence of these risks, their associated mitigation, monitoring measures and residual risk rating are presented in Section 7.0 and Appendix A. An assessment of potential and routine environmental effects and the risks arising from the Sweetpea's exploration activities was conducted.

In accordance with AS/ISO 31000, a team of multi-disciplinary professionals conducted and reviewed the risk assessment to ensure the controls adopted follow the hierarchy of controls. The primary contributors to the risk assessment included:

- Erik Vik – Sweetpea Representative
- Gibson Porkime – Northern Territory Operations Manager
- David Close – Vice President, Operations & External Affairs
- Donny Loughry – Geoscience Technical Advisor
- Dan Behrendt – HSE Production Operations Technical Advisor
- Neil Barman – Planning and Reservoir Engineering Technical Advisor
- Jaime Lopez – Tamboran US Operations Team Manager & Completions Technical Advisor
- Alana Court – Associate Director – Environment
- James Jentz – Civil Engineer
- David van den Hoek – Senior Botanist
- William Riddell – Senior Ecologist
- Mark Jenkins – Drilling Engineer
- Tim Anderson – Principal Scientist/CEPSC

The environmental risk assessment methodology is presented in the following sections.

6.1 Methodology

A formal assessment of the risk of potential environmental and safety impacts and issues was carried out based upon a standard risk management approach.

This process involved was two-fold:

1. Identifying the latent risk of the activities associated with DST activities prior to allocating risk mitigation management and monitoring strategies involved the following stages:
 - Identification of the key activities and considerations.
 - Ascertaining the potential hazards associated with these activities including the potential impacts associated with them.
 - Determination of the environmental, engineering, cost and reputational aspects associated with the hazard.
 - Assigning a consequence severity rating.
 - Assigning a likelihood/frequency rating.
 - Determining the resultant level of risk for each potential impact.
2. Once each hazard aspect was rated, the residual risk rating was determined by:
 - Evaluating the current known body of information available to inform the management and mitigation of the identified hazard.
 - Generating management mitigation and monitoring measure to incorporate into the management planning.
 - Assigning a consequence severity rating.
 - Assigning a likelihood/frequency rating.
 - Determining the residual level of risk for each potential impact.

The management practices identified are designed to keep risks as low as reasonable possible (ALARP) and environmentally acceptable (Section 6.1.1). Taking these management practices into consideration the risk levels are assessed.

The Impact Consequence Severity Rating Matrix is shown in the Risk Treatment Criteria in Table 31 and Table 32, and the final Qualitative Risk Analysis Matrix based on likelihood and severity in Table 33.

Table 31 Environmental and safety impact consequence severity rating matrix

Consequences	Category				
	Safety	Environmental and community	Cost	Stakeholder perception	Law, regulation and civil action
5 Severe	One or more fatalities or illness or total permanent disability to a large exposed group	Major and long-term damage extending beyond exploration area. Extensive loss of community livelihood.	>\$50M	Multiple stakeholder groups mobilising and encouraging others to take action as reflected in media channels with significant reach and influence	Criminal charges against director, senior executive or senior manager not involving jail or loss of right to manage the company. Prolonged major litigation – exposure to significant damages. Suspension/ restriction to operate asset.
4 Massive	Injury or illness to one or more persons, resulting in permanent partial disability	Major and long-term damage within exploration area; or Significant but reversible damage extending beyond exploration area. Significant impacts to community cost of living, business viability or social wellbeing.	>\$5M - \$50M AUD	More than one stakeholder groups opinion or view influencing other stakeholders, reported through media channels with some reach and influence	Criminal charges against any employee (not described above) Major litigation – exposure to damages.
3 Major	Serious injury or illness to one or more persons resulting in hospitalisation and lost time	Significant damage confined to exploration area. Moderate impacts to community cost of living, business viability or social wellbeing.	>\$100K - \$5M AUD	More than one stakeholder group offering an opinion or view, reported through media channels with some reach and influence	Non-compliance with conditions of license to operate an asset or to conduct an activity. Litigation – exposure to damages.
2 Moderate	Injury or illness resulting in medical treatment and first aid injuries and lost time	Minor short-term damage confined to exploration area. Small scale impacts to community cost of living, business viability or social wellbeing.	>\$5K - \$100K AUD	A single stakeholder group drawing attention to an incident, issue or approach, conveyed through media channels with potential reach and influence.	Moderate non-compliance with external mandatory obligations or breach of contractual or other legal obligations.
1 Minor	Minor illness or injury requiring first aid	Minor environmental or community impact – readily dealt with.	Up to \$5K	A person or organisation within stakeholder group signalling an interest in an incident, event or approach, using channels with limited reach or influence.	Minor non-compliance with external mandatory obligations or breach of contractual or other legal obligations.

Table 32 Qualitative measures of likelihood/frequency

Likelihood of occurrence (in any given year)		
5	Highly likely	Has a >90% chance of occurring if the risk is not mitigated.
4	Likely	Has a 60-90% chance of occurring if the risk is not mitigated.
3	Possible	Has a 40-60% chance of occurring if the risk is not mitigated.
2	Unlikely	Has a 10-40% chance of occurring if the risk is not mitigated.
1	Rare	May occur in exceptional circumstances, i.e. less than 10% chance of occurring if risk is not mitigated.

Table 33 Qualitative risk analysis matrix level of risk based on likelihood/severity

		Likelihood				
		5. Almost Certain	4 Likely	3 Possible/ Occasionally	2 Unlikely	1 Rare. Remote
Consequence	5 Severe	Extreme	Extreme	High	High	Medium
	4 Massive	Extreme	High	High	Medium	Low
	3 Major	High	High	Medium	Medium	Low
	2 Moderate	High	Medium	Medium	Low	Low
	1 Minor	Medium	Low	Low	Low	Low
Risk level		Risk treatment criteria				
Low		Some mitigation may be required - no detailed assessment of factors and aspects required but addressed in EMP as routine controls				
Moderate		Substantial mitigation required - assessment required of factors and aspects				
High		Major mitigation (including offsets) may be required - assessment required of factors and aspects				
Extreme		Potentially unacceptable, modification of proposal required				

6.1.1 ALARP and Risk Assessment

Section 7.0 considers the outcome of the risk assessment process and the hierarchy of controls (eliminate, substitute, engineering, administrative, personal protective equipment) to determine if all reasonably practicable control measures have been identified and implemented and that the risk to environmental factors/aspects has been reduced to ALARP as result of the proposed activities.

6.1.2 Scientific Uncertainty

The risk assessment prepared for the exploration activities has considered the scientific uncertainty in relation to the information available to assess the risk. The scientific uncertainty has been qualitatively assessed in Section 7.0 using the following scoring system:

- **LOW (1)** – Existing controls and mitigation measures exist and demonstrated as effective in previous activities and other industries. Decision tool includes legislation, codes and standards that exist to regulate the activity and ensure good industry practice.
- **MODERATE (2)** – Existing controls and mitigation measures exist and demonstrated as effective in previous activities and other industries, although information used is dated or information gaps. Decision tool uses a risk-based assessment tool to assess (i.e. modelling, quantitative risk assessment and cost benefit analysis).
- **HIGH (3)** – Limited or no data available to support risk assessment, including no guidance material. The precautionary approach is taken to management the risk.

6.2 Cumulative Impacts

Cumulative impacts relate to potential cumulative effects of other projects as well as increased impacts to an environmental aspect as a result of different components of the regulated activities. The following section considers environmental factors such as water supply, greenhouse gas emissions, traffic and social and community that are applicable to Sweetpea's exploration activities.

6.2.1 Water Supply

Water will be required for the exploration program, including ongoing camp operations, access track installation and maintenance, lease pad construction and maintenance, water bore drilling and monitoring, DST and rehabilitation activities.

Water is proposed to be extracted (with a water extraction licence from Water Resource Division) from water bores installed as part of Sweetpea's exploration program (as detailed in Section 3.11.2). Potable water will be sourced locally from the water supply bores onsite, subject to meeting the *Australian Drinking Water Quality Guidelines*.

Although the Gum Ridge Formation is recognised regionally to have the best potential for water production due to the higher yields (Tickell, et al., 2019), Sweetpea have made an application for a groundwater extraction licence for both the Gum Ridge Formation and Anthony Lagoon Formation aquifers and will evaluate the results from its groundwater monitoring program to determine which aquifer and licence will be used for groundwater extraction. At this stage the application for the Anthony Lagoon Formation aquifer has been placed on hold.

The total cumulative water use of Sweetpea's exploration program, including the seismic and civil construction program estimates is provided in Table 34.

Table 34 Cumulative Water Use over 3 Year Program

Program	Estimated Usage
Seismic Exploration and Water Bore (SWP1-04)	1 ML
Civil Construction and Water Bore (SWP2-03)	318 ML
Well Drilling, Hydraulic Fracture Stimulation and Well Testing	578 ML
Cumulative Water Use	897 ML
Planned Annual Water Use	299 ML

A groundwater extraction licence has already been issued to Sweetpea to obtain a water supply from the Gum Ridge Formation at RN037655 (Water Extraction Licence GRF10346). A summary of the availability of groundwater in the Gum Ridge Formation aquifer was provided in the decision statement prepared by the NT Controller of Water Resources for Licence GRF10346. The decision was made after considering current information including:

- The water Allocation Framework (NTG, 2021)
- A technical report on the classification of water resources in the Top End and Arid Zone (Short and Bond, 2021)
- The Georgina Basin Groundwater Assessment (Tickell and Bruwer, 2019).

Key findings included:

- The Gum Ridge Formation Storage Capacity – 1,766,000 GL to 3,532,000 GL
- Arid zone principles state that the total extraction over 100 years will not exceed 80 percent of the total aquifer storage at the start of extraction.
- Using a conservative storage estimate, 1,412,800 GL of water can be used over 100 years, or an average of 14,128 GL/year.
- An estimated 8.98 GL/year is required to support stock uses in the basin.

- The existing take of groundwater from the Gum Ridge Formation aquifer is 10,131 ML/year
- Water remaining available to take from the Gum Ridge Formation aquifer is 14,118 GL/year
- EP136 covers about 4.2% of the resource area
- The 299 ML of water permitted to be extracted by Sweetpea under licence GRF10346 is 0.0212% of the consumptive pool of 10%
- The nearest private bores are RN005783 (about 1.2 km from RN37655) and RN0252916 (about 6.1 km away) that are pumped at less than 2 L/sec for stock watering.

For context, the available take is equivalent to about 5,640,000 Olympic swimming pools (2.5 ML per pool) of which Sweetpea's WEL equates to 120 Olympic swimming pools per annum.

As such the anticipated maximum annual water use over a four-year petroleum exploration activity period of 299 ML/year will be well within the sustainable yield of the Beetaloo GBA region available aquifers. It is not expected to impact on other current and future water users due to the remote location and that the future domestic demand is unlikely to change significantly.

As per Section 3.10.6, Sweetpea will be considering opportunities for the use of water re-use technologies where the environmental impacts and risks associated with the technology or methodology will be performed and proper control measures will be put in place to reduce any risks to a level that is ALARP and acceptable. Re-use will only occur following consultation and agreement with DEPWS and DITT.

6.2.2 Flora and Fauna

Sweetpea has designed the DST program to maximise where possible the use of existing roads and pastoral tracks to establish their lease pads, accommodation camp and gravel pits. In addition, the placement of the lease pads has endeavoured to avoid heavily wooded areas and trees (including *Corymbia* and *Eucalyptus* species), as well as other sensitive habitats including riparian habitats along Newcastle Creek.

Impacts from the potential introduction of weeds to the permit area will be managed through the project specific Weed Management Plan (Appendix H). It is understood that all other petroleum operators and pastoral leaseholders also require to have a weed management plan, which is evident by the low incident of weeds across the permit area. To access pastoral properties, all visitors must sign a Weed Declaration which certifies the equipment and machinery are weed free.

On completion of exploration activities within the permit area, Sweetpea intend to progressively rehabilitate disturbed areas back to original state and consistent with the vegetation communities identified in the baseline assessments (refer Section 4.0).

The use of open top tanks for evaporation of wastewater could attract fauna and if wastewater is consumed it could be a risk to fauna due to the salinity and chemistry of flowback water. The overall risk to impact on fauna species (i.e. birds and amphibians) is considered minimal due to the salinity levels itself acting as a deterrent from fauna consuming or interacting with wastewater. A number of controls are detailed in Section 7.9 and Appendix F, including monitoring of wastewater storage areas, include fauna ladders in storage tanks and where known interaction of wildlife with wastewater has occurred, will be documented and if necessary additional preventative measures employed.

Stygofauna are likely to be present in the karstic systems such as the Gum Ridge Formation aquifer, with the GISERA program identifying and characterising the stygofauna assemblages in the CLA units of the Beetaloo Sub-basin. The known factors affecting the distribution of stygofauna include:

- Stygofauna predominantly found in aquifers with large pore spaces.
- Abundance and diversity of stygofauna decreases with depth below ground, with fauna rarely found more than 100 m below ground level (Hose, GC et al 2015).
- 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.

Sweetpea's groundwater monitoring program and the known factors considers presence of significant assemblages of stygofauna in the exploration area for the DST activities is considered limited and impacts considered unlikely (Section 7.2).

6.2.3 Greenhouse Gas Emissions

GHG emissions from the well drilling, hydraulic fracture stimulation and well testing, and associated activities have been estimated using the threshold calculator developed for the National Greenhouse and Energy Reporting scheme (refer Table 17, Section 3.11.3).

Sweetpea are required to report under the Large Emitters Policy for scope 1 emissions if equal or exceed the 100,000 tCO₂-e in any financial year over the life cycle of a project, not counting emissions generated from land clearing directly associated with the project.

The GHG estimates for the regulated activities and associated activities under the EMP over the planned program is provided in Table 35.

Table 35 Cumulative Gas Emissions Estimates for Sweetpea's Exploration Activities – FY2022-23 to FY 2025-26

Program	Maximum GHG Emission Estimates (tCO ₂ -e)	GHG emissions compared to:	
		NT total GHG emissions*	Australia's total GHG emissions^
Seismic Exploration and Water Bore EMP (SWP1-04 and modification)	5,377	0.026%	0.001%
Civil Construction and Water Bore EMP (SWP2-03)	13,400 - 14,909	0.065%	0.003%
Well Drilling, Hydraulic Fracture Stimulation and Well Testing (SWP4-1)	450,505 - 728,399 (Range of 96,242 to 217,611 tCO ₂ -e per annum)	2.187%	0.145%
Total Exploration 4-year Program GHG Emission Estimate Range	469,282 – 748,685		

*Northern Territory *National Inventory Report* (inventory year 2019) of 20.6 million tonnes CO₂-e (Department of Industry, Science, Energy and Resources, 2019)

^Commonwealth *National Greenhouse Gas Inventory Quarterly Update: September 2021* of 501.5 million tonnes CO₂-e (Department of Industry, Science, Energy and Resources, 2022)

Total greenhouse gas (GHG) emissions generated over the entire 4-year program for all DST activities and associated activities is anticipated to range from 469,282 to 748,685 tCO₂-e (tonnes of Carbon Dioxide equivalent). The well testing activities equates to 93% to 95% of all GHG emissions produced over the four-year program. The annual range of GHG emissions for the DST program is 96,242 to 217,611 tCO₂-e per annum or 0.47% to 1.06% of the total annual greenhouse gas emissions reported for the NT by the Commonwealth *National Inventory Report* (inventory year 2019) of 20.6 million tonnes CO₂-e (Department of Industry, Science, Energy and Resources, 2019) or 0.019% to 0.043% of the total Australian annual greenhouse gas emissions reported in the most recent Inventory update of 501.5 million tonnes of CO₂-e.

On a regional, national and activity perspective, the emissions from the Gas Industry are not considered significant and is a critical part of the transition to lower carbon intensity energy and also as an input into many critical elements of the modern economy (e.g. fertilisers). The IEA Net Zero scenario anticipates substantial gas production will still be critical in 2050, and currently there is a risk that there is insufficient investment to ensure that sufficient gas will be available for domestic and global markets. Gas in the Asia-Pacific can help decarbonise electricity markets and reduce CO₂ emissions and atmospheric pollution providing better air quality to major population centres.

Understanding the potential of the Beetaloo Sub-basin is critical in determining Australia's energy and industrial future – in the absence of success in the Beetaloo or other new plays it is likely that eastern Australia will become a gas importer and a higher CO₂ footprint on a comparative basis.

Sweetpea have prepared a standalone GGAP which provides for planned carbon offset targets.

6.2.4 Traffic

A Traffic Impact Statement (TIS) was completed for the exploration activities. The TIS determined that the average daily traffic flows, according to traffic counts undertaken from the DIPL Annual Traffic Report 2018, including a peaking factor of 50% are approximately 118 to 177 vehicles per day for the Carpentaria Highway.

The peak additional traffic generated from mobilisation of the vehicles relating to the DST program will be up to 44 vehicles per day. The peak additional traffic generated from Santos and Imperial works will be approximately 67 and 56 vehicles per day respectively. Cumulatively, this causes the Carpentaria Highway to experience 356 vehicles per day when factoring existing daily flows. These anticipated values are well below the *AUSROADS Guide to Traffic Management Part 3 (AGTM03-20)*.

It is concluded that with the low traffic volumes and management practices that will be implemented during the exploration program, will have minor cumulative impact on existing traffic movements, with no reduction in level of service of the Carpentaria Highway.

6.2.5 Social and Community

The regulated well activity and associated activities proposed are remote and located on perpetual pastoral lease Tanumbirini Station. The cumulative impact of the activities on the local community and social aspects are considered minor based on the following:

- The regulated well activity and associated activities are located on private property and personnel will be accommodated in self-sufficient exploration camps for the duration of the activities.
- The regulated well activity and associated activities will occur over the next four years contributing to the economy of the region. The number of personnel required to deliver regulated well activity and associated activities will be relatively small operations for majority of operations ranging from (6-10 personnel and up to 100 personnel).
- There are no other major industries within the area of EP136, other than pastoral operations.
- The waste stream from the regulated well activity and associated activities, will be managed to reduce risk to stock, fauna and the local community as detailed in Appendix F. All waste produced during regulated well activity and associated activities will be removed from the permit area to a licensed landfill or reuse facility.
- EP136 is surrounded by other petroleum exploration permits including Origin and Santos where seismic and well drilling and well testing exploration activities have been undertaken in recent years. Drilling and testing activities are also proposed for the future. The distance and extent of exploration permit areas relative to the density and footprint of exploration activities will not result in any loss of visual amenity or tourism value.
- The traffic impact statement has considered road safety for visitors travelling along government roads, in particular where a heavy vehicle is turning off the highway onto an unsealed road (off Carpentaria Highway).
- The regulated well activity and associated activities requires specific skill sets and capabilities, therefore the risks associated with increased competition for labour from exploration activities, including other petroleum operators, is considered low and within the capacity of existing service providers.

Given the footprint of the overall exploration program, the small and temporary nature of the project and the level of activities in surrounding areas, remoteness of the permit area, the cumulative impacts of this nature are expected to be negligible.

Sweetpea has a stated preference to use local contractors and services to support the regulated activities where possible, including but not limited to land management services (weed surveys and treatment, fencing, civil construction, water bore drilling etc.), camp management and catering, engagement of NLC cultural managers throughout the surveys and supporting local service providers such as fuel retailers and accommodation providers during recreational breaks. This would result in a positive economic activity and gain for the region.

7.0 Potential Impacts and Management

The assessment of potential impacts and management of risks aims to avoid and or minimise environmental impacts, measured in terms of the consequence and likelihood of those consequences occurring, during the drilling, HFS and testing program. The Australian Petroleum Production and Exploration Association Limited (APPEA) Code of Environmental Practice (APPEA, 2008) and a range of State/Territory Government Exploration Guidelines have been used to develop the management strategies for each of the identified impacts associated with the project.

Environmental risks associated with the regulated well activity and associated activities have been identified through a thorough impact and risk assessment process applied to the suite of exploration activities proposed (refer Section 3.0). The environmental risk assessment was conducted by Sweetpea personnel, experienced engineers and scientists and with industry input and leadership from specialist, NT-based environmental and engineering consultants input. The purpose of the analysis was to identify potential impacts, assess the associated risk of these impacts and develop measures for preventing or mitigating impacts that reduce the risks.

A risk register is provided in Appendix A which presents the outcome of the risk assessment process. The inherent risk assessment results are based on the proposed exploration activities and the timescale that they will occur. The residual risk assessment results are based on the implementation of the management tasks detailed in Section 7.0 that aim to minimise the impact of the exploration activities to as low as reasonably practicable (ALARP) and considered acceptable.

7.1 Risk Assessment Summary

An assessment of potential and routine environmental effects and the risks arising from the proposed well drilling, HFS and well testing activities was conducted and a copy of the environmental risk assessment is presented in Appendix A.

A summary of the number of risks and risk levels is tabulated in Table 36.

Table 36 Risk assessment summary

Activity	Number of risks				Total
	Low	Moderate	High	Extreme	
Number of risks for the regulated activity and associated activities prior to mitigation measures	23	19	0	0	42
Number of risks for regulated activity and associated activities program including mitigation measures.	42	0	0	0	

Sweetpea has committed to ensuring that the regulated activity and associated activities are conducted in a manner that minimises impacts to the environment. Sweetpea's performance against its environmental goals and objectives is measured by setting environmental outcomes and environmental performance standards.

Under the Petroleum (Environment) Regulations, the EMP must include environmental outcomes (EOs) that address the identified environmental risks. The EOs must address legislative and other controls that manage the environmental aspects of the activity.

The environmental outcomes, environmental performance standards and measurement criteria for the planned regulated activities are outlined in the issue specific EMPs. The issue specific EMPs have been developed based on the results of the risk assessment as follows:

- groundwater (Section 7.2)
- land and surface water management (includes waterways, soil, erosion and sediment control measures) (Section 7.3)

- weeds (Section 7.4)
- bushfire (Section 7.5)
- waste and wastewater (Section 7.6 and Appendix F)
- spill prevention and response (Appendix G)
- noise, vibration and lighting emissions (Section 7.7)
- air quality and emissions (Section 7.8, Appendix E)
- biodiversity management (Section 7.9)
- social environment and access (Section 7.10)
- cultural heritage and Sacred Sites (Section 7.11).

Overall roles and responsibilities for implementation of the controls and measures detailed in the DST EMP and associated Appendices are outlined in Section 8.1.

7.2 Groundwater Management Sub-plan

Values, Risks and Outcomes	
Environmental Values	- Hydrological regimes of groundwater maintained, including connectivity, movement and quantity of groundwater and surface water sources. - The quality of groundwater and surface water suitable for the ecological health, land use and the welfare and amenity of people. - Aquatic habitats including biodiversity, ecological integrity and ecological functions.
Environmental Risks (Appendix A)	- Cross flow of groundwater from a utilised aquifer to another formation causes declining groundwater levels in shallow aquifers (Risk Reference 1). - Deterioration of water quality in utilised aquifers through introduction of microbiological organisms (bacteria) that can impact on water quality (i.e. iron bacteria cause clogging of screens and water delivery equipment) as result of failure of well casings or inappropriate waste management results in effluent releases to groundwater (Risk Reference 2). - Failure of liquid storage on the surface causes impacts to groundwater quality in shallow / utilised aquifers (Risk Reference 3). - Hydraulic fracturing induces local seismicity in cross flow of groundwater levels and quality (Risk Reference 4). - Groundwater extraction levels are unsustainable impacting on GDE's, Pastoral Activities and Sacred Sites (Waterholes) (Risk Reference 5, 6 and 7). - Contamination or pollution of groundwater through waste or wastewater impact (e.g. ablution facility operations, refuelling etc.) (Risk Reference 6).
Environmental Outcomes	- Protect the quality and quantity of groundwater so that environmental values including ecological health, land uses, and the welfare and amenity of people and animals (i.e. stock and wildlife) are maintained. - Protect Groundwater Dependent Ecosystems (i.e. Stygofauna). - Detects changes in groundwater as a result of drilling and stimulation activities.
Activities	Management Tasks
Project Management and Design	- Develop and implement a Well Operations Management Plan (WOMP) outlining how the requirements of the code shall be addressed, including: - The protection of aquifers. - All wells to be designed, installed, tested and maintained in a way that is consistent with the well design, best practice, WOMP, well integrity management system (WIMS) and barrier requirements for the well as specified by the Code. - Any exploration well shall be constructed, maintained and decommissioned in such a manner that it can be demonstrated there are at least two verified well barriers between a hydrocarbon bearing zone or any saline formation and potable aquifers or the surface. Specifically: - Casing setting depth is selected to protect resources including aquifer systems. - All aquifer systems, as identified in the area must be isolated from each other and any permeable hydrocarbon bearing zones by appropriate well barriers, as per the Code.

	- Cemented conductors and casing used to ensure isolation of aquifers from non-potable water-bearing or hydrocarbon bearing formations. - Cement, casing, casing connections, wellheads, and valves used in petroleum wells will be designed to withstand the loads, pressures and temperatures that may act on them throughout the entire well life cycle. This includes casing running and cementing, any treatment pressures (e.g., hydraulic stimulation), production pressures, potential well control situations, any potential corrosive conditions (H₂S, CO₂, etc.), and other factors pertinent to local experience and operational conditions. - A well integrity management system will be developed governing the integrity of the well over its life, and primary cementing design and verification is carried out in accordance with the well integrity management plan. • A buffer of >1 km will be maintained between exploration well locations and stock water bores. • Only water-based drilling fluids to be utilised whilst drilling through potable aquifers, with no BTEX additives or chemicals with residual toxicity permitted. Refer to Chemical Risk Assessment (Appendix C). • SDS and manufacturer's recommendations to be made available to the DEPWS and on the drill sites for all drilling fluid products. • The makeup water shall be fresh non-polluted water for all drilling fluid preparations. • Baseline groundwater monitoring will occur before, during and after activity at both control and impact monitoring bores as per the <i>Preliminary guidelines: Groundwater Monitoring bores for Exploration Petroleum Wells in the Beetaloo Sub-basin</i>. • The storage and disposal of drilling fluids, muds and cuttings shall be undertaken in accordance with the Wastewater CoP. • Drilling activities will be covered by a spill management plan outlining how chemicals will be stored, handled and how spillages will be detected and remediated. • All groundwater extraction and monitoring bores will be drilled in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i>.
DST Operations – Subsurface activities	• Wastewater Management Plan (Appendix F) implemented in accordance with B.4.2 and B.4.17 of the Code. • Separation distance between the surface and the closest regional aquifer (Anthony Lagoon) anticipated to be between 100 to 300 meters. • SPRP implemented to prevent, detect and remediate any spills (Appendix G). • Wastewater Management Plan developed to manage wastewater • Enclosed tanks and open tanks with sufficient freeboard (1:1000 year 72-hour storm event) to be used to manage rainfall ingress into wastewater storages. • All drill and completions wastewater stored over the wet season to be able to be pumped into enclosed storages within 72hours where significant rainfall predicted. • Tanks manifolds to be designed to ensure each tank is isolated to prevent multiple tanks draining. • Flowback storage within double lined tanks with sufficient freeboard, water level monitoring and leak detection to prevent leaks/spills or overtopping. • Wastewater tanks are designed to prevent the risk of failure from overtopping, wall failure, explosion and liner damage. • Engineered water storage tanks installed with QA/QC plan including inspections, leak testing and hydraulic loading prior to commissioning. • Sites will be manned during flowback activities.

	Wastewater storage areas will be inspected daily during operation and after a significant rainfall event (greater than 20 mm in 24-hour period).	
HFS activities	- Seismic survey will identify any major structural features, noting major faults/structural features are generally restricted to the margins of the Basin away from proposed drilling and stimulation areas. 2D seismic survey data and information are used to place wells and screen for faults or other major structural features. - Drilling logs used to identify major faults if encountered. - Modelling undertaken to design fracture stimulation program and ensuring fracture growth is controlled. - During hydraulic fracturing operations, implement traffic light system for measured seismic intensity. - Pressure monitoring during stimulation can identify if fluid is entering an open fault system. - Seismicity during HFS operations will be monitored through Geoscience Australia's Beetaloo Sub-basin Seismic Monitoring Project (GABMP). - Adapt drilling programs as required. - Implement Induced Seismicity Monitoring as part of the WOMP.	
Groundwater Extraction for DST and domestic use	- Permits will be obtained for all bore works and water extraction as per the <i>NT Water Act</i>. - Extraction limited to the volumes required to support drilling and stimulation activities covered under the EMP and the extraction licence (GRF10346). - Volume used for stimulation activities are small and within sustainable recharge levels (individually and cumulatively including all other users). - Extraction of water from water bores to supply water for hydraulic fracturing will not occur within 1km of existing groundwater bores - Agreements (including compensation) to be reached with land holders for the use of pastoral leaseholder bores. - Sustainable use of groundwater measures will be implemented including recording of all groundwater use for all activities using flow meters on each groundwater well. - Compare actual versus estimated usage and make operational / permitting adjustments as required. - Water extraction to be metered.	
Implementation		
Environmental performance standards	Measurement criteria	Records
SWP7.2-1 Regional aquifers isolated	Isolation of the Gum Ridge Formation and Anthony Lagoons Formation to be confirmed through cement bond logs and casing pressure tests.	Well Completion Report
SWP7.2-2 No long-term (>12 month) reduction in quality of an impact groundwater monitoring bore that is attributable to Sweetpea activities.	Quarterly groundwater monitoring data obtained from the control and impact bores at each lease pad and analysed against baseline data demonstrates no material decline in groundwater quality.	- Quarterly groundwater monitoring results maintained for the control and impact bores at each well lease pad. - Qualified professional details maintained.

	• Use of suitably qualified professionals.		
SWP7.2-3 No long term (>12 month) reduction in groundwater level observed in the impact monitoring bore that results in >1 m decline in groundwater water level.	• Quarterly groundwater monitoring data collected and analysed against baseline data from the control and impact bore at each lease pad confirms no material (>1m) decline in groundwater level. • Do not exceed approved annual water extraction level of 299 ML/year (GRF10346 - Expiry - 31/12/2024) without applying for new extraction licence.	• Quarterly groundwater monitoring results maintained for the control and impact bores at each lease pad. • Groundwater metering records maintained for the control and impact bores at each lease pad. • Qualified professional details maintained.	
SWP7.2-4 Secondary liner of wastewater tanks remains intact	• Leak detection alarms investigated within 24 hrs • No incidents of secondary liner failure.	• Leak detection alarm records maintained, including investigation outcomes • Document incidents of tank failure and reported to Regulator.	
Monitoring	• Monitoring of barriers and casing condition will be carried out as per the well integrity management plan. • All wells be fully tested for integrity before and after hydraulic fracturing, with results being independently certified. Any issues must be remediated immediately. • Groundwater monitoring undertaken during and after activities at control and impact monitoring wells. • The groundwater monitoring program for exploration petroleum wells will be conducted in accordance with the <i>Preliminary Guideline: Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-basin</i> (DENR, November 2018) at each well or group of wells as required. • Where these guidelines are revised by NTG as relates to groundwater monitoring parameters, methodologies and frequencies, Sweetpea will review and update their monitoring program. • Groundwater monitoring program methods will be consistent with the following guidelines: - AS/NZ5667.11: 1998. <i>Water Quality Sampling Part 11: Guidance on Sampling of Groundwaters</i> - AS/NZ5667.1: 1998. <i>Water Quality Sampling Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.</i>		
Overall Residual Risk	Consequence – Low (2)	Likelihood – Unlikely (2)	Residual Risk – Low
Scientific Uncertainty	Sweetpea has obtained a water extraction licence (GRF10346) to conduct activities under this EMP. The decision statement prepared by the NT Controller of Water Resources indicated that the maximum annual water use over a four-year petroleum exploration activity period of 299 ML/year is well within the sustainable yield of the Beetaloo GBA region available aquifers.		Low (1)

	In addition, existing baseline groundwater data (Section 4.1.5), and the Sweetpea's exploration program meets the requirements of <i>Preliminary Guideline: Groundwater Monitoring Bores for Exploration Petroleum Wells in the Beetaloo Sub-basin</i> (DENR, November 2018) provides sufficient understanding of the underlying aquifers of the activity area. Aquifers are expected at approximately 100 m below ground level with thick clay layers, therefore the inherent risk profile of groundwater contamination is low. Effective implementation of the SPRP will further reduce risk to the environment. All planned controls (i.e. secondary containment, bunding and handling chemicals) meet the requirements of the Code and standards across Australia and the world to limit exposure to employees and surrounding environment.		
ALARP Statement	The highest risk to groundwater is perceived to be the hydraulic fracture stimulation activities. The residual risk was assessed as a 'low', with a 'minor' consequence (minor environmental or community impact) and 'unlikely' likelihood when environmental controls detailed in the management tasks are implemented and compliant with the mandatory requirements of the Code. The management tasks have considered the 'hierarchy of control' to demonstrate all reasonably practicable control measures have been identified and implemented to reduce the risk to an acceptable level. Appendix A presents the ALARP evaluation for the activities to be conducted during the DST activities.		
	Eliminate	- Well barriers between a hydrocarbon bearing zone or any saline formation and potable aquifers or the surface. >1 km buffer between exploration well locations and stock water bores.	
	Substitute	Only water-based drilling fluids to be utilised whilst drilling through potable aquifers, with no BTEX additives or chemicals with residual toxicity permitted.	
	Engineering	- Protection of aquifers through design. - Designed to withstand the loads, pressures and temperatures that may act on them throughout the entire well life cycle.	
	Administrative	- Well Operations Management Plan (WOMP). - Spill Prevention and Response Plan (SPRP) (Appendix G) and Wastewater Management Plan (WWMP) (Appendix F). - Monitoring and Auditing (refer Section 8.7 and Section 8.8). - Monitoring data records.	
Acceptable	Based on the controls detailed in this table and the monitoring and auditing program (Section 8.7 and Section 8.8) to be implemented, the residual risk cannot be reduced any further and are considered acceptable. The risk mitigation measures outlined in the EMP and supporting management plans including the WOMP, Wastewater Management Plan (Appendix F), the Spill Prevention and Response Plan (Appendix G) meet the industry best practice requirements of the environmental performance standards (IECA, 2008) and Sweetpea's environmental policies that make up this EMP. Controls above best practice are unlikely to reduce the risk to groundwater further.		

7.3 Land and Surface Water Management Plan

Values, Risks and Outcomes	
Environmental Values	- Suitability and stability of land and surface water for existing uses (erosion and sediment controls implemented). - Stability of land to preserve existing surface water quality, landscapes and ecosystems.
Environmental Risks (Appendix A)	- Surface water and stormwater flow and quality are altered due to operational activities (Risk Reference 8). - Soil erosion and sedimentation resulting from ground disturbance activities (Risk Reference 9). - Wet weather activities can impact on DST activities including access constraints, ground condition deterioration and increase risk of spills (Risk Reference 10). - Transport of hazardous liquids and chemicals (including HFS chemicals and wastewater) pose risk of spills off lease and on public areas (Risk Reference 11). - Soil and surface water contamination from hazardous substance spills (i.e. handling of fuels and drilling and flowback fluids etc.) (Risk Reference 10 and 11). - Spills/leaks of: - fuels and hydrocarbon - drilling additives - HFS activities - storage and transportation of wastes (Risk Reference 10).
Environmental Outcomes	- No significant long-term impacts to the ecological function and productivity of soils at the exploration lease pads, gravel pits and accommodation as result of Sweetpea's exploration activities. - Meet AAPA conditions as relates to Newcastle Creek Crossing at RWA2.
Activities	Management Tasks
Project Management	Planning, Consultation and Logistics - Use existing road and tracks where practicable and designed to suit intended purpose and volume of traffic. - Civil maintenance timing to be during the dry season wherever possible and wet weather contingencies to be implemented if activities continue into the wet season (October to April inclusive) (refer Section 8.7). - Site environmental inductions for all site personnel and contractors in relation to land and surface water management tasks. - AC2020/072 allows for 'transit only' across RWA2 at Newcastle Creek on the existing pastoral lease track, which provides one of the two possible mobilisation routes to and from the exploration lease pads. Sweetpea's contingency plan to the 'transit only' limitation for RWA2 in AC2020/072 is considered under the C&WB EMP, which includes provision for two access options, the Western Access Track (WAT) and the Eastern Access Track (EAT). Further consultation with AAPA and the Traditional Custodians is underway for a SSCC. - Wet weather use of the EAT will only be necessary if the WAT option is not available due to delays with land access negotiations. If neither a new SSCC nor access to the WAT is available by Q4 2022 then Sweetpea may have to stack equipment south of Newcastle Creek or move all equipment north of Newcastle Creek prior to the 2022-23 wet season and alter the drilling priority.

Camp Expansion and Lease Pad and Access Track Maintenance	Vegetation Clearing - Undertake selective clearing (only necessary clearing areas), using lighter machinery such as graders or smaller bulldozers, taking care, not to overwork tracks or pads. Overworking the site can lead to the loss of topsoil, compaction, the formation of windrows and wheel rutting. Refer to <i>Section 4.1.1 ESC Treatment Options for specific situations</i> in Appendix B. - Ground surface to be stabilised before the nominated wet season (October to April), and only where an alternative route is unavoidable. - Take all reasonable and practicable measures to minimise the removal of, or disturbance to, trees, shrubs and ground covers (organic or inorganic) that are to be retained. - All land clearing must be in accordance with the Federal, Territory and local government vegetation clearing requirements and <i>IECA Table 4.4.7 Best practice land clearing and rehabilitation requirements</i>. - All reasonable and practicable steps to be taken to apply best practice erosion control measures following earthworks and site stabilised prior to anticipated rainfall. Disturbed areas will be stabilised in accordance with the rehabilitation plan. Reference should be made to Appendix J Rehabilitation Plan for the camp, lease pads, access tracks and gravel pits. - ESC treatments are defined for sections less than 2% and greater than 2% in Appendix B. The relevant treatment will be implemented on a case-by-case basis on site. In particular, the final positioning of Gravel Pits 11 and 12 will take into account the local slope and avoid the high to very high-risk areas (slopes >2%). - Minimise impact to vegetation and soils within the 200 m native vegetation buffers along pastoral property boundaries and 50 m buffer for land adjoining NTG road reserves.
	Access Track Maintenance and Highway Intersection - Vehicles that enter and exit the exploration permit will be constrained in such a manner to prevent dropping or tracking material on the Highway in accordance with the Road Agency Approval. Refer treatment in Appendix B2. - Access tracks are designed and maintained to allow for off-road drainage. - Minimise vegetation clearance, where possible and retain vegetation buffers surrounding streams and creeks, as outlined in the NTG <i>Land Clearing Guidelines 2021</i> and in accordance with AAPA certificate conditions. - All vehicle movements to be within designated access roads and tracks. - Allow disturbed areas to be stabilised and natural regeneration of the native grasses to occur. - Monitor Carpentaria Highway during operation. Where tracked material on the road pavement becomes a potential safety issue, Sweetpea and principal contractors will sweep and clean material off the road. If Carpentaria Highway Turn-in results in dust, dirt creating a hazard to road users, additional ESC will be considered including installation of shaker grid or rock pad.
	Stockpile – soil/topsoil/vegetation - Stockpile existing topsoil, where available, so that it can be reused on the site for ESC and future rehabilitation at project completion. - Stockpiles of erodible material that has the potential to cause environmental harm if displaced, must be: i. Appropriately protected from wind, rain, concentrated surface flow and excessive up-slope stormwater surface flows. ii. Located at least 2 m away from any retained vegetation. iii. Located up-slope of an appropriate sediment control system. iv. Provided with an appropriate protective, impervious cover (synthetic or vegetative) if the materials are likely to be stockpiled for more than 28 days.

	v. Provided with an appropriate protective, impervious cover (synthetic or vegetative) if the materials are likely to be stockpiled for more than 10 days during those months that have an erosion risk rating higher than medium. - A suitable flow diversion system must be established immediately up-slope of a stockpile of erodible material that has the potential to cause environmental harm if displaced if the up-slope catchment area draining to the stockpile exceeds 1,500 m2. - Avoid creating windrows. Do not create windrows across creeks, use rollers when putting in tracks in preference to dozers, or walk the dozer with the blade raised off the ground.																								
	Erosion and Sediment Control - Avoid, minimise and control soil erosion and discharge of sediment or soil into waterways or established drainage systems. - Erosion and Sediment Controls to be implemented in accordance with the ESCP (Appendix B). - Rehabilitation work should begin as soon as possible after the completion of works, including removal of any windrows. - All reasonable and practicable steps to be taken to apply best practice erosion control measures following earthworks and site stabilised prior to anticipated rainfall. Disturbed areas will be stabilised in accordance with the rehabilitation plan (Appendix J).																								
Creek and Drainage Line Crossings Management and Maintenance	- Creeks and drainage lines (also referred to as intermittent streams) crossings will be maintained in accordance with the ESCP and specifically EAT crossing of RWA2. Further consultation is currently underway. - All creek crossings will be located at stable and level crossing points. - The civil maintenance crew will need to engage with the TOs and the NLC wherever the access track cross Newcastle Creek, because of its known cultural sensitivities (RWA2 requirements). - All large shrubs and trees will be avoided along creeks and drainage lines. - Other than crossing at RWA2, ramps may be utilised to improve the crossing, where ramps are used they will be aligned perpendicular to creek bed or drainage line, as much as possible using local materials. - Any rock protection must be restricted to what is necessary to provide safe passage and be placed at bed level. - The retention of vegetation buffers (as outlined in <i>Table 19 of the NTG Land Clearing Guidelines 2021</i>) as they relate to stream order will need to be considered for the improvements to the existing crossing points. - Disturbance in the riparian buffers in accordance with the stream order of the encountered drainage lines will be in accordance with the buffers provided below: <table><tr><th>Riparian class</th><th>Stream order</th><th>Minimum buffer width</th><th>Measured from</th></tr><tr><td>Drainage depression</td><td>Not applicable</td><td>25</td><td>The outer edge of the drainage depression, which is the extent of the associated poorly drained soils and associated vegetation</td></tr><tr><td>Intermittent streams</td><td>First</td><td>25</td><td>The outer edge of the riparian vegetation or levee (whichever is greater). If braided channels are present, the edge of the outer most stream channel</td></tr><tr><td>Intermittent streams</td><td>Second</td><td>50</td><td>As above</td></tr><tr><td>Creeks</td><td>Third and fourth</td><td>100</td><td>As above</td></tr><tr><td>Rivers</td><td>Fifth or higher</td><td>250</td><td>As above</td></tr></table>	Riparian class	Stream order	Minimum buffer width	Measured from	Drainage depression	Not applicable	25	The outer edge of the drainage depression, which is the extent of the associated poorly drained soils and associated vegetation	Intermittent streams	First	25	The outer edge of the riparian vegetation or levee (whichever is greater). If braided channels are present, the edge of the outer most stream channel	Intermittent streams	Second	50	As above	Creeks	Third and fourth	100	As above	Rivers	Fifth or higher	250	As above
Riparian class	Stream order	Minimum buffer width	Measured from																						
Drainage depression	Not applicable	25	The outer edge of the drainage depression, which is the extent of the associated poorly drained soils and associated vegetation																						
Intermittent streams	First	25	The outer edge of the riparian vegetation or levee (whichever is greater). If braided channels are present, the edge of the outer most stream channel																						
Intermittent streams	Second	50	As above																						
Creeks	Third and fourth	100	As above																						
Rivers	Fifth or higher	250	As above																						

	- Wet weather contingency procedures will be implemented from 1 October to 31 March. - The activities are to be completed in a manner that does not cause material change to the shape of a waterway, the volume, speed or direction of flow or likely flow of water in or into a waterway, or alteration to the stability of the bed or banks of a waterway, including by removal of vegetation. - Ongoing monitoring of creek and drainage crossing condition prior to, during and at completion of rehabilitation will be required. - The original topography of the creek or drainage bed will be reinstated following practical completion of the exploration program.
Site Management	- All plant and equipment brought to the site are to be certified as “free” of weeds, soil pathogens and pests (Section 7.4). - All disturbed areas identified as very low, low, medium or high erosion risk must be suitably stabilised before anticipated rainfall, from the day that soil disturbances on the area have been finalised- IECA Table 4.4.7 (Appendix B). - Tracks to be regularly inspected for early signs of compaction, erosion and soil degradation (generation of bulldust). Ongoing maintenance and repair work should be implemented as required on tracks. - Monitor road conditions to ensure deterioration does not occur. Assist in the maintenance and repair work on roads and tracks used. - No off-lease or off-road driving. - Land-disturbing activities must: - allow stormwater to pass through the site in a controlled manner and at non-erosive flow velocities. Preferably, stormwater runoff must be diverted around the site. - minimise soil erosion resulting from rain, water flow and/or wind. - minimise adverse effects of sediment runoff, including safety issues. - prevent, or at least minimise, environmental harm resulting from work-related soil erosion and sediment runoff. - ensure that the value and use of land/properties adjacent to the site (including access roads) are not diminished as a result of the adopted ESC measures. - Additional and/or alternative ESC measures must be implemented if unacceptable off-site sedimentation is occurring as a result of the work activities. - Sediment deposited off the site as a direct result of on-site activity must be collected and the area appropriately rehabilitated as soon as reasonable and practicable, and in a manner that considers the safety and environmental risks associated with the sediment deposition.
Surface water and stormwater	- AAPA Conditions for RWA2 to ‘transit only’ to be adhered to if use EAT option. - Surface water is not used to support drilling and stimulation activities. The NT <i>Water Act</i> prohibits the take of surface water for petroleum activities. - Infrastructure on the lease pads are constructed to design. - Comply with relevant guidelines such as the International Erosion Control Association <i>Best Practice for Erosion and Sediment Control</i> 2008 and the Australian Pipeline Industry Association Code of Environmental Practice 2009 as detailed in Appendix B. - Inspections following major rainfall events and if required undertaken review and maintenance of controls. - Release of stormwater to occur in accordance with the WWMP in Appendix F.

Wet Weather Contingency	7-day forecast from the Bureau of Meteorology (BOM) to be monitored and the activities planned around the forecasts. - Where forecasts indicate rainfall is likely to result in an event that has potential to limit access to the work area, inspections of the site ESC devices and storage infrastructure will be conducted and specific controls implemented as per the ESCP (Appendix B), (WWMP (Appendix F) and SPRP (Appendix G). - Emergency response – a post-rainfall/flood damage reconnaissance and assessment will be completed once area is accessible. Any damage observed would be repaired as soon as practicable after the event. - A trigger action response plan is presented in Section 5.4 of Appendix B.	
Site Rehabilitation	- At the completion of activities and before the commencement of decommissioning activities, Sweetpea will discuss any possible residual beneficial use of the assets with the landowner. Assets may include the well pads, tank pads, access tracks, accommodation camps, gravel pits and water infrastructure. If the pastoral leaseholder does request for infrastructure to remain in place, the proposed infrastructure will have ownership transferred following approval by DEPWS and the Pastoral Land Board. - Where assets cannot be beneficially used, the site will be rehabilitated using assisted natural regeneration back to a safe, stable landform consistent with surrounding land use. Once Sweetpea identifies the completion of activities within an area of the permit, rehabilitation will commence within that 12-month period. - Rehabilitation of disturbed areas will occur as soon as practicable following completion of works in accordance Appendix J to reduce exposed soils and minimise runoff from first flush events. - Monitoring following rehabilitation (refer Section 8.7).	
Implementation		
Environmental performance standards	Measurement criteria	Records
SWP7.3-1 The planned disturbance footprint are within the parameters established for the exploration lease pads, gravel pits and associated access tracks (refer to Table 3).	Spatial data before and after to be used to confirm the regulated activity stayed within the vegetation clearing parameters.	Records maintained during and post construction through a quality review of actual disturbance.
SWP7.3-2 Erosion and sediment controls in place and working as designed.	- Records show the erosion and sediment control plan implemented prior to the commencement of the activity. - Records show all active work sites inspected for evidence of erosion and sedimentation, including after significant rain events, and that where erosion/sedimentation is identified, remedial actions are taken. - The incident management system shows no incidents relating to the failure of ESCP controls (within the design parameters).	- ESC inspection records maintained. - Any instances of erosion to be documented with georeferenced photographs (Section 8.7).

	No evidence of active erosion within 12 months of civil construction completion at the exploration lease pads, camp and access tracks.	
SWP7.3-3 No releases of contaminants chemicals, hydrocarbon, drilling wastewater or flowback wastewater) outside Sweetpea's exploration areas	- Records show all spills remediated immediately on discovery, and where necessary contamination assessment undertaken. - The incident management system indicates no releases of contaminant incidents related to wet weather operations. - Records show emergency response plan implemented in the event of a spill or leak.	- Records of weekly inspections of petroleum and waste storage and transfer areas (refer Section 7.6 and in accordance with Appendix F and Appendix G). - Any spills to be cleaned up and reported as an incident (refer Section Appendix G). - All environmental incidents are to be recorded in a field log that must remain accessible to all relevant regulatory authorities as detailed in Section 8.5.
SWP7.3-4 No reportable spill as result of wastewater tank/sump overtopping or tank failure	- No records of reportable spills. - No reportable incidents resulting from chemical or waste transportation accidents.	All environmental incidents recorded and reported in accordance with Section 8.6.
SWP7.3-5 No permanent damage to Newcastle Creek Crossing	- Records show use of Newcastle Creek crossing or other creek/drainage crossing does not significantly cause material change to the shape of a waterway, the volume, speed or direction of flow or likely flow of water in or into a waterway, or alteration to the stability of the bed or banks of a waterway. - No legal action against Sweetpea for maintaining Newcastle Creek, outside the bounds of RWA2 conditions.	- Photographic records of weekly inspections at Newcastle Creek Crossing. - Cultural monitoring inspections recorded.
SWP7.3-6 Following conduct of the regulated activity, land not required for operational activities will progressively be returned to pre-disturbance conditions	Topography to be reinstated to the nearest standard based off pre-recorded photographs (refer Appendix J).	Monitoring of rehabilitated sites will be undertaken annually until final rehabilitation success criteria has been achieved (Appendix J).
Monitoring	- Monitoring for soil erosion and related issues is undertaken at the following key stages: - Assessment of existing erosion during siting of access track, exploration lease pads and field camp. - Following completion of key phase of activity – e.g. inspected for early signs of compaction, erosion and soil degradation (generation of bulldust) following completion of the civil construction program. - If the 7-day forecast indicates greater than 50% chance of rain. - After more than 20 mm of rainfall has fallen in a 24-hr period. - Vegetation recovery monitoring (refer below).	

	- Additional, routine inspections are to be conducted monthly to assess that: - Erosion and sediment controls employed on site are in place and in working order. - There are no wind erosion scalds, especially along the access tracks, exploration lease pads and camp areas. - No water erosion gullies forming along access tracks and exploration lease pads or around the field camp. - Weekly site inspections completed during chemical and wastewater storages and other inspections required in accordance with Appendix F and Appendix G.		
Maintenance	- Erosion and sediment control measures, including drainage control measures, must always be fully operational and maintained in proper working order during the DST program (refer Appendix B). - Erosion and sediment control measures must be inspected within 18 hours of a rainfall event of sufficient intensity and duration to cause runoff on-site or greater than 20 mm in 24 hours. - During the wet season, weekly inspections of drainage and erosion control structures must be carried out in areas where track access is maintained. Any sediment removed from sediment traps around lease pads, the camp and other places of sediment deposition must be disposed of in a lawful manner that does not cause ongoing soil erosion or environmental harm. The access tracks, lease pads and field camp will be stabilised for operations to the satisfaction of Sweetpea's company representative and HSE manager.		
Overall Residual Risk	Consequence – Moderate (2)	Likelihood – Unlikely (2)	Residual Risk – Low
Scientific Uncertainty	Baseline data is current to assess land condition. The measures to be implemented to manage risk to the land (erosion, sediment, soil and waterways) are well understood and established within industry to ensure risk effectively controlled.		Low (1)
ALARP Statement	The highest risk to land is predominantly from soil erosion and open tank overflow during the wet season activities. The residual risk was assessed as a 'low', with a 'minor' consequence (minor environmental or community impact) and 'unlikely' likelihood when environmental controls detailed in the management tasks are implemented. The management tasks have considered the 'hierarchy of control' to demonstrate all reasonably practicable control measures have been identified and implemented to reduce the risk to an acceptable level. Appendix A presents the ALARP evaluation for the DST activities.		
	Eliminate	- Existing pastoral tracks and repurposed seismic lines used in accordance with C&WB EMP. - No works within intersection of Newcastle Creek and Eastern Access Track at RWA2. Transit only. - Lease pad locations away from low drainage areas where vertosols of moderate erosion potential occur. - Avoid transport of HFS chemicals and wastewater during wet season where possible.	
	Substitute	- Where forecasts indicate rainfall is likely to result in an event that has potential to limit access to the work area, inspections of the site ESC devices and storage infrastructure will be conducted and specific controls implemented as per the ESCP (Appendix B), (WWMP (Appendix F) and SPRP (Appendix G). - AAPA Conditions for RWA2 to 'transit only' to be adhered to if use EAT option.	
	Engineering	- ESCP typical treatments for lease pad and access tracks (refer Appendix B). - Stabilisation of ground surface to commence within 5 days of the activities being completed on any part of the site, and disturbed areas are to be restored and/or rehabilitated.	

		Improve all other existing creek crossing to minimise impacts, noting RWA2 conditions for transit only.
	Administrative	- Site environmental inductions. - Refer to local road restriction as provided by DIPL. - Chemical or HFS transport to be in accordance with WWMP (Appendix F) and SPRP (Appendix G) - For Chemical or HFS transport in wetseason: - 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 to be reviewed by Operation Team and notice to DEPWS/DIPL of movement. - Controls including fatigue management, route selection. load constraint, speed restrictions, pilot requirements etc. will be considered. - Monitoring and Auditing (refer Section 8.7 and Section 8.8). - Spatial data before and after to confirm stayed within survey parameters.
	Personal Protective Equipment	Not applicable.
Acceptable	Based on the controls to be implemented, the residual risk cannot be reduced any further. The risk mitigation measures outlined in the EMP and ESCP (Appendix B) meet the industry best practice requirements of the environmental performance standards (IECA, 2008) and Sweetpea's environmental policies that make up this EMP. Controls above best practice are unlikely to reduce the risk to land (soil, erosion and waterways) further.	

7.4 Weed Management Sub-plan

Values, Risks and Outcomes	
Environmental Values	Maintain the integrity of significant ecosystems and agricultural productivity.
Environmental Risks (Appendix A)	- Introduction and Spread of Weeds can have a range of deleterious impacts including: - altering fire regimes (Risk Reference 30) - displacing native flora (Risk Reference 29 and 31) - poisoning of stock (Risk Reference 31).
Environmental Outcomes	No introduction of new or spread of existing Weeds of National Environmental Significance (WoNS) or weeds listed under NT legislation or locally significant weed species.
Activities	Management Tasks
Project Management	- Source machinery locally if available. - Ensure contractual requirements specify vehicle hygiene requirements, specifically that all equipment is cleaned and to have valid weed hygiene declaration prior to accessing pastoral properties. - Site inductions are used to ensure that all personnel are aware of vehicle weed hygiene requirements and staying on designated areas and existing access tracks. - Necessary field staff to be trained in weed identification and reporting. - Allow enough time and budget for weed survey, monitoring and control activities during and on completion of the DST program.
Civil Maintenance Program, Camp Operations and DST Operations	- Weed surveys are to be conducted in all activity areas to establish a baseline, inform weed control activities and compare post-activity vegetation with the baseline. - Ensure machinery is clean and free from mud and plant material prior to entering or leaving the exploration area. Site inductions are to ensure that all personnel are aware of vehicle weed hygiene requirements and staying on designated access tracks. - As there are currently no vehicle wash-down facilities in the region, the most appropriate and applicable cleaning procedure is visual inspection and dry removal. This will reveal vegetative material caught in the underbody, moving parts of machinery or any other part of the vehicle or machine and the materials located could be manually removed or removed with the assistance of compressed air. With this method, there is no requirement to be able to distinguish between weed and native species, as all vegetative matter should be removed. It is noted that a weed washdown facility is currently being constructed near Highway Inn, Daly Waters. - If an outbreak of a declared weed occurs during exploration activities weed treatment is to be undertaken according to DEPWS guidelines and the <i>Northern Territory Weed Control Handbook</i> (DENR, 2018) (refer Appendix H). - All vehicles, plant and equipment to be checked and cleaned prior to demobilisation from exploration area to avoid the spread of weeds off the exploration permit. - All vehicles, plant and equipment to be checked and cleaned prior to demobilisation from exploration area to avoid the spread of weeds off the EP.

Implementation		
Environmental performance standards	Measurement criteria	Records
SWP7.4-1 No introduction of new or spread of existing Weeds of National Environmental Significance, weeds listed under NT legislation or locally significant weed species.	- No declared weeds imported into or exported from the DST area. - No introduction or spread of declared weeds resulting from Sweetpea's activities. - Six-monthly weed inspections completed on all activity areas including camp area, access tracks and lease pads. - Weed free certifications are provided for all vehicles, equipment and machinery moving from known areas of WoNS, weeds listed under NT legislation or locally significant weed infestation prior to attending a well location. - Personnel inductions include specific requirements around weed hygiene.	- Records of observed presence, with identification of weed if possible, will be maintained within Sweetpea's GIS and provided to the NT Government's Onshore Petroleum Weed Management Officer. - All weed outbreak incidents will be reported in Sweetpea's incident management system and corrective action initiated. - Include annual reporting on the performance of weed management against NT. - Records of weed inspections will be maintained.
Monitoring	- As part of the Annual Weed Management Action Plan (refer Appendix H), Sweetpea will undertake weed survey and mapping of the areas that will be impacted by the exploration activities and where required undertake weed control. - Weed monitoring is to be carried out in all disturbance areas to determine the extent of existing weed infestations within the program area, inform weed control requirements and assess any changes in the number, size and species of weed infestations as a result of the project following its completion.	
Notification Requirements	- The Northern Territory Government Onshore Petroleum Weed Management Officer at the Weed Management Branch of DEPWS should be notified within 48 hours of the discovery of a new weed species in the area. - Initial notification may be verbal, with follow-up written notification provided within seven working days. The notification should include a preliminary species identification and location information. The Onshore Petroleum Weed Management Officer will advise what further action is required. - It is noted that some species spread rapidly, so immediate action may be required to control spread. For example, as stated in Appendix H Parthenium (<i>Parthenium hysterophorus</i>) is a Class A (to be eradicated) and Class C (not to be introduced) weed in the Northern Territory as well as being classified as a Weed of National Significance. Early detection is crucial in not allowing this species to spread in the Northern Territory (DPIR, 2016). - The Weeds Management Act 2001 requires: 'The owner and occupier of land must... within 14 days after becoming aware of a declared weed that has not previously been, or known to have been, present on the land, notify an officer of the presence of the declared weed'. - All weed outbreak incidents will be reported in Sweetpea's incident reporting system and corrective action initiated.	

Overall Residual Risk	Consequence – Moderate (2)		Likelihood – Rare (1)	Residual Risk – Low
Scientific Uncertainty	Baseline data is current to assess land condition (refer Section 4.2.7) and manage weeds during the program (Appendix H). The measures to be implemented to manage risk of introduction and spread of weeds in the exploration permit can be implemented easily to ensure the risk effectively controlled.			Low (1)
ALARP Statement	The introduction and/or spread of weeds during exploration activities was assessed as a 'low', with a 'moderate' consequence (minor short-term damage confined to exploration area) and 'rare' likelihood when environmental controls detailed in the management tasks are implemented. The management tasks have considered the 'hierarchy of control' to demonstrate all reasonably practicable control measures have been identified and implemented to reduce the risk to an acceptable level.			
	Eliminate	Corrective action initiated immediately where weed outbreaks are reported.		
	Substitute	Source machinery locally if available to avoid importation of exotic weeds.		
	Engineering	All plant and machine operators to monitoring for weeds while conducting activities including routine checks along access track, lease pads and gravel pits.		
	Administrative	- Site environmental inductions, including trained in weed identification and reporting. - Monitoring and Auditing (refer Section 8.7 and Section 8.8). - Spatial data before and after to confirm stayed within survey parameters.		
	Personal Protective Equipment	Not applicable.		
Acceptable	Weed survey in October 2019 and May 2020 (Appendix H) indicated a low concentration of weeds across the exploration area. Based on the controls to be implemented, the residual risk is assessed as acceptable. Weed prevention, monitoring and treatment mitigation measures will be effective and any controls above best practice are unlikely to reduce the risk of the introduction and spread of weeds into the permit area any further.			

7.5 Bushfire Management Sub-plan

Values, Risks and Outcomes	
Environmental Values	- Maintain a natural fire regime of the region. - Protection of public, private infrastructure and equipment.
Environmental Risks (Appendix A)	- Vegetation degradation and habitat modification (Risk Reference 32). - Damage to or loss of infrastructure (Risk Reference 33). - Damage to culturally significant sites (Risk Reference 35). - Delay to rehabilitation success as result of bushfire (Risk Reference 34).
Environmental Outcomes	Bushfires are not started as a result of conduct of the regulated activity and exploration lease pads are protected from fires started outside of the work area.
Activities	Management Tasks
Project Management and design	- Implement the Bushfire Management Plan (BMP) (Appendix I). - Fire breaks (minimum of 4 m) to be incorporated into lease pad and camp layout. - Liaise with pastoralists to coordinate activities cognisant of fire management activities, including timing for any planned burns. - Ensure adequate firefighting equipment is available and sufficient training and familiarisation carried out by personnel. - Firefighting equipment will always be carried during DST activities, due to increased risk of ignition. - An emergency response plan that includes actions to be carried out in the event of a bushfire is presented in Appendix K. - All staff to be trained in bushfire awareness and emergency response procedures. - Smoking only allowed in designated smoking areas.
Civil Maintenance Program, Camp Operations and DST Operations	- Monitor NAFI to identify any severe, extreme and catastrophic Fire Danger Index (FDI) days and assess risk of conducting activities on such days and if additional controls are required to conduct the day's activities. - Fire extinguishers to be fitted to or available in all vehicles and at key locations at camp. In accordance with section 275 of the NT Schedule of Onshore Petroleum Exploration and Production Requirement 2021, fire precautions including at least four 9 L and one 68 L dry-chemical type extinguishers (or their equivalent) shall be kept at strategic locations on or around active DST vehicles and equipment. - A hazardous area diagram for the vehicles and equipment is to be clearly displayed and communicated during inductions. - Fire-fighting equipment will be kept on hand during clearing activities as this is the highest risk period of fire ignition. - No hot works are permitted on total fire ban days without written approval from a fire control officer or fire warden. - Site inductions are to ensure that all personnel are aware of risk of smoking and other site activities that may cause fire. - Drive on designated access roads only. Driving through long dry grass is to be avoided. - Ensure that vehicles and equipment are fitted with spark arrestors. - Ensure appropriate storage of fuel and other flammable and combustible liquids in accordance with <i>AS1940:2004 The storage and handling of flammable and combustible liquids</i> (refer Appendix G). - In case of natural fires in the vicinity of operational areas an attempt should be made to put them out if safe to do so.

	Any rubbish, debris or oil refuse that could constitute a fire hazard shall be removed to a safe distance away from camp facilities, existing water bores and other infrastructure.		
Implementation			
Environmental performance standards		Measurement criteria	Records
SWP7.5-1 No uncontrolled fires occurring as a result of DST activities.		- The incident management system shows no fires started as a result of Sweetpea's activities. - Records shows annual fire scar mapping, annual fire load estimates and maintenance of firebreaks are undertaken. - Records show emergency response plan implemented in the event of a fire.	All incidents of fire to be recorded in the Sweetpea incident reporting tool.
Emergency response	- In the event of a bushfire the designated Fire Officer (in the civil and water bore construction team) will coordinate response efforts in accordance with the Emergency Response Plan (Appendix K). - Sweetpea has the primary responsibility for fire response in the exploration lease but at times may be required to take direction from a fire warden or fire control officer. - Consultation and engagement with Bushfires NT and the Pastoral Leaseholders will also be required during a bushfire emergency. - Sweetpea is obliged to inform neighbouring Leaseholders of fire events as they occur in the exploration area, or with potential to effect adjoining properties. All notifications and communication should be undertaken by or at the direction of the Fire Officer.		
Overall Residual Risk	Consequence – Major (3)	Likelihood – Unlikely (2)	Residual Risk – Low
Scientific Uncertainty	Historical records of fire in the area show that fire frequency within the exploration area over the past 11 years (2008 to 2019) are low, ranging between one and five times in an 11-year period (NAFI, 2020) (refer Section 4.1.9. Consideration of Barkly Regional Bushfires Management Plan 2018 and the measures to be implemented to manage risk of fire can be implemented easily to ensure the risk of uncontrolled bushfire is effectively controlled.		Low (1)
ALARP Statement	The inherent risk of bushfire as result of the exploration activities was ranked as 'moderate' in the northern area of EP136. With the implementation of the controls and the specific Bushfire Management Plan (Appendix I) the residual risks were assessed as a 'low', with a 'major' consequence (significant damage confined to exploration area) but was considered 'unlikely' likelihood. The Bushfire Management Plan and the specific controls incorporated into the plan have considered previous industry experience for similar activities in the Beetaloo Basin. The management tasks have considered the 'hierarchy of control' to demonstrate all reasonably practicable control measures have been identified and implemented to reduce the risk to an acceptable level. Appendix A presents the ALARP evaluation for the activities to be conducted during the seismic and water bore activities.		

	Eliminate	- Hot works not permitted on total Fire Ban Days, unless under direction of Fire Control Officer or Warden. - Stay on dedicated access tracks to avoid potential of grass to build up fuel within the vehicle's engine bays. - Regular inspections of vehicle's engine bay and remove any build-up of vegetated matter (if applicable).
	Substitute	Not applicable.
	Engineering	- A 4 m fire access trail around camp site and water bore pad. - Monitor NAFI to identify any severe, extreme and catastrophic Fire Danger Index (FDI) days and assess risk of conducting activities on such days and if additional controls are required to conduct the day's activities. - Fire-fighting equipment will be kept on hand.
	Administrative	- Bushfire Management Plan (Appendix I), including engaging with Bushfires NT and pastoral leaseholders in the area. - Site environmental inductions, including trained on emergency response procedure (Appendix K) in event of fire. - Monitoring and Auditing (refer Section 8.7 and Section 8.8).
	Personal Protective Equipment	- Fire extinguishers to be fitted to all vehicles. - Water cart to be available at all times during civil maintenance activities.
Acceptable	Based on the understanding of bushfire risk in the area and the additional controls to be implemented during the exploration activity, the risk of Bushfire is considered to be as low as reasonably practicable (ALARP) and acceptable. Controls above best practice are unlikely to reduce the risk any further and are consistent with other land management activities in the permit area.	

7.6 Waste and Wastewater Management Sub-plan

Values, Risks and Outcomes	
Environmental Values	- Maintain the integrity of ecosystems and agricultural productivity. - Minimise the amount of waste and wastewater generated on-site and disposed of off-site.
Environmental Risks (Appendix A)	- Inappropriate wastewater management practices leading to localised soil contamination (Risk Reference 19). - Pollution of water through release of chemicals into nearby creeks (Risk Reference 20). - Contamination of soil through inappropriate waste management (Risk Reference 20 and 22). - Attraction of pest species due to inappropriate organic waste management (Risk Reference 21). - Potential for accumulation of naturally occurring radioactive materials (NORM) in well equipment and drilling muds and wastewater could impact on the health and safety of people and the environment (Risk Reference 23).
Environmental Outcomes	No long-term adverse impacts on soil, surface water, groundwater, sensitive habitats (including stock and fauna) and air quality as result of Sweetpea's waste and wastewater generation.
Activities	Management Tasks
Project Management	- Wastewater Management Plan prepared in accordance with section C.7.1 of the Code (refer Appendix F). - Designated waste storage and handling area to be planned for and provided onsite at well pads and the accommodation camp. - Ensure provision for appropriate vermin-proof waste storage containers at the camp. - All waste and wastewaters should be removed from site following completion of the specific activities. - Ensure contractual requirement to remove all waste and dispose of in licenced facility are met. - Removal and disposal of hazardous wastes to be in accordance with NT hazardous waste disposal requirements. - The site assessment criteria provided in the DoH Code of Practice (2014) (Section 7.2) should be followed for the planning and constructing effluent disposal systems (refer to DoH Environmental Health – Guidelines for Land Capability Assessment for On-site Waste Management (2014)).
Accommodation and Fly Camp Operations	- Ensure site environmental inductions for all site personnel and contractors include the safe storage and segregation of wastes, and disposal of wastes in appropriate containers. - Segregate and safely store and label chemical packaging, oils, batteries, tyres, maintenance and other industrial waste for proper disposal to recycling and approved landfill facilities. - Ensure Safety Data Sheets (SDS) and handling procedures for hazardous chemicals are accessible on site and widely promulgated. - Undertake inspection of waste storage areas regularly, or after significant rainfall event (greater than 20 mm in 24-hour period). - All recyclable materials, including glass and cans, are to be separated from general waste and stored for later disposal at a recycling facility or a recycling bin. - Wastewater, sewage and sillage generated by the camp activities will be managed by an approved sewage treatment system.

	• Prior to the instillation, a suitable area of land will be set aside for reticulation of grey water treated by the STS. Design of the reticulation area will follow requirements outlined in the NT Department of Health <i>Code of Practice for Small On-site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent</i>, 2014 (DoH Code of Practice). • Treated water will be dispersed to a dedicated area of land suitably landscaped for the disposal of reclaimed water by means of surface irrigation onto a suitable medium and plants capable of effecting a high rate of evapo- transpiration. • Grey water from kitchen and showering facilities will be managed in accordance with Part 6 of the DoH Code of Practice. • Visual inspections of the wastewater management systems should be undertaken regularly or if an unseasonal significant rainfall event occurs (i.e. greater than 20 mm in a 24-hour period). • Records show effluent irrigation area designed in accordance with DoH Code of Practice. • Inspection records show plant and effluent irrigation area are in working order. • Visual inspections of the site's wastewater containment systems should be undertaken weekly.
Drilling Fluids, Muds and Cuttings	• All residual drilling fluids, muds and cuttings will be contained in an engineered pit on the well pad that is lined with an impermeable membrane with a coefficient of permeability of less than 10^{-9} m/s tested in accordance with AS1289.6.7.2 and with resistance tearing >0.5kN (ASTM D 4073); static puncture >0.5kN (ASTM D 4833) and tensile strength of >20kN in accordance with Section C.4.1.2 (b) of the Code. • Geomembranes will be installed under the liners to prevent punctures and tears. • The excess drilling fluids may be transferred into an above ground storage tank that meets section B.4.16.2(h) of the Code. The removal of the drilling fluids will assist in the drying out the muds and cuttings. • The tank and pits will be designed in accordance with Section C.7.1 of the Code to allow 1:1,000 ARI freeboard as calculated in Section 3.2 of Appendix F. • The opened tanks and pits will be marked with the appropriate freeboard for the season to ensure capacity is available, including 1.3 m freeboard during the wet season. • The pit will be protected from overland waterflow across the lease pad as detailed in <i>Appendix B Erosion and Sediment Control Plan</i> of the DST EMP. • The pit and tanks will be fitted with fauna ladders, and the lease pad fenced off from Stock and other larger fauna species. • Routine inspections and monitoring will be undertaken in accordance with Section 6.0 of Appendix F. • Drilling muds, cuttings and fluids to be transferred directly from drill rig, via the shakers to the mud sump. • Drilling fluids may be recycled back in the well drilling process to reduce the quantity of drilling fluids required for disposal at end of operations. • Excess fluids may be pumped via pipelines to an aboveground storage tanks that meets Section B.4.16.2(h) of the Code. • Storage volumes will be monitored daily during operations. • The quality of all fluids will not contain benzene, toluene, ethylbenzene, or xylene (BTEX) above the prescribed levels detailed in the Code for drilling fluids. • Aboveground tank, sump liners and embankments will be inspected weekly during operations. • Dried drilling muds and cuttings will be covered during the wet season to prevent ingress of rainwater.

	• In the unlikely event of a spill, Sweetpea's Spill Prevention and Response Plan and Emergency Response Plan (Appendix G and Appendix K) will be enacted. • The potential for accumulation of NORM will be monitored to ensure risks to the health and safety of people and the environment, although elevated NORM levels associated with drilling activities is not anticipated to be significant. The hazard of NORMs in cuttings will be assessed using real-time, quantitative monitoring of NORM concentrations from X-ray fluorescence data as required by the NT <i>Radiation Protection Act 2004</i>. • Final disposal options for muds and drill cuttings will be determined based on onsite characterisation of solid waste and risk assessment. Options for disposal include: - Onsite disposal to be mixed, buried and covered. - Offsite disposal to a licensed waste disposal facility in accordance with the NT Waste Management and Pollution Control Act and related interstate waste consignment requirements. • Sweetpea will engage services of a suitably qualified third party to assess the material is suitable for disposal options in accordance with Section C.4.1.2(f). • Leachability testing of drill cuttings will be undertaken in accordance with Section C.4.1.2 (e) and Table 9 Analytes and method for drilling waste assessment of the Code to inform disposal options. • Should results indicate onsite disposal is an option, Sweetpea will obtain approval from DEPWS. • Recycling and re-use of the solid waste from the drilling muds and cuttings may be considered if a viable option is identified to minimise the volume of waste that is disposed of onsite or transported and managed offsite. • Wastewater tracking for drilling fluids, muds and cuttings will be in accordance with Section 7.1 of Appendix F. • The wastewater tracking will follow an auditable chain of custody system and will be documented and available upon request. • Wastewater tracking documentation will be reported annually as per Section 8.5.
Produced Water and Flowback Fluids	• All produced water and flowback fluids are to be managed in accordance with section C.4.2 of the Code. • All produced water and flowback fluid will be held in above ground, double line tanks in accordance with Section A.3.8 (g) of the Code and have secondary containment that has sufficient capacity to hold a capacity of at least 110% of the largest tank utilised. • Liners chosen will be compatible with the wastewater held within. • Above ground closed top storage tanks will be designed and constructed in accordance with Australian Standards (including AS3990 Mechanical Equipment – Steel Work, AS1170.1 Hydrostatic loading, AS1170.2 Wind Rating (cyclonic wind rating) and AS1554.1 Structural Welding Procedure) including: - Designed to withstand bushfire attack (20 m Firebreak, plus 20 m APZ) and meet local wind loading considerations. - Fitted with leak detection system and high-level alarms, calibrated to the freeboard requirement of 1.3 m for open topped tanks and 0.5 m for closed topped tanks as per Tank Specification. - Leak detection system capable of detecting leaks between the primary and secondary liner. - Prevent entry of rainwater using a fitted floating cover. - Enclosed top tanks will incorporate a system to remove rainwater from above the floating cover. - Fitted with vents to prevent the build-up of explosive gasses.

- Above ground open topped treatment tanks will be designed and constructed in accordance with Australian Standards (including AS3990, AS1170.1, AS1170.2 and AS1554.1 Structural Welding Procedure), as per closed top storage tanks, plus:
 - Visibly marked with the freeboard level (1.3 m).
 - Fitted with fauna ladders and minimises access point as far as reasonably practicable for fauna.
 - All wastewater stored in an open topped treatment tank will be transferred to an enclosed storage tank at least eight (8) hours before the onset of a significant rainfall event (as per Section 3.2 of WWMP (Appendix F).
- The leak detection system and tank level system used will be equipped with telemetry and will send alerts at predefined levels or if moisture occurs between the liners.
- Tanks will have 20 m firebreak, plus additional 20 m asset protection zone surrounding the tank area as per Appendix F of the DST.
- Manifolds are designed to prevent siphoning of a tank.
- Tanks will be installed with the use of non-return valves used to prevent uncontrolled discharge from multiple tanks should a tank fail.
- Liners for all above ground storage tanks will meet or exceed all requirements for permeability, puncture and tear standards.
- All secondary containment will be inspected in accordance with Section C.5.5 of the Code.
- Water re-use technologies will be considered for potential reuse of flowback and produced water on future fracture stimulation of wells. This will help minimise waste. It is noted that should wastewater be reused for other purposes, an analysis of environmental impacts and risks will be provided to the Minister/Department for review and endorsement.
- If water re-use is not feasible or in place, evaporation methods will be utilised to reduce quantity of wastewater for disposal.
- The quality of all fluids that are to be used for fracture stimulation treatments will not contain benzene, toluene, ethylbenzene, or xylene (BTEX) above the prescribed levels detailed in the Code for stimulation and drilling fluids.
- If the total volume of flowback fluid and produced water stored on-site exceeds the allowed capacity of the open and closed tanks (freeboard included with open top tanks), then the well(s) will be shut in. Sweetpea will provide written notification to DEPWS within 48 hrs of exceedance, along with the proposed plan forward to return the tanks to a level where the wells can be operated.
- Monitoring local weather and climate information to make informed decisions regarding site operations as per (as per Section 3.2 of Appendix F).
- Ensure site environmental inductions for all site personnel and contractors' protective measures to prevent avoidable discharge into, or contamination of, groundwater, waterways or established drainage systems, and ensuring groundwater extraction limits are not exceeded.
- Ensure appropriate well control training/certification for rig personnel.
- Ensure well control critical equipment and systems on stimulation equipment are fit for purpose, certified, maintained in good working order and tested as required.
- The quality of the water will be monitored, and reports submitted as required under the Code (refer Section 6.0 and Section 7.0 of the Appendix F).
- In the unlikely event of a spill, Sweetpea's Spill Prevention and Response Plan and Emergency Response Plan (Appendix G and Appendix K) will be enacted.
- Transport of hydraulic fracturing chemicals or wastewater during the wet season, should be avoided, particularly on unsealed roads, to avoid risk of spills, unless a risk assessment is carried out and notice provided to DEPWS/NT EPA of movement.

	- Hydraulic fracturing wastewater (treated or untreated) will not be discharged to either drainage lines, waterways, temporary stream systems or waterholes. - Wastewater will not be re-injected into deep aquifers and/or conventional reservoirs. - At the completion of works, flowback water will be managed in accordance with the waste management hierarchy. - Any residual water or other waste fluids produced from the well shall be disposed of in a manner which does not cause risk to public health or safety or cause contamination of water or land not specifically designated to waste disposal. - Sweetpea will engage services of a suitably qualified third party to assess the material is suitable for disposal options in accordance with Section C.4.1.2(f). - Any solids derived from water re-use technology or sediments in the bottom of a tank will be analysed and disposed of properly either on location or at licensed and approved disposal sites as set out in the regulations. Testing of solids will be required prior to any disposal to determine how and what approved licensed disposal facility the solids may need to be transferred to by licensed contractors.
Drilling and Completion Fluids (suspension and kill fluids)	- Drilling and completion fluids (highly saline fluids) will be stored in either the mud sump or transferred as required to above ground storage tank. - Leak detection will be installed on all tanks. - Storage volumes will be monitored daily during operations. - Fluids will be transferred directly from well to mud sump or storage tank. - Fluids will be evaporated where possible in open topped tanks. - All wastewaters will be transferred to enclosed storage tank when a significant rainfall event is predicted as per Section 3.2 of Appendix F. - Secondary containment will be used under all pumps and connections. - Visual inspections of tanks will be conducted weekly. - Any residual fluids will be transported offsite for final disposal at a licensed facility at completion of operations. - Sweetpea will engage services of a suitably qualified third party to assess the material is suitable for disposal options in accordance with Section C.4.1.2(f). - Wastewater tracking for drilling and completion fluids will be in accordance with Section 7.1 of Appendix F. - The wastewater tracking will follow an auditable chain of custody system and will be documented and available upon request. - Wastewater tracking documentation will be reported annually as per Section 8.5.
Stormwater discharges	- All external catchments to the lease pads should be diverted around the exploration lease pads. - Sediment basin is designed and installed to capture all lease pad runoff. - Sediment basin sized in accordance with the design standard as detailed in the Appendix B of the DST EMP. - Visual inspections of the site's sediment basin should be undertaken weekly. - Following rainfall event, sediment basin should be inspected and physical water quality testing (physical parameters only) prior to discharge of water offsite in accordance with the Section 5.4 of Appendix B of the DST EMP, unless water quality did not meet water quality discharge indicators. - External NATA accredited laboratory testing of soil/sediment and water from the sediment basin would be required for the following triggers:

	- Lease pad had a known existing contaminating event in the preceding 3 months that could influence stormwater discharge quality (refer to Appendix L SPRP of the DST EMP). - The visual inspection and physical water quality testing indicate potential contamination. - Where there is a sensitive receiving water body within 200 m of the discharge point. • Sediment pond is to be de-silted and made fully operational as soon as reasonably practicable after a sediment-producing event to retain capacity of 75% of its design retention capacity. • Maintenance activities should be undertaken when required or prior to the onset of the wet season (1 October each year). • If water quality conditions meet the discharge indicators, beneficial reuse of the water may be considered on site. • Any material removed from sediment basin should be assessed for quality (as above) and if required transported offsite for disposal at a licensed facility as per Section 7.3 of Appendix F. • Sweetpea will engage services of a suitably qualified third party to assess the material is suitable for disposal options in accordance with Section C.4.1.2(f). • Wastewater tracking for stormwater or sediment from the basin will be in accordance with Section 7.1 of Appendix F. • The wastewater tracking will follow an auditable chain of custody system and will be documented and available upon request. • Wastewater tracking documentation will be reported annually as per Section 8.5.	
Rehabilitation	• At completion of exploration program, all evidence of waste and wastewater are to be removed. • Refer to Section and Appendix F.	
Implementation		
Environmental performance standards	Measurement criteria	Records
SWP7.6-1 Designated wastewater storage and handling delivered in accordance with this plan.	• All waste volumes tracked whilst on-site and in transport. • Waste transport certificates available for all wastes generated. • No off-site releases of waste products.	• Waste disposal records (tracking and disposal certificates) to be maintained and kept for audit purposes.
SWP7.6.2 Freeboard in open-topped tanks and sump maintained.	• No overtopping event occurrence. • All tanks marked with freeboard level. • Daily inspections confirm wastewater levels do not exceed freeboard. • Where exceedance of freeboard are identified, incident management system and corrective actions evident.	• Records show daily wet season weather forecast checks and inspections records. • Daily inspections records maintained during wastewater storage activities. • Report to Minister.
SWP7.6-3 No instance of loss of containment of wastewater.	• All leak detection alarms investigated within 24hrs. • No incidents of secondary liner failure. • Daily inspection of all wastewater containment.	• Records of leak detection alarms and investigations retained.

		Incidents documented and reported in accordance with Section 8.5.
SWP7.6-4 No release of wastewater (drilling fluids and flowback) off lease pad into surrounding vegetation.	No loss of containment (structural failure, overtopping or major spill event) resulting in offsite release of wastewater.	- Weekly inspections during wastewater storage activities. - Records maintained.
SWP7.6-5 No overtopping of pits, flowback water or produced water tanks due to significant rainfall event.	No overtopping occurs as result of significant rainfall event.	Records show daily wet season weather forecast checks and inspections records.
SWP7.6-6 <7 individual fauna deaths per week for 2 consecutive weeks caused by flowback water storage.	- Daily checks of wastewater tanks for fauna mortality. - Weekly inspection of area surrounding lease pad for fauna deaths.	Fauna interaction log maintained, including species and if possible, cause of death.
SWP7.6-7 Irrigation of treated effluent does not adversely impact soil, surface water, groundwater, sensitive habitats and air quality.	- Records show effluent irrigation area designed in accordance with Department of Health, Code of Practice for On-site Wastewater Management (2014). - Inspection records show plant and effluent irrigation area are in working order.	- Record of approval from Department of Health for the use of the small sewage system. - Records of inspections.
SWP7.6-8 No releases of contaminants (wastes, chemicals or hydrocarbons) resulting in long-term contamination of the soil, surface water, groundwater, sensitive habitats and air quality.	- No off-site releases of chemicals or hydrocarbons. - No accidental on-site release of chemicals or hydrocarbons. - Incident report indicate <10L of chemical spills. - Incident reports indicate <20L of hydrocarbon spills. 100% of spills cleaned up immediately on discovery. - Incident reports indicative of effective remediation or removal and safe disposal of contaminated material/soil. - Incident reporting to DEPWS is to comply with the requirements in Regs 33 and 35 – reportable and recordable incidents.	- All chemical and hydrocarbon volumes tracked whilst on-site and in transport. - Waste disposal records (tracking and disposal certificated) to be maintained and kept for audit purposes and provided to DITT/DEPWS. - Inspection reports and maintenance records of secondary containment shall be kept for audit purposes and provided to DITT/DEPWS. - Accidental release, leaks and spills of chemicals and hydrocarbons to be maintained on the incident register.
Monitoring requirements	- Monitoring in accordance with WWMP (Appendix F). - Visual inspections of the waste and wastewater management systems should be undertaken regularly or if an unseasonal significant rainfall event occurs (i.e. greater than 20 mm in a 24-hour period).	

	- Regular inspection of fuel and chemical storage areas will be undertaken during DST activities. Areas that should be regularly inspected and maintained as required include: - work areas - containment areas and structures - secondary containment areas - containers (e.g. fuel drums) - spill kits - designated refuelling areas and maintenance areas. - Monitoring should include a daily inspection of taps and valves, soils within the work area for staining and the hazardous liquids storage area and secondary containment areas. A weekly inspection of spill clean-up kits, MSDSs and labelling of hazardous wastes and materials is also to be carried out. - An indicative waste and wastewater register provided below in Section 3.10 and Section 3.10.3. - Weekly running sheets for waste volumes per waste stream will be recorded.		
Incident Notification	- Incident notification must comply with the requirements outlined in regs 33, 34 and 35, subject to the nature, scale and impact of the incident (refer Section 8.6). - In event of an offsite incident (i.e. fuel spill on transit to EP) must notify NT EPA. - Other OH&S notifications that would be required if the incident occurs offsite – e.g. hydrocarbon spill on the way out to site.		
Overall Residual Risk	Consequence – Moderate (2)	Likelihood – Unlikely (2)	Residual Risk – Low
Scientific Uncertainty	Waste and wastewater will be managed in accordance waste management hierarchy principals. There are a range of legislation, codes and standards available to ensure risk of waste and wastewater management effectively mitigates the risk to the environment. The distance of sensitive receptors surrounding the exploration lease pads will likely result in lower risk. Experience from other operators in the Beetaloo Sub-basin have indicated the main contaminants of concern are high salt content of the flowback water (i.e. chlorides), hydrocarbons and some heavy metals which can be managed through appropriate handling, containment and disposal.		Low (1)
ALARP Statement	The risk from waste and wastewater is ranked as a 'low'. The risk was assessed as being a 'minor' consequence, 'unlikely' likelihood event. The risk mitigation measures outlined in the EMP, Appendix F WWMP, Appendix G SPRP and Appendix K Emergency Response Plan all meet the industry best practice requirements of the <i>NT Petroleum Codes of Practice</i> and <i>NT Waste Management and Pollution Control Act 1998</i> and have considered the 'hierarchy of control'. Controls above best practice are unlikely to further reduce the risk to wildlife, stock and human receptors or the environment where waste and wastewater management occur. Based upon the risk being ranked as a 'low', the risk is determined to be ALARP.		
	Eliminate	No discharge or reinjection of wastewater.	

		- Only use chemicals of low concern when standard chemical handling, storage and disposal practices are used. - Use chemicals that are biodegradable where possible. - Drilling fluids shall not contain benzene, toluene, ethylbenzene, or xylene (BTEX) above the levels prescribed in section B.5 of the Code. - Eliminate the generation of wastewaters through design modification (i.e. reuse options).
	Substitute	- Where able, alternative chemicals can be used that are biodegradable and environmentally sensitive (i.e. detergent choice for camp cleaning). - Chemical Risk Assessment (DST EMP Appendix A) completed to evaluate potential hazards of chemicals and the potential for exposures to human and environmental receptors and the exposure pathways.
	Engineering	- Storage of waste reduce risk of release (i.e. bunded, secured). - Use existing approved wastewater treatment plants already approved by Department of Health. - Use of enclosed tanks, double-lined with leak detection. - Secondary containment for all pumps and high-risk spill locations. - Freeboard requirements (based on 1:1,000-year average recurrence interval rainfall estimates). - Produced water and flowback fluid volumes will be managed to maximise evaporation to reduce volumes. Drilling fluids evaporated as much as possible; pending the weather window and freeboard requirements (minimum 1.3 m during the wet season) with remaining fluid to be appropriately transported and disposed of at a licenced facility.
	Administrative	- Well Operation Management Plan (WOMP). - Standalone Spill Prevention and Response Plan, Wastewater Management Plan and Emergency Response Plan implemented. - Waste register maintained. - Water and wastewater will be tracked in accordance with requirements of C.6.1 of the Code. - Site-specific risk assessment at completion of drilling activities to determine disposal requirement for all drilling fluids and muds in accordance with Condition C.4.1.2 of the Code. - Groundwater monitoring to detect changes to the underlying aquifers in accordance with B.4.17 of the Code. - Monitoring and Auditing (refer Section 8.7 and Section 8.8).
	Personal Protective Equipment	- Spill response kits appropriate for types of spill at each facility. - Appropriate PPE used when handling.
Acceptable	Waste and Wastewater management measures detailed in this plan for drilling, HFS and well testing are proven effective at minimising risks to the environment and are in accordance with Part C of the Code. The risks to the environment are considered to be as low as reasonably practicable (ALARP) and acceptable. No further input is required to reduce the risk any further.	

7.7 Noise, Vibration and Lighting Emissions Management Sub-plan

Values, Risks and Outcomes		
Environmental Values	A rural acoustic, lighting, vibration and visual amenity environment conducive to the wellbeing of the community, including its social and economic amenity, and an individual, including the opportunity to have sleep, relaxation and conversation without unreasonable interference from Sweetpea’s activities.	
Environmental Risks (Appendix A)	- Noise impacts on surrounding communities (Risk Reference 12). - Disruption to wildlife through noise, vibration and lighting from mechanical equipment (Risk Reference 13). - Disturbance to stock through noise, vibration and lighting from mechanical equipment (Risk Reference 14).	
Environmental Outcomes	Manage activities in accordance with occupational health and safety guidelines for noise, vibration and light exposure and minimise nuisance noise and vibration impact on surrounding communities, including fauna and stock.	
Activities	Management Tasks	
Project Management	- Drill site location selected to minimise impacts on pastoralist operations – including appropriate separation distances between sensitive receptors and local communities. - Site location has considered pastoralist activities and inputs to minimise potential impact to existing users and further consult with leaseholders prior to scheduling of program activities to take into consideration stock movements. - Position/design camp to minimise impact on shift worker for the 24-hour operations. - Operating hours for the DST program are to be established and communicated to personnel, contractors and Pastoralists. 24-hour operations will occur during key stages of the DST program. - Native vegetation provides a suitable buffer between land users. - Provide at least two weeks notification to households and businesses if operations are to be conducted within 10 km of their premises. - All nuisance-related complaints from sensitive receptors investigated and reported upon.	
Associated activities - access track, water bores, exploration lease pads and camp operations.	- Ensure site environmental inductions for all site personnel and contractors include noise, vibration and light emissions requirements. - Ensure vehicles, machinery and equipment is maintained in good working order. - Existing noise attenuation devices fitted to construction vehicles and machinery used on site will be maintained in good working order. - Slow down vehicles when passing cattle and other wildlife.	
	Daily and ongoing consultation with station managers and station personnel.	
Implementation		
Environmental performance standards	Measurement criteria	Records
SWP7.7-1 No significant impact to rural acoustic, lighting, vibration and visual amenity environment as a result of the DST program.	Nuisance-related complaints investigated immediately.	All complaints and subsequent actions are to recorded in the Sweetpea’s incident management system.

		Corrective action(s) recorded and taken where appropriate.	
Overall Residual Risk	Consequence – Minor (1)	Likelihood – Rare (1)	Residual Risk – Low
Scientific Uncertainty	EP136 is considered remote and there are no known tourism operators in the vicinity of the proposed project works. Activities are located away from populate areas. Position/design camp to minimise impact on shift worker for the 24-hour operations.		Low (1)
ALARP Statement	The DST activities are within discreet locations, with a centralised accommodation camp for all 7 lease pads. The permit is remote from sensitive receptors. The risk was assessed as having a ‘low’ inherent and residual risk (a ‘minor’ consequence, ‘rare’ likelihood). The management tasks have considered the ‘hierarchy of control’ to demonstrate all reasonably practicable control measures have been identified and implemented to reduce the risk to an acceptable level. Appendix A presents the ALARP evaluation for the activities to be conducted during the DST activities and summarised below:		
	Eliminate	Remote location.	
	Substitute	Not applicable.	
	Engineering	- Vehicles, machinery and equipment is maintained in good working order. - Position/design camp to minimise impact on shift worker for the 24-hour operations.	
	Administrative	- Operating hours for the DST program are to be established and communicated to personnel, contractors and Pastoralists noting that 24-hour operations will occur during key stages of the DST program. - Monitoring and Auditing (refer Section 8.7 and Section 8.8). - Notice to pastoral lease holders and immediate response to nuisance-related complaints. - Ongoing consultation with station managers and station personnel as required.	
Acceptable	The residual risk is considered acceptable for noise, vibration and lighting emissions. The remote location of the activity area and the measures to be implemented during survey do not warrant further risk reduction.		

7.8 Air Quality and Emissions Management Sub-plan

Values, Risks and Outcomes	
Environmental Values	Rural air environment with qualities conducive to suitability for the life, health and wellbeing of humans, stock and wildlife.
Environmental Risks (Appendix A)	- Increase in dust during site preparation (clearing of access tracks, lease pads, gravel pits and camp area) and resulting from vehicular traffic during the civil and water bore construction program (Risk Reference 15). - Increase in exhaust emissions from contractors' vehicles, plant and generators resulting in localised effect on air quality and global contribution to GHG (Risk Reference 16). - Drilling, HFS, well testing, well suspension and abandonment emissions contribute to global warming and reduction in localised air quality (Risk Reference 17). - Air emissions from venting and flaring activities (Risk Reference 18).
Environmental Outcomes	- Minimise environmental nuisance at sensitive receptors. - Minimise greenhouse gas emissions.
Activities	Management Tasks
Project Management	Ensure dust minimisation and suppression requirements are communicated to personnel including contractors.
Civil Construction and Maintenance, Camp Operations	- Ensure site environmental inductions for all site personnel and contractors include protective measures to minimise dust generation. - All vehicles and equipment used on site will be well maintained to minimise emissions. - If dust levels are high, particularly in the vicinity of public areas (e.g. Carpentaria Highway), use a water truck to manage dust emissions. - Use existing roads and tracks where practicable and ensure suit intended purpose and volume of traffic required for the DST activities. - Implement controls as detailed in the Land and Surface Water Management Plan (refer Section 7.3).
Drilling, HFS, well testing, well suspension and abandonment	- Venting of gas will be minimal, restricted to: - methane that escape source rocks brought to the surface during drilling - dissolved in flowback or produced fluids that outgasses at surface - is vented from the separator during well testing prior to the gas volumes reaching the level where a flare will work continuously. - All activities will comply with the requirements of the CoP for well operations requiring the use of flares and managing uncontrolled releases of hydrocarbons. - All flowback must be routed to a well completion vessel, with flowback sent to a separator as soon as the separator will function and then directing the separated gas to a completion combustion device with a continuous ignition device. - Flare to be equipped with an auto-ignite system. - Well testing activities will utilise a Reduce Emissions Completion (separator and flare) in accordance with the US EPA <i>New Source Performance Standards of 2012</i>. - Ensure all equipment and machinery to be in good working order to minimise vehicle exhaust emissions.

	- Leak detection to be undertaken on all exploration wells six-monthly. - Comply with the requirements detailed in the CoP for methane which includes methane emissions monitoring, leak management, detection and reporting for petroleum exploration and operations in the Northern Territory. - Regular maintenance of equipment and machinery to minimise vehicle exhaust emissions. - Unexpected gas encountered during drilling to be diverted to a flare for combustion. - Exploration activities are not within the vicinity of sensitive receptors, such as high conservation areas, communities or homesteads. - A reduced emissions completion will be utilised for well testing post stimulation as per the US NSPS requirements (an NT Inquiry Recommendation). This involves the use of a separator and combustion of gases produced via a flare with an efficiency of 96% destruction efficiency. - Volume of gas vented and flared to be estimated and reported as per the <i>National Greenhouse and Energy Reporting Scheme</i> (NGERS). - Volumes of gas emitted during the “separation flowback stage” must be measured using direct measurement as governed under the Commonwealth <i>National Greenhouse and Energy Reporting (Measurement) Determination</i> (2008). - Volume of diesel to be estimated and reported as per the NGERS. - Emissions from flaring and fuel combustion activities are not predicted to exceed relevant NEPM ambient air guidelines for NO_x, Carbon Monoxide or VOC's due to low intensity of activity and isolated location.
Drilling operations – Flaring and Venting	- All activities will comply with the requirements of the CoP for petroleum well operations requiring the use of flares and managing uncontrolled releases of hydrocarbons. - All flowback must be routed to a well completion vessel, with flowback sent to a separator as soon as the separator will function and then directing the separated gas to a completion combustion device with a continuous ignition device. - Comply with the requirements detailed in the CoP for methane which includes methane emissions monitoring, leak management, detection and reporting for petroleum exploration and operations in the Northern Territory (refer Appendix E). - Volumes of gas emitted during the “separation flowback stage” must be measured using direct measurement as governed under the Commonwealth <i>National Greenhouse and Energy Reporting (Measurement) Determination</i> (2008). - Emissions from flaring and fuel combustion activities are not predicted to exceed relevant NEPM ambient air guidelines for NO_x, Carbon Monoxide or VOC's due to low intensity of activity and isolated location. - Well testing activities will utilise a Reduce Emissions Completion (separator and flare) in accordance with the US EPA <i>New Source Performance Standards of 2012</i>. - Exploration activities are not within the vicinity of sensitive receptors, such as high conservation areas, communities or homesteads.
Rehabilitation	- Rehabilitate and/or stabilise the ground surface as soon as practicable following completion of disturbance. - Uniformly re-spread previously removed vegetation and topsoil over disturbed area to assist with rehabilitation process through agencies of increased infiltration and return of seed-bearing topsoil.

Implementation			
Environmental performance standards		Measurement criteria	Records
SWP7.8-1 No significant impact to air quality at sensitive receptors as a result of the DST program.		- No nuisance-related complaints regarding dust / air quality resulting from exploration activities. - All complaints responded to and, where appropriate, corrective action taken immediately.	All complaints and subsequent actions are to be recorded in Sweetpea's incident management system.
SWP7.8-2 Greenhouse gas emissions are minimised during the DST activities.		All emissions related data (fuel use, flaring volumes etc.) reported in accordance with NGERS requirements.	- Emission related data (fuel use, flare volumes, etc.) retained. - NGERS reporting where GHG emissions exceed the 25,000 tCO₂-e threshold and will be covered by the safeguard mechanism if emissions exceed a 100,000 tCO₂-e threshold (during a financial year period).
SWP7.8-3 Venting to be eliminated as far as reasonably practicable.		Daily reports confirm all technically recovered hydrocarbons sent to the flare is metered and recorded.	Gas flow volumes recorded.
SWP7.8-4 Leaks to be detected and repaired in accordance with the Code.		All leaks reported within five business days of remediation leak detection and specify date of identification, nature and level of leak, location and name of the operating plant and rectification actions taken.	- Leak detection records retained. - Leaks and management records maintained in Sweetpea's incident management system and in accordance with Appendix E.
Implementation			
Monitoring		- Monitor road conditions to ensure deterioration with possible increase in dust creation, does not occur and undertake road rehabilitation if required. - Visual monitoring will be carried out in the vicinity of the public roads (i.e. Carpentaria Highway) to ensure that visibility for motorists is not obscured. In this event, water carts will need to be applied to reduce dust. - Visual monitoring of the vegetation along the access track to be ensure vegetation is not being impacted by dust. - The National Pollutant Inventory (NPI) Emission estimation technique manual for Oil and Gas Extraction and Production (2013) associated with a DST is not considered reportable at this stage (refer Section 3.11.3)	
Overall Residual Risk	Consequence – Minor (1)	Likelihood – Possible (3)	Residual Risk – Low
Scientific Uncertainty	Activities on EP136 are greater than 2 km from existing and proposed habitable dwellings including all buildings or premises where people reside or work, schools and associated		Low (1)

	playgrounds, permanent sporting facilities and hospitals and other community medical facilities. In addition, proposed exploration activities are not in close proximity to sensitive receptors, such as high conservation areas, communities or homesteads and roads. Full list of receptors is provided in Section 4.3.2 of this EMP. Management tasks detailed below will mitigate any risk to further increase dust and emissions in the region.	
ALARP Statement	The risk from dust and GHG emissions on air quality in the region is ranked as 'low' (minor consequence and possible likelihood). The risk mitigation measures outlined in the EMP meet the industry best practice requirements of the <i>Code of Practice</i> ; with site selection being the primary control. The management tasks have considered the 'hierarchy of control' to demonstrate all reasonably practicable control measures have been identified and implemented to reduce the risk to an acceptable level. Appendix A presents the ALARP evaluation for the activities to be conducted during the DST activities. The emissions from flaring and fuel combustion activities are not predicted to exceed relevant NEPM ambient air guidelines for NOx, Carbon Monoxide or VOC's due to low intensity of activity and isolated location.	
	Eliminate	• Remote location. • Use existing roads and tracks where practicable and ensure suit intended purpose and volume of traffic required for the DST activities.
	Substitute	• Not applicable.
	Engineering	• Implement dust control measures including use of water cart. • On completion of disturbance activities areas to be stabilised and or rehabilitated. • Stay within activity boundaries and to designated speed limits. • Ensure all equipment and machinery to be in good working order to minimise vehicle exhaust emissions. • All petroleum infrastructure including, petroleum wells, pipelines and gas processing facilities will have setback distance of at least 2 km from an existing or proposed habitable dwelling including all buildings or premises where people reside or work, schools and associated playgrounds, permanent sporting facilities and hospitals or other community medical facilities. • All flowback must be routed to a well completion vessel, with flowback sent to a separator as soon as the separator will function and then directing the separated gas to a completion combustion device with a continuous ignition device. • Flare to be equipped with an auto-ignite system. • Leak detection to be undertaken on all exploration wells six-monthly.
	Administrative	• Site environmental inductions, including protective measures to minimise dust evolution. • Implement the Methane Emissions Plan (Appendix E) • Volume of gas vented and flared to be estimated and reported as per the NGERS. • Volumes of gas emitted during the "separation flowback stage" must be measured using direct measurement as governed under the Commonwealth <i>National Greenhouse and Energy Reporting (Measurement) Determination</i> (2008) in accordance with Sweetpea GGAP. • Volume of diesel to be estimated and reported as per the NGERS.

		- Monitoring and Auditing (refer Section 8.7 and Section 8.8). - Notice to pastoral lease holders and immediate response to nuisance-related complaints.
	Personal Protective Equipment	PPE to be worn where Methane emissions pose risk to Human Health and Safety.
Acceptable	The residual risk is considered acceptable for dust and emissions. The remote location of the activity area and the measures to be implemented during the activity do not warrant further risk reduction.	

7.9 Biodiversity Management Sub-plan

Values, Risks and Outcomes	
Environmental Values	- Maintain the integrity of significant ecosystems. - Maintain habitat elements for native flora and fauna, including species protected by EPBC Act and TPWC Act. - Avoid impacts on high value habitat.
Environmental Risks (Appendix A)	- Disturbance to native fauna and stock (Risk Reference 24). - Loss or endangerment of threatened and native fauna species and stock from open storage tanks (Risk Reference 25). - Risk of Injury or mortality from vehicle strike (Risk Reference 26). - Groundwater extraction may impact on potential Groundwater Dependent Ecosystem (GDE) particularly in relation to stygofauna communities (Risk Reference 27). - Introduced Feral Animals and Other Pest Species can impact native such as reptiles, and ground-dwelling birds (Risk Reference 28).
Environmental Outcomes	No significant impact to threatened fauna, their habitat and sites of conservation significance during the DST program.
Activities	Management Tasks
Project Management, DST Operations, including camp.	- Site inductions will ensure that all personnel are aware of their obligations and know the correct procedures for fauna encounters. - Well pad areas will be fenced. - Fauna ladders are used on the storage tanks. - Personnel will be prohibited from interfering with wildlife. - Personnel will be prohibited from bringing domestic pets onto the Program area. - Avoid driving at dawn and dusk to minimise fauna mortality. - Vehicle movement will be restricted to existing access roads at a suitable speed limit. - No domestic animals brought to site. - Inspect all deliveries for potential stowaways (i.e. cane toads, ants etc that could pose biosecurity risk). - Machinery and equipment is checked for pest species. - Waste and housekeeping audits.
Water and Wastewater Storage	- Inspection of open tanks and sumps for fauna activity. - Wastewater storage areas will be monitored for: - General observations recorded of bird and other fauna around wastewater storages. - Daily checks of opened tanks and pits for fauna mortality when in operations. - Weekly checks of fauna mortality around lease pad (~50 m). - Inspect for fauna carcasses during tank and pit emptying or decommissioning. - In event trapped wildlife encountered in open tanks and sumps, implement recovery. - Any known interaction of wildlife with wastewater will be documented and if needed preventative measures in place will be modified accordingly to further reduce the likelihood of fauna interaction.

	- Solid domestic waste storage areas will need lids or protective barriers installed that effectively restrict access to pest species, including those species able to dig under or climb over barriers. - No rubbish (i.e. food packaging) to be left on drill sites. All refuse to be taken back to waste storage areas at camp. - All solid and regulated waste to be removed offsite, tracked and disposed of at an approved waste facility in accordance with the NT <i>Waste Management and Pollution Control Act</i>.		
Rehabilitation	- Retain topsoil, scrub and vegetation cleared to facilitate rehabilitation. - Refer to Appendix F.		
Implementation			
Environmental performance standards	Measurement criteria		Records
SWP7.9-1 Injury to fauna and stock during the conduct of the activity will be minimised.	- The incident management system indicates no recorded incidents involving vehicles traveling above site speed limits. - The incident management system indicates no recorded incidents of fauna trapped in open excavations or pits. - Personnel inductions include specific requirements around protection of fauna, flora and their habitat and compulsory reporting of fauna interactions.		Record any fauna deaths as result of the DST program.
SWP7.9-2 All pest and feral animal records will be maintained.	- No introduction of pest species detected. - No observed pest presence (live or dead individuals, scat traces, nesting sites). - No instances of putrescible waste found to be accessible by animals. - Rehabilitation efforts not hindered by feral animal or pest species using disturbance areas for access.		- Records of observed presence, with identification of pest if possible, will be maintained within Sweetpea's GIS and if required provided to DEPWS. - All pest outbreak incidents will be reported in Sweetpea's incident management system and corrective action initiated (where required).
Overall Residual Risk	Consequence – Moderate (2)	Likelihood – Possible (3)	Residual Risk – Low
Scientific Uncertainty	A desktop assessment of the project area revealed that five threatened fauna species may occur. The project area is highly unlikely to hold a Nationally significant population of these species, therefore the consequence of impacts to native fauna is reduced. If mitigation measures are effectively implemented the risk profile will remain low. The use of open top tanks for use in evaporation of wastewater could if consumed be a risk to fauna due to the salinity and chemistry of flowback water. The risk is minimal as the salinity levels itself acts as a deterrent from fauna consuming or interacting with wastewater.		Low (1)

	Earthen freshwater pits and drilling pits will be fenced in to minimise the chance of animals having any interaction with the contents of the pits whether freshwater or drilling fluids.	
ALARP Statement	The Baseline Land Condition Assessment has identified that the risk to vegetation, flora, fauna and habitat was ranked as 'low'. The risk mitigation measures outlined in the DST EMP meet the industry best practice requirements of the NT Petroleum Codes of Practice. Controls above best practice are unlikely to further reduce the risk to flora, fauna and habitat. Based upon the risk being ranked as a 'low', the risk is determined to be ALARP. Appendix A presents the ALARP evaluation for the activities to be conducted during the DST activities.	
	Eliminate	Minimise vegetation clearance by using existing access tracks and disturbed areas as much as possible.
	Substitute	Chemical Risk Assessment (Appendix C) completed to evaluate potential hazards of chemicals and the potential for exposures to human and environmental receptors and the exposure pathways.
	Engineering	Buffers, fencing and use of fauna ladders to reduce potential for wildlife, stock and humans being impacted by activities.
	Administrative	- Implement Rehabilitation Plan (Appendix J). - Site environmental inductions for all site personnel and contractors include the management of onsite vegetation and flora, including site personnel to stay within designated access roads and work areas. - Monitoring and Auditing (refer Section 8.7 and Section 8.8). - Records of observed presence, with identification if possible, will be maintained within Sweetpea's GIS and if required provided to DEPWS.
Acceptable	Based on the understanding of the land condition of the survey area, time of year and the additional controls to be implemented during the exploration activity, the risk of impacts to flora and fauna, vegetation and habitat is considered to be as low as reasonably practicable (ALARP) and acceptable. Controls above best practice are unlikely to reduce the risk any further and are consistent with similar activities conducted in the region.	

7.10 Social Environment and Access Management Sub-plan

Values, Risks and Outcomes	
Environmental Values	• Maintain and enhance the livelihood and well-being of local communities and towns. • Maintain the level of amenity and experience for tourists and local community members. • Allow pastoral operations to continue.
Environmental Risks (Appendix A)	• Restriction of access to pastoral operations and Traditional Owners during the works (Risk Reference 37). • Poor relations with pastoral leaseholders and other stakeholders (Risk Reference 38). • Negatively impact on existing road infrastructure and increased traffic (Risk Reference 39). • Unwanted facilitation of public access (trespass) to lease areas through the creation, improvement or use of access tracks (Risk Reference 40). • Pastoral groundwater bores suffer reduced groundwater yields (Risk Reference 5). • Visual Amenities impacted by scar left after exploration activities completed (Risk Reference 41).
Environmental Outcomes	• No significant adverse impacts to the community as a result of conduct of the regulated activity.
Activities	Management Tasks
Project Management and DST Program	• Sites of lease pads chosen to minimise impacts on pastoralist operations – including appropriate separation distances between sensitive receptors and activities (to the greatest extent possible). • Site inductions completed to ensure that all personnel are aware of and understand social constraints of working within the permit area, including conditions specified in any relevant access agreement. • All workers will be required to attend cultural awareness and code of conduct training. • Work instructions to be issued to all contractors relating to access constraints (Work Instruction – Logistics and Access). • NLC is consulted through the ministerial office and exploration agreements in place with NLC and Native Title Holders. • Consult with other relevant land users and public interest groups, such as pastoral leaseholders, Aboriginal communities, natural resource managers, conservation groups, tourism operators and other affected parties, to exchange information and facilitate good working relationships as required. • Seek advice from the NLC on appropriate persons to fulfil the role of Aboriginal Liaison Officers, who are able to speak for certain areas and on behalf of certain groups. • Provide a Work Program for each year's proposed activities to the NLC and other regulatory bodies, which includes site-specific environmental and cultural issues, likely impacts and their mitigation. • Prior to commencement onsite, communicate with pastoral leaseholders and/or provide notice of entry with details as required by any relevant access agreement or regulations. • LACA to be in place with each station prior to commencement of the regulated activity in the permit area. • Regular engagement, as necessary, with station manager and station personnel during activities to monitor potential disturbances to cattle and jointly arrive at reasonable solutions to mitigate any anticipated effects.

	- Local businesses to be assessed and utilised where possible for delivery of the exploration program. - A Sweetpea community contact number will be provided in all communications correspondence.	
Rehabilitation	- At the completion of activities and before the commencement of decommissioning activities, Sweetpea will discuss any possible residual beneficial use of the assets with the lessee. Assets may include the well pads, tank pads, access tracks, accommodation camps, gravel pits and water infrastructure. If the lessee does request for infrastructure to remain in place, the proposed infrastructure will have ownership transferred following approval by DEPWS and the Pastoral Land Board. - Where assets cannot be beneficially used, the site will be rehabilitated using assisted natural regeneration back to a safe, stable landform consistent with surrounding land use. Once Sweetpea identifies the completion of activities within an area of the permit, rehabilitation will commence within that 12-month period. - Engage with pastoral leaseholders on the rehabilitation areas to determine potential interaction with pastoral operations with the rehabilitation success.	
Implementation		
Environmental performance standards	Measurement criteria	Records
SWP7.10-1 No complaints from identified stakeholders during conduct of the regulated activity.	- Records show stakeholder consultation (i.e. communication log) ongoing during the activity. - Stakeholder communication log shows any complaints made in relation to conduct of the regulated activity are addressed. - Personnel inductions show requirements about activities authorised during conduct of the regulated activity in accordance with land access agreements.	- Record of consultation with NLC regarding Aboriginal Employment opportunities. - Record of consultation with lessee and other stakeholders. - Record of opportunities for local employment and training reflect attendance of local community members. - Record of feedback pertaining to the usage and the capacity of road infrastructure has not been negatively impacted by maintaining the level of surface usage for public roads in the vicinity of activities. - Record of groundwater take in litres/megalitres. - Land Access Agreements closed out at completion. - All complaints recorded in the Sweetpea incident reporting tool.
SWP7.10-2 No complaints from the wider community in regard to traffic management during conduct of the regulated activity.	- Records show transportation of over-width or over-dimension loads under approved NT Department of Transport permit. - Records show DIPL approved traffic management plan implemented at each access to permit area from Public Road. - The incident management system shows no evidence of incidents involving personnel driving on roads under the influence. - Records of Sweetpea’s approved journey management plans.	

SWP7.10-3 All contractors informed of regulatory obligations in relation to the regulated activity in tendering information.		- Sweetpea contracting strategies include requirements for contractors to understand regulatory permits required relevant to the contracted activities. - Sweetpea due diligence checks performed to demonstrate contractors have the appropriate licenses, permits or approvals prior to commencing works under the contract.	
SWP7.10-4 No complaints from the wider community in regard to visual amenity, noise or nuisance during conduct of the regulated activity.		- Entry to exploration area and lease pads area clearly sign-posted. - The incident management system shows no evidence of incidents involving unauthorised third-party access.	
Overall Residual Risk	Consequence – Minor (1)	Likelihood – Rare (1)	Residual Risk – Low
Scientific Uncertainty	Land Access Agreement and Native Title Exploration Agreements will be in place prior to commencing regulated activity.		Low (1)
ALARP Statement	The risk to community from the activity is ranked as ‘low’. The risk is assessed as being a ‘major’ consequence, ‘rare’ likelihood for the event. This risk is reflected by the scale of the activity, remote location and the risk mitigation measures outlined in the EMP. Due to the limited nature of the activity and the additional controls further reduce the risk to community. Groundwater supply bores will be required to conduct DST activities. The cumulative impact of groundwater extraction for all Sweetpea’s proposed regulated activities assumes a maximum usage of 299 ML per annum. Water is proposed to be extracted under a water extraction licence issued by DEPWS Water Resources Branch and extraction will be metered. Provided Sweetpea adheres to the terms of the granted water extraction license, environmental impacts to groundwater will be unlikely to occur and minor in consequence. Based upon the risk being ranked as ‘low’ and consistent with standard small-scale surface activities (regardless of industry), the risk is determined to be ALARP. Appendix A presents the ALARP evaluation for the activities to be conducted during the DST activities.		
	Eliminate	Not applicable.	
	Substitute	Not applicable.	
	Engineering	Not applicable.	
	Administrative	- Land Access Agreements - Native Title Exploration Agreement	

		- Site inductions completed to ensure that all personnel are aware of and understand social constraints of working within the permit area, including conditions specified in any relevant access agreement (refer Section 7.11). - Regular engagement, as necessary, with station manager and station personnel during activities to monitor potential disturbances to cattle and jointly arrive at reasonable solutions to mitigate any observed effects. - Monitoring and Auditing (refer Section 8.7 and Section 8.8).
	Personal Protective Equipment	Not applicable.
Acceptable	Risk to the community from the regulated activity is considered 'acceptable'. No further risk reduction warranted. Land Access and Compensatory Agreement will be in place with the host pastoral property. All groundwater take will be metered during operations.	

7.11 Cultural Heritage and Sacred Site Management Sub-plan

Values, Risks and Outcomes	
Environmental Values	- Maintain both Indigenous and non-Indigenous cultural heritage values of the region. - Protect sacred sites, culture and heritage.
Environmental Risks (Appendix A)	- Damage to or loss of culturally significant artefacts, areas or species (Risk Reference 35). - Inappropriate access to sacred sites or culturally significant places (Risk Reference 36).
Environmental Outcomes	- No significant impact to Indigenous and non-Indigenous artefacts, Aboriginal Sacred Sites, and non-Indigenous heritage sites. - Protection of culture.
Activities	Management Tasks
Project Management	- As part of Stakeholder Engagement, Sweetpea will directly engage with Native Title Holders (NTH) and the NLC. - Work Program Meetings will be provided to NTH, facilitated by the NLC, for each year's proposed activities, which includes site-specific environmental and cultural issues, likely impacts and their mitigation. - Through the NLC and NTH, Sweetpea will engage Cultural Managers to support any new land disturbance activities. - Prior to the commencement of any on-ground activities, an Authority Certificate is to be obtained from the Aboriginal Areas Protection Authority (AAPA) and conditions adhered to. - The Site Clearance process should include explanation of the proposed activities and the location and timing of all proposed activities. Opportunity should be allowed for representatives of Native Title Holders and their representative and Traditional Owners to comment on the location of proposed activities, in relation to the presence of culturally sensitive sites or archaeological sites. - Details of the proposed sites of disturbance, including sites that will be impacted by the DST program have previously been provided to the Heritage Branch of the NTG prior to on-ground activities, along with specific mitigation and management strategies for all sites identified. - Identify location of culturally sensitive areas and ensure planning and design avoids these areas.
Civil Maintenance, Program, Camp Operations and DST Operations	- Site inductions are to ensure that all personnel are aware of cultural awareness obligations, such as: - regulations applying to the area, including specific conditions on the exploration permits and agreements with the NLC - awareness of the conditions outlined in the AAPA Certificate - ensure all site personnel and contractors are aware of any potential Restricted Work Areas (RWAs) and conditions outlined in the AAPA Certificates - brief personnel on the rules and regulations and disciplinary measures for breaches of the RWAs - considerations and special procedures to be used for protection of archaeological and cultural sites in the defined work areas - ensure that site personnel and contractors report all new discoveries of archaeological or cultural artefacts, as per Sweetpea's Aboriginal Cultural Heritage Find Protocol (Appendix L) - cease work and effect practical protection measures until the area can be assessed by a Heritage specialist.

	- Avoid disturbance of the Restricted Work Areas (RWAs), unless granted permission to do so (as detailed in the conditions of the AAPA certificate). - Implement the Cultural Heritage Find Protocol (Appendix L). - Sweetpea will engage cultural managers, facilitated by the NLC, on location for the duration of clearing and land disturbance activities, including works on creek crossings.		
Rehabilitation	On practical completion of activities, areas will be rehabilitated in accordance with the Rehabilitation Plan (Appendix F) and monitoring instigated to ensure successful restoration of the activity areas (Section 8.5.2).		
Implementation			
Environmental performance standards	Measurement criteria	Records	
SWP7.11-1 No unauthorised activities within or access to a Restricted Work Area or Sacred Site.	- Records show all activities undertaken in accordance with the conditions of the relevant AAPA certificates and NLC agreements. - The incident management system shows no recorded incidents involving damage to Aboriginal sacred sites. - Personnel inductions show requirements about location of known cultural and heritage sites, exclusion areas and process for unexpected finds (Appendix D).	- Updated data will be supplied to relevant agencies as required by law and/or agreement. - A project register will be kept of all occurrences of archaeological sites identified during the Project. Updated data will be supplied to relevant agencies as required by law and or agreement.	
SWP7.11-2 No unapproved impact to known archaeological sites.	- A project register will be kept of all occurrences of archaeological sites identified during the Project. - All site personnel and contractors report all new discoveries of archaeological or cultural artefacts. All work must cease, and protection measures implemented until the area can be assessed by heritage specialist. - Records show chance find procedure implemented if artefacts located during clearing activities - No removal of artefacts in situ without prior approval from Heritage Branch NT.		
Overall Residual Risk	Consequence – Minor (1)	Likelihood – Rare (1)	Residual Risk – Low
Scientific Uncertainty	The baseline cultural heritage assessment (AECOM, 2020) as detailed in Section 4.3 and adhering to the conditions of the AAPA certificate will guide the implementation of the activities and minimise impact on Cultural Heritage. Sweetpea’s current Authority Certificate		Low (1)

	allows all of the drilling, hydraulic fracturing, testing and associated activities proposed under this EMP. However, AC2020/072 allows for 'transit only' across RWA2 at Newcastle Creek on the existing pastoral lease track, which provides one of the two possible mobilisation routes to and from the exploration lease pads. Sweetpea's contingency plan to the 'transit only' limitation for RWA2 in AC2020/072 is considered under the Civil and Water Bore EMP, which includes provision for two access options, the Western Access Track (WAT) and the Eastern Access Track (EAT).	
ALARP Statement	The risk to cultural heritage, including Sacred Sites, from the regulated activity is ranked as 'low'. The risk is assessed as having a 'minor' consequence, 'rare' likelihood event. This is due to the completion of the Cultural Heritage Assessment Report (previously provided in the Seismic EMP and summarised in Section 4.3) which provides a detailed description of the cultural heritage constraints across the exploration area and the commitment to avoid all identified archaeological sites, report any newly discovered sites to Heritage Branch of the NTG and to develop a proposed relocation protocol for artefacts with Traditional Owners. In addition, Sweetpea and their contractors aim to comply with the conditions detailed in the Exploration Agreement between the host TOs and the NLC, as well as the conditions detailed in the AAPA certificate. Sweetpea will engage cultural managers, facilitated by NLC to support all land disturbance activities. The management tasks have considered the 'hierarchy of control' to demonstrate all reasonably practicable control measures have been identified and implemented to reduce the risk to an acceptable level. Appendix A presents the ALARP evaluation for the activities to be conducted during the DST activities.	
	Eliminate	- Avoid areas of cultural heritage and significance (i.e. Restricted Work Areas and Sacred Sites detailed in AAPA certificate). - Design access to lease pads to have the minimal impact on Newcastle Creek by using existing crossing or alternative crossing (i.e. Western Access Road instead of EAT due to RWA2 requirements).
	Substitute	Not applicable.
	Engineering	Not applicable.
	Administrative	- Cultural Heritage Finds Protocol (Appendix D). - Endeavor to have cultural managers, facilitated by the NLC, to be on location for the duration of the clearing and land disturbance activities. - Site inductions are to ensure that all personnel are aware of cultural awareness obligations. - Cultural Managers nominated to provide the cultural awareness induction for the project - Ongoing consultation with Native Title Holders and the NLC. - Monitoring and Auditing (refer Section 8.7 and Section 8.8).
	Personal Protective Equipment	Not applicable.

Acceptable

The risk to cultural heritage, including Sacred Sites from the regulated activity is 'acceptable'. No further risk reduction warranted considering program will have an AAPA clearance certificate for the activities and cultural managers as part of the exploration delivery team. This approach mitigates the risk of not being able to do works, other than transit, of the Newcastle Creek crossing within the restricted working area (RWA2).

Sweetpea are committed to continuing to engage AAPA and to meeting the conditions specified in AC2020/072, and future authority certificates to ensure risks to sacred sites and identified restricted work areas are managed.

8.0 Implementation Strategy

8.1 Management Systems, Practices and Procedures

Sweetpea has a comprehensive Health, Safety and Environment Management System (HSEMS) aligned with its Health, Safety and Environment Management Policy. The key project HSE documents for the regulated activities are:

- this DST EMP
- the WOMP
- Emergency Management Procedure (Appendix K)
- Subcontractors' Quality Health Safety Environment Management Plan
- Subcontractors' Site-specific ERP
- Wastewater management Plan (Appendix F)
- Spill Prevention and Response Plan (Appendix G)
- Bushfire Management Plan (Appendix F).

8.2 Roles and Responsibilities

Overall roles and responsibilities for implementation of the DST EMP are outlined below in Table 37.

Table 37 Roles and responsibilities

Role	Responsibility
Chief Operating Officer	Sweetpea employee responsible for the overall program.
VP Operations	Sweetpea employee responsible for approvals, operations and execution.
Operations Manager	Sweetpea employee responsible for managing regulatory approvals and program changes and reporting, and supporting operations (incl. HSE). Sweetpea employee responsible for monitoring compliance of operations of all regulated and associated activities. Sweetpea employee 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.
Drilling and Completions Manager	Sweetpea employee/contractor responsible for well drilling, hydraulic fracture stimulation and well testing activities. This person is responsible for ensuring the activities are designed and implemented in accordance with the NT legislation and the NT Petroleum Code of Practice, as well as complying with the requirements detailed in the WOMP, the Civils and Water Bores (C&WB) EMP and this EMP.
Project Operations Manager	Sweetpea employee/consultant that oversees the planning and execution of the exploration program and is ultimately responsible for ensuring all other parties are working within the HSE guidelines. Sweetpea employee/consultant responsible for the operational aspects of the exploration program.
Drilling and Completions Superintendent	Sweetpea employee/consultant that oversees the execution of the drilling of the wells in accordance with the WOMP and drilling program, this EMP while taking rig calls from the onsite Company Representatives, Quality Control (QC) and Health Safety and Environment (HSE) Representative; for completions, the Ops Supt maintains the same roles and responsibilities but has the technical competencies in the field of hydraulic stimulation and

Role	Responsibility
	completions to allow him to take calls from the onsite Company Representatives, QC, and HSE.
Onsite Company Representatives, Quality Control (QC) and Health Safety and Environment (HSE) Representatives	Sweetpea employees/consultants responsible for ensuring all areas of operations are carried out in accordance with the WOMP, the C&WB EMP, and this EMP and Sweetpea HSE Policy and the exploration quality controls. This role also provides guidance and advice to site personnel on the day-to-day management of the environment and implementation of this EMP. This role also responsible for planning and implementation of Sweetpea monitoring requirements including weeds, groundwater, soil and erosion and bushfire
Civil Construction Contractor Project Manager	Civil construction contractor responsible for contractor's equipment and personnel, as well as adherence to industry practices, the C&WP EMP and this EMP.
Well site representative	Person based at the well pad responsible for ensuring all areas of drilling, completion and well testing are carried out in accordance with the WOMP and EMP and HSE Policy. All well drilling, hydraulic fracture stimulation and well testing contractors report to this position, who reports to the Drilling and Completions Superintendent.
Camp site representative	Camp operations contractor responsible for the day-to-day operations of the camp in accordance with industry practices and this EMP.
Field Crew	Contractor and subcontractors' personnel involved in the day-to-day delivery of the exploration program and for reporting on environmental aspects.
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 HSE Objectives and Key Performance Indicators

The regulated well activity and associated activities have the following HSE objectives:

- everybody returns home safe
- the impact to the environment of our activities is minimised
- senior management demonstrate proactive HSE leadership and commitment which supports a strong safety culture
- all personnel, by means of their actions and attitudes, demonstrate safety leadership
- all HSE risks are reduced to as low as reasonably practicable and the effectiveness of controls is monitored
- effective consultation and communication take place with contractors and other interested parties
- resources are available to ensure that work is carried out safely
- all incidents and near misses are reported.

To achieve these objectives the following KPIs are to be implemented (Table 38).

Table 38 HSE KPIs

Performance Indicator	Measure	Target
Personnel on site to undergo project and site inductions	Induction records	100%
Corrective actions closed out by due date	Due date	90%

Performance Indicator	Measure	Target
Incidents reported in timely manner and in accordance with Section 8.5.2	Incident reports	100%
Weekly safety meetings are held over course of activity	Minutes of meetings held and attendance register	100%
Emergency response drills	Records of drills performed	100%
HSE performance is tracked over course of activity	Weekly HSE scorecard issued to project team by HSE advisor	100%

8.4 HSEMS Induction

Sweetpea's HSEMS requires environmental and safety inductions to be delivered to all personnel prior to beginning work on the project. The environment and safety induction package to be delivered includes:

- Regulatory requirements for the area, including specific conditions on the exploration permits and agreements with the NLC.
- Pastoral Leaseholder and Aboriginal Traditional Owner requirements.
- Environmental considerations and special procedures to be used for environment protection, as well as protection of archaeological and cultural sites within the permit areas, including the discovery of unrecorded artefacts.
- HSE in remote area operations, including procedures on the safe use of vehicles, equipment and explosives, as well as first aid.
- Ensure each employee or contractor working on, or in connection with, the regulated activity are aware of his or her responsibilities in relation to the plan, including during emergencies or potential emergencies.
- Training in safe storage and handling of flammable and combustible liquids and wastewater from DST activities.

The competency of contractors will be assessed as part of the contracting qualification audit during the prestart. Competencies assessed during the contracting process include:

- Quality of EHS systems
- EHS Performance
- Internal training and auditing processes
- Existing policies, procedures, and training, including:
 - Emergency Management Procedures
 - Quality Management Plan
 - SWP-01 Weed identification and management
 - SWP-02 Refuelling procedures
 - SWP-03 Procedures for seismic line preparation
 - SWP-04 Hazardous material and waste management procedures
 - SWP-05 Incident notification and management processes.
 - SWP-06 Manual Handling
 - SWP-07 Personal Protective Equipment
 - SWP-08 Logistics Planning and Access
 - SWP-09 Code of Conduct.

8.5 Reporting

Reports on performance standards will be carried out by the Sweetpea authorised representative and distributed to Sweetpea management, the DEPWS Petroleum Operations and DITT Petroleum Operations (where relevant) for compliance as detailed in Table 39.

Table 39 Reporting Frequency

Report	Internally Recorded	External Submission
Commencement of Regulated Activity	As determined	Provide notice for the commencement of regulated activities as required by regulations and/or relevant access agreements.
Annual Environment Performance Report	Daily, Weekly and Monthly as per Table 40	Annually to DEPWS
Reportable Incident Report	As occurs	DEPWS 2 hours after the incident first occurred or - If incident not detected at time it first occurred, then within 2 hours becoming aware of the reportable incident then - Interim report no later than 3 days after the reportable incident first occurs - Final report no later than 30 days after the clean up or rehabilitation of the area affected by the reportable incident is complete
Quarterly Recordable Incident Report	As occurs	Quarterly to DEPWS
Flowback Fluid Report	As per Table 40	A report on flowback fluid required within 6 months of flowback commencing in accordance with section 37A of the <i>Petroleum Regulations 2016</i>
Produced Fluid Report	As per Table 40	A report on produced fluid required within 6 months of production testing commencing in accordance with section 37B of the <i>Petroleum Regulations 2016</i>

8.5.1 Annual Environment Performance Report

Sweetpea will prepare an annual environment performance report (AEPR) and submit to DEPWS annually to show that Sweetpea's activities are meeting the environmental outcomes and environmental performance standards committed to in their EMP.

The contents of the AEPR will include:

1. A summary of activities conducted.
2. An evaluation of Sweetpea's compliance with the Ministerial approval conditions of the EMP.
3. An evaluation of each environmental outcome and environmental performance standard within the approved EMP.
4. An evaluation of reporting requirements in accordance with the Code and Regulations.
5. Provision of all recordable and reportable incidents, including root cause analysis and related corrective actions to prevent re-occurrence.
6. Findings of all regulatory inspections and audits and related action to address the findings.

8.5.2 Incident Reporting

Reporting of incidents will be based on Sweetpea's environmental and safety impact consequence severity rating matrix presented in Section 6.1 where an assessment of the rating matrix and the degree of impact will determine whether the event is reportable or recordable. In addition, *Section 10.3* of the Spill Prevention and Response Plan (Appendix G) details the triggers for reporting a spill.

Reportable incident

In accordance with the Petroleum (Environment) Regulations 2016, Sweetpea must give the Minister notice of a reportable incident. A reportable incident is defined as an incident, arising from a regulated activity, that has caused or has the potential to cause material environmental harm or serious environmental harm.

In the event of a reportable incident, Sweetpea will notify the Minister in writing or orally as soon as practicable but no later than 2 hours after the incident first occurred or if the incident was not detected at the time it first occurred, then within 2 hours (if orally notified a written notification must be provided within 24 hours).

The notification report must outline the following:

- the contact details of the interest holder
- all material facts and circumstances
- information about any action taken to avoid or mitigate material environmental harm or serious environmental harm
- information about the corrective action that has been taken or is proposed to be taken.

Once confirmed it is a reportable incident, a written report must be provided to the Minister within three days after the reportable incident first occurs. The reportable incident report will contain:

- the results of any assessment or investigation of the incident that caused or contributed to the occurrence, including an assessment of the effectiveness of the designs, equipment, procedures and management systems that were in place to prevent the occurrence of an incident of that nature
- the nature and extent of the material environmental harm or serious environmental harm
- details of any actions taken, or proposed to be taken, to clean up or rehabilitate an area affected
- detail any actions taken, or proposed to be taken, to prevent a recurrence of an incident of a similar nature, including a root cause analysis.

A final report is to be provided within 30 days after the clean up or rehabilitation of the area affected by the reportable incident. Progress or interim reports are to be provided to the Minister no greater than every 90 days while clean up and rehabilitation activities are conducted.

Recordable incident

A recordable incident is a breach of an Environmental Objective or Environmental Performance Standard as outlined in this EMP. A report about recordable incidents must be reported to DEPWS within 15 days after the end of the reporting period (90 days unless otherwise advised by the Minister) and must relate to each reporting period for the regulated activity.

The recordable incident report will include:

- a record of all recordable incidents that occurred during the reporting period; and
- all material facts and circumstances concerning the recordable incidents that the operator knows or is able, by reasonable search or enquiry, to find out; and
- any action taken to avoid or mitigate any adverse environment impacts of the recordable incidents; and
- the corrective action that has been taken, or is proposed to be taken, to prevent similar recordable incidents.

8.5.3 Record Keeping

Record keeping is required for 5 years following the period during which the activity is in force and 15 years after the record comes into existence. Records will be maintained on Sweetpea's document filing system for easy retrieval.

The environmental records are to be maintained as detailed in Section 7.0 management sub-plans, including:

- Induction records
- Severe weather monitoring records
- Water extraction records
- Waste and waste disposal records, including waste classification testing
- Chemicals and wastewater storage records
- Weed inspection and treatment records
- Fauna observations and mortality records
- Non-compliance and corrective action records
- Internal audits and inspection records
- Management of change records.

8.6 Incident Management

The Spill Prevention and Response Plan (Appendix G) integrates with the project Health, Safety and Environment Plan and the Emergency Response Plan (Appendix K).

These plans provide the details required for emergency response and preparedness during the DST activities, including responsibilities and reporting arrangements; and the interaction between Sweetpea, the contractors and key third parties (i.e. pastoral properties or regulators).

Incident reporting and investigation provides the mechanism to prevent a recurrence. Personnel are required to proactively report all reportable and recordable incidents, near-misses and identification of potential hazards.

Sweetpea uses an incident management and reporting system. Any environmental incident, near miss or observation is reported through the incident reporting system. All personnel are encouraged to report minor events to act as an alert to environmental risks and to maintain a program of continual improvement.

At the conclusion of the activities Sweetpea will provide a summary of the environmental incidents that occurred over the course of the regulated activity to DEPWS.

8.7 Environmental Monitoring

The project manager, operating company representative and the DST contractor's operation manager shall ensure each element of the activities are monitored and that the appropriate environmental protection/procedures are in place. Monitoring requirements for each environmental factor as outlined in the aspect-specific Sub-plans above (Section 7.0).

The HSE manager shall also undertake random site inspections and direct such action as may be considered necessary to protect, minimise or rectify any environmental concerns.

Table 40 provides a summary of the environmental monitoring program to be followed for regulated well activities and associated activities.

Table 40 Summary of environmental monitoring program

Monitoring Requirements	Frequency	Person Responsible	EMP Section
General requirements			
Monitoring local weather, bushfire and climate information	Daily	Operations Manager or delegate	Section 7.3, Section 7.5, Section 7.6, Appendix B, Appendix F and Appendix I.
Monitoring seismic events during HFS operations from https://earthquakes.ga.gov.au	During HFS operations	Operations Manager or delegate	
Monitoring of the 7-day forecast to determine the works program around the forecasts. Significant Rainfall event Monitoring.	7-day forecasting daily during wet season operations and weekly during dry season operations to identify when additional procedures need to be implemented.	Operations Manager or delegate	
Induction records to be retained that demonstrate what was covered and who was inducted.	Ongoing	HSE Representatives	Section 8.4
Risk analysis review of monitoring program outcomes.	Annually, or as required due to incidents or events.	Operations Manager or delegate, HSE Representatives	Section 8.8
Calibration of monitoring equipment to assess the performance and accuracy of the equipment used.	Daily on use and in accordance with manufacturers calibration requirements (Annually)	HSE Representative	Section 7.2, Section 7.3 and Section 7.6
Groundwater Monitoring			
Water quality testing, including EC, of installed water bores by NATA accredited laboratory or by two separate laboratories for independent testing or evaluation where required	Extraction bores used for exploration activities are to be tested for analytes as described in section B4.17.1 of the Code. Control Monitoring Bore (CMB) – 6 months prior to drilling, and preferably to include both wet season and dry season samples. In circumstances, which lie outside of the control of the operator, where six months monitoring data from the control bore is not achievable before drilling, it must at minimum provide six months of data prior to hydraulic fracturing activities.	HSE Representative Project Manager	Section 7.2

Monitoring Requirements	Frequency	Person Responsible	EMP Section
	Impact Monitoring Bore (IMB) – Quarterly for one year and then annually, or as required due to incidents or events relevant to water quality.		
Record groundwater take using an approved flow meter.	Continuous recording during extraction periods for compliance with water extraction licence conditions. Records maintained weekly for reporting purposes.	Operating Company Representative	Section 7.2 and Section 7.10
Fluid levels in storages containing abstracted groundwater will be monitored to provide a measure of the stored quantity of water.	Daily during DST operations.	Well site representative	Section 7.6 and Appendix F
Real time pressure monitoring during HFS to determine if a fracture has propagated outside of design operating envelope or if indicate fluid loss.	Realtime monitoring during HFS in accordance with the WOMP.	Well site representative	As per WOMP.
Land and Surface Water			
Visual inspection and monitoring of access tracks (including creek crossings), gravel pits and exploration lease pads.	During siting of access tracks, civil construction and lease pad areas (baseline assessment). After completion of a key phase of activity. After the wet season to look for signs of erosion as part of the 6-monthly monitoring program during operations.	HSE Representative Operating Company Representative	Section 7.3 and Appendix B
Routine visual inspections of the creek and drainage line crossings and the wastewater containment system at the camp.	After more than 20 mm of rainfall in a 24-hour period. Any damage observed would be repaired as soon as practicable after the event.	Operations Manager or delegate	
Inspection of all ESC devices across the worksite and physical water quality testing (physical parameters only) at the lease pad sediment basin should be conducted prior to discharge of water offsite.	Weekly or following a rainfall event (i.e. greater than 20 mm in 24 hours). If water quality conditions meet discharge indicators, beneficial reuse of water may be considered for operational activities. External laboratory analysis only required for following triggers:	HSE Representative	

Monitoring Requirements	Frequency	Person Responsible	EMP Section
	- Work area has a known existing contaminating event in the preceding 3-months that could influence stormwater discharge quality (refer to Spill Prevention and Response Plan – Appendix G). - The visual inspection and physical water quality testing indicated potential contamination. - Where there is a sensitive receiving water body within 200 m of the discharge point.		
Rehabilitation Monitoring (including provision of spatial data to DEPWS).	Before disturbance, after disturbance and at completion of construction to ensure site stabilised. At practical completion of activities in the area rehabilitation monitoring to commence within 6 months, 1 year and 2 years, up to 5 years.	Operating Company Representative	Section 7.9 and Appendix J
Weeds			
Visual survey of weed and pest species on site and areas used/disturbed throughout Sweetpea activities.	Baseline, pre and post wet season, then 6-monthly for the first 12 months following completion of rehabilitation activities; then once annually over 5-year period.	Project Manager Operating Company Representative	Section 7.4 and Appendix H
All Plant, Equipment and Machinery to be inspected by designated and trained weed officer prior to entering and existing the station and the permit.	On arrival and exit from exploration area.	All personnel HSE Representative	
Bushfire			
The Fire Officer is to monitor ground conditions from the NAFI site and scan the surrounding area during regulated activities.	Daily	Fire Officer	Section 7.5 and Appendix I
Monitor Bushfire Alerts and Warnings issued by Secure NT and act according to the advice.			
Monitoring fuel loads within APZ to determine maintenance requirements.	In accordance with Annual Works Calendar presented in Appendix I.	Contractors Operations Manager or delegate	

Monitoring Requirements	Frequency	Person Responsible	EMP Section
Monitoring of welding activities on total fire ban days if written approval obtained by fire control officer or warden	During total fire ban days.	Welding Operator and onsite fire watchman.	
All incidents of fire should be recorded in an incident register.	As required.	Contractors Operations Manager or delegate	
Waste management			
Inspect waste storage containment systems.	Weekly, or after significant rainfall event (greater than 20 mm in 24-hour period).	HSE Representative	Section 3.10, Section 7.6, Appendix F and Appendix G
Maintain waste register, including receipts to verify waste has been properly disposed of.	As occurs and record in the waste registers and waste disposal records	HSE Representative Project Manager	
The potential for accumulation of naturally occurring radioactive materials (NORM) will be monitored to ensure risks to the health and safety of people and the environment, although elevated NORM levels associated with drilling activities is not anticipated to be significant.	NORM will be monitored during activities to ensure risks to the health and safety of people and the environment using real-time, quantitative monitoring of NORM concentrations from X-ray fluorescence data and will be included in waste classification for both onsite and offsite disposal options.	HSE Representative Project Manager	
Wastewater management			
Inspect all wastewater storage containment systems.	Weekly, or after significant rainfall event (greater than 20 mm in 24-hour period).	HSE Representative	Section 3.10.4, Section 7.6, Appendix F and Appendix G
Maintain waste register, including receipts to verify waste has been properly disposed of.	As occurs and record in the waste registers and waste disposal records	HSE Representative Project Manager	
Structural integrity of liners, pits and tanks.	Inspect for leaks daily while operational.		
Structural integrity of secondary containment while in use.	Inspect for damage or compromised weekly and daily during the wet season.		
Structural integrity of well pads transfer lines, valves and hoses.	Visual inspection for leaks daily when operational.		
Structural integrity of buried flowlines (if used)	Monitor for leaks using numerical telemetry monitoring continuously (hourly reporting).		

Monitoring Requirements	Frequency	Person Responsible	EMP Section
Structural integrity of bunded areas.	Monitor for presence of spill or rainwater daily while operational.		
Drilling Fluids – Drill cuttings and residual drilling fluids to be analysed to confirm composition and inform disposal options.	As required or to inform disposal options. Cuttings and residual fluids will be tested in accordance with Table 9 of the Code and include: - Chemicals of concern (e.g. BTEX, metals). - Radioactivity from naturally occurring organic materials (NORMs) and assessed against Northern Territory and Commonwealth legislation regarding reportable activity. Leachability testing of drill cuttings must be undertaken in accordance with the Australian Standard Leaching Procedure (Australian Standards AS4439.2 and 4439.3) by a NATA accredited laboratory. The analytes and method for drilling waste assessment for this assessment are shown in Table 9 of the Code.	HSE Representative Project Manager Suitably qualified third party	Section 3.5, Section 7.6, Appendix F and Appendix G
HFS Fluids and Produced Waters – Flowback fluid and produced waters monitoring to characterise fluid quality.	Continuous monitoring (sampling frequency of once per 24 hrs) for electrical conductivity, pH and temperature. Monitoring weekly determine quality of flowback fluid or produced water based on the wastewater chemistry analytes detailed in section C.8 of the Code until the weekly fluid is stable, then every 6 months. For each stage of HFS activity report: - Total volume of hydraulic fracturing fluid pumped. - Quality of the water used in accordance with section C.8 (only once if same water source used for each stage). - Typical and maximum concentrations of chemicals and other substances used. Monitor flowback fluid and produced waters storage weekly for all stored volumes and available freeboard, and daily telemetry inspections during wet season.	HSE Representative Project Manager Suitably qualified third party	Section 3.6, Section 3.7, Section 7.6, Appendix F and Appendix G

Monitoring Requirements	Frequency	Person Responsible	EMP Section
	Analyse fluids stored in tanks every 6 months to characterise for disposal options.		
Spill prevention and response			
Inspection of fuel and chemical storage areas, including containment and secondary containment areas and structures, containers and spill kits.	Daily visual and level monitoring of tank volume will be undertaken with well shut down procedures implemented where total tank storage freeboard is below the freeboard requirements	HSE Representative	Appendix G
Tank leak detection	Continuous to detect fluid migration through the primary containment.		
Tank structural integrity to detect potential structural weakness.	Weekly visual inspections		
Flowlines to determine whether there has been a gradual loss of volume over time.	Daily volume balance.		
Routine emergency response drills	At least once during operations, or quarterly		
Noise, vibration and lighting emissions			
Complaints reported to Sweetpea and followed up.	Immediately on receipt of complaint	Project Manager	Section 7.7
Air quality and emissions			
Visual monitoring will be carried out in the vicinity of the public roads (i.e. Carpentaria Highway) to ensure that visibility for motorists is not obscured. In this event, water carts will need to be applied to reduce dust.	Daily	HSE Representative	Section 7.8
Visual monitoring of the vegetation along the access track to ensure not being impacted by dust.	Weekly	Operating Company Representative	
Monitoring of potential fugitive emissions from well flowlines, all gas containing equipment following major maintenance.	- Personal gas detectors use ongoing during well testing and within 48 hrs of recommissioning during routine operational visits. - Potential fugitive methane emissions six monthly leak detections during non-well testing periods.	Project Manager	

Monitoring Requirements	Frequency	Person Responsible	EMP Section
Vehicle maintenance in accordance with manufacturers requirements to reduce vehicle and plant emissions during operations.	All plan and equipment records maintained for life of project.	HSE Representative	
Flaring and venting during production testing	Realtime testing during production testing and reported to NGERS.	Project Manager	
Flowline high point vents monitored for leaks.	Weekly while flowlines contain wastewater.	Project Manager	
Complaints reported to Sweetpea and followed up.	Immediately on receipt of complaint	Project Manager	
Biodiversity			
Fauna interactions with wastewater tanks, pits and surrounding lease area	- General observations recorded of bird and other fauna around wastewater storages. - Daily checks of opened tanks and pits for fauna mortality - Weekly checks of fauna mortality around lease pad (~50 m). - Fauna remains identified during tank and pit emptying or decommissioning. When fauna mortality is triggered further mitigation measures may be required including installation of small fauna-proof barrier, reflective flicker-tape or netting over tanks and pits.	HSE Representative Project Manager	Section 7.6 and Section 7.9.
Site decommissioning (all above ground infrastructure, site wastes, backfill pits and re-spread vegetation) and associated rehabilitation monitoring.	- Decommissioning within 12 months of site/infrastructure closure. - As per the C&WB EMP, within 6 to 9 months post rehabilitation (February to June), then annual monitoring after the wet season (February to June) for a period of five years. The cover of native grasses, forbs, shrubs and trees will be recorded from monitoring plots in both rehabilitated and nearby representative undisturbed areas (control sites). Rehabilitation success will be determined by previously disturbed areas exhibiting a similar proportion of species and cover to control sites.	Operating Company Representative	Section 7.9 and Appendix J

Monitoring Requirements	Frequency	Person Responsible	EMP Section
Record any fauna encounters, injuries or death as result of regulated activity on a standing fauna database.	Duration of works	Operations Manager or delegate	Section 7.6 and Section 7.9.
Records of observed presence with identification of feral animal or pest (if possible) will be maintained within Sweetpea’s GIS	Duration of works	HSE Representative Project Manager	
Social environment and access			
Record and respond to any public or pastoral leaseholder complaints and forwarded to the Project Manager	Immediately over duration of works	HSE Representative Project Manager	Section 7.10
Communication log with station manager and station personnel to monitor any potential (but unlikely) disturbance to cattle and jointly arrive at reasonable solutions to mitigate any observed effects	Daily for duration of works	Operating Company Representative	
Record groundwater take using an approved flow meter	Weekly	Operating Company Representative	Section 7.2
Cultural heritage and sacred sites			
Heritage register maintained	Duration of activities	HSE Representative Project Manager	Section 7.11 and Appendix L
Cultural Finds Procedure			
No entry to identified RWA’s or meet conditions of AAPA certificate.			
Health Safety and Environment			
Non-compliance reporting	Non-conformances reported as soon as possible, but within 24 hours at a minimum	HSE Representative Project Manager	Section 8.5
Site Inductions	All new staff and visitors to site Annual	HSE Representative Project Manager	Section 8.4
Job hazard analysis	New tasks	All personnel	Section 8.1

All regulated activity undertaken that results in a disturbance to environmental factors will be monitored with photographic records (including georeferenced photographs) and impact assessments.

GIS data will be provided outlining the nature, extent and location of disturbances on vegetation areas, with marked presence of weeds (if any) in order to provide a monitoring system. Significant locations for animal habitat (i.e. tree hollow) will be documented and georeferenced. These assessments will be used to determine that environmental outcomes and performance standards are being met.

The geospatial data used in the development of the EMP will be provided to DEPWS on submission of the EMP. This information provides the pre-disturbance condition of the activity area and will be the guide for rehabilitation at completion. In addition, spatial data files will also be provided to DEPWS in line with the environmental monitoring requirement (Table 40).

8.8 Environmental Auditing

In addition to regular monitoring as set out in this document, EMP audits will be regularly undertaken by a suitably qualified person. System deficiencies, adverse or potentially adverse environmental conditions arising from site activities may be subject to the issue of Environmental Non-conformances or Corrective Action Requests.

Sweetpea will also comply with any auditing regime set by relevant external Authorities. Table 41 presents the current Audit Schedule for the 2021 to 2024 activities.

Table 41 EP audit schedule

Frequency	Audit
Pre-start	- Pre-start checks are undertaken prior to the commencement of all activities. - Pre-start/Toolbox/Safety briefings (review of input and administration of).
Daily	- Permit to Work audits commensurate with the volume of permits issued. It is not anticipated that there will be a requirement for this on a daily basis. - Regular behavioural and health observations undertaken by Sweetpea and DST contractor personnel i.e. HSE, Sweetpea representative. - Site safety inspections: weekly and others as required or identified (joint walk around). - Major hazard work / tasks. - Safety critical equipment (i.e. fire extinguisher, communication Devices and vehicles). - Daily reports. - Safety and regulatory equipment, procedures and requirements. - Commissioning. - Site set up inspections – including impact of inclement weather considerations (e.g. cyclones and securing of facilities, flooding.).
Weekly	- Weekly audit of procedural compliance – the topic shall be selected by the Sweetpea Representative. - Site inspections: daily, weekly and others as required or identified of controls detailed in Section 7.0 management tasks and responsibilities including but not limited to dust, noise, Sacred Sites and cultural heritage sensitive areas, vehicle speed limits, complaints, fauna encounter. - Camp, secondary containment and chemical storage area inspections. - Food safety and hygiene inspections.
Monthly	- Site inspections: daily, weekly and others as required or identified. - Operational compliance checks to ensure risk management controls implemented.
Annually	Compliance audit against the EMP commitments and risks management controls.
End of project	- End of project report summary and analysis. - End of activity aggregated analysis of performance as a means of continuous improvement.
Mobilisation	- Post mobilisation audit of contractors. - Pre-move surveys.

Frequency	Audit
Trigger reviews	- Changes in safety codes, standards. - An event or incident on site or via a shared learning (Bulletin/Alert). - Performance / output. - Incidents.
Emergency drill	Monthly at times to be agreed at site.
Competencies	Ongoing performance of personnel on site – assuring their competencies.
HSEMP audit	Review of EMP performance and environmental approval compliance: - Prior to commencement of activities. - At least one audit per annum, and preferably undertaken within one month of commencement of activities.

8.9 EMP Management of Change Process

A management of change process will be implemented should the EMP need to be revised (regulation 17) or there is a modification to the regulated activity (regulation 22) or where there is an identified change to the existing environment (regulation 23). The *Changes to Onshore Petroleum Environment Management Plans Guideline* (DEPWS, 2021) provides key questions to determining the applicable change process (Figure 31).

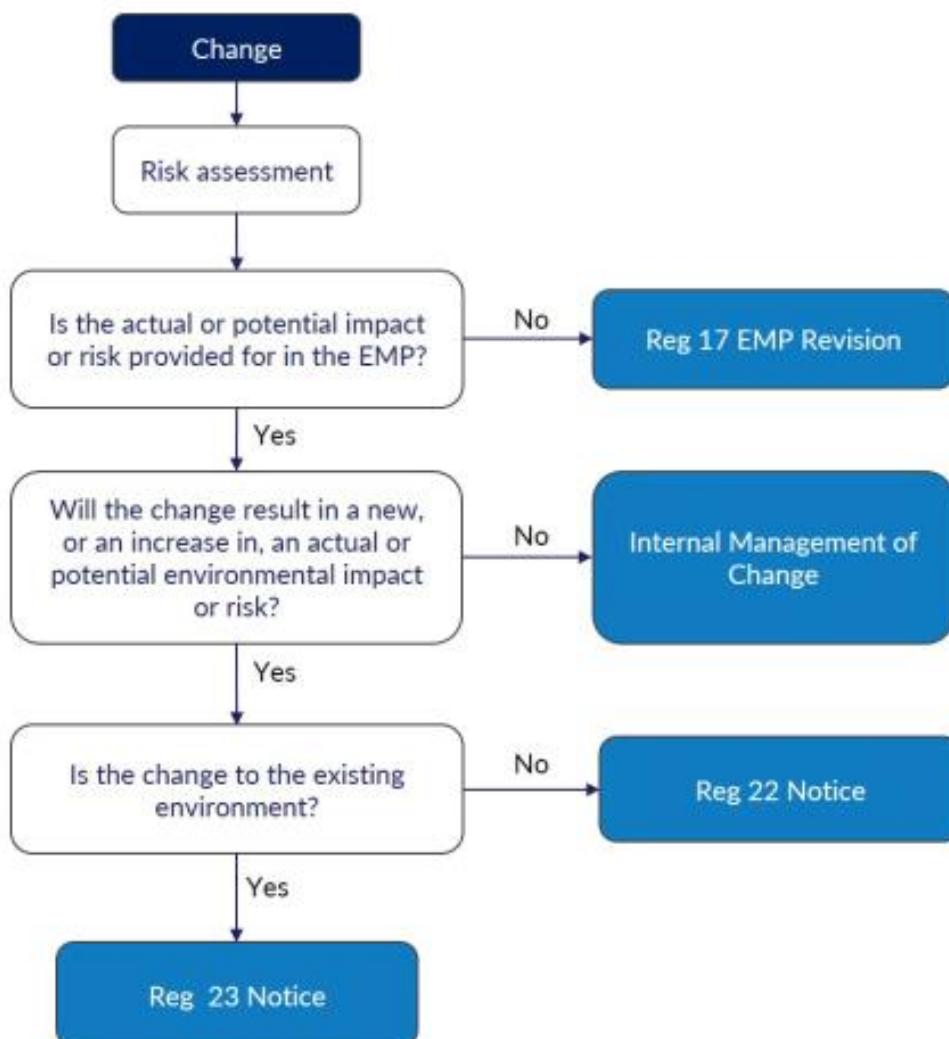


Figure 31 Key questions for determining the applicable change process (DEPWS, 2021)

Sweetpea management shall review the EMP and its activities as required to ensure that they meet operational requirements and relevant environmental legislation and standards. The EMP will be routinely reviewed during the delivery of each work program and any deviation from what is described will be managed internally where the change does not result in an increase in or new impact or risk and those impacts and risks are already provided for in an approved EMP.

Internal management reviews of the EMP may occur as a result of the following:

- identification of opportunities for improvement
- following recommendations from audits
- changes to operations or activities within the permit areas
- changes to legislation.

Implementation of the EMP will be continually monitored and the EMP reviewed with regards to monitoring and audit results, complaints, employee and stakeholder feedback and change to the program. A formal internal management review will be undertaken annually.

An EMP change register would be maintained to demonstrate that such changes were supported by a risk assessment in advance of the change and documented.

Changes to the EMP that require revisions under regulation 17, or notices under regulation 22 and 23 will be managed as follows:

- **Revision to the EMP** - A revision to an approved EMP will only be required if the change results in an increase in, or new, impacts and risks and that these are not already considered in the EMP. For example, this could be the inclusion of a new exploration lease pad in addition to those already approved under the EMP.

Revision of the EMP under regulation 17 would be required to be resubmitted under regulation 6 for approval.

- **Modification of the regulated activity** - If there is any deviation or change to the manner in which a regulated activity will be conducted or managed, for which environmental impacts and risks have already been described then a modification notice would be required. Example of a modification to a regulated activity include:
 - A deviation that may change the location and/or extent of land clearing in the same habitat type or landform when environmental impacts have already been considered for clearing of the same habitat type.
 - Modify how the regulated activity is to be conducted, while maintaining compliance with mandatory requirements and maintaining an ability to achieve the stated environmental outcome
 - Material modification when regulated activity is to be conducted or commenced on that stated in the EMP such as delay to rehabilitation commencement.

Sweetpea must give the Minister notice that specifies details of the proposed modification within 30-days of the modified activity occurring.

- **Change to the existing environment** – If there is a change in the existing environment that is described in a current EMP and the change will not require a revision of the plan, Sweetpea must give the Minister notice that specifies details of the change. Example of change to the existing environment is the identification of a new groundwater aquifer determined by Water Resources Division or where pastoral activities have included a new access track or fire break where previously was vegetated.

Sweetpea must give the Minister notice within 30-days of becoming aware of the change to the environment.

8.10 Notice of Commencement

Sweetpea will notify the Minister and the key Stakeholders (owners and occupiers of pastoral property within EP136, Traditional Owners, Gas Pipeline Operator and neighbouring EP holders) of the proposed date of commencement of DST activities through the submission of a letter. The timing of the submission will be in accordance with the Code of Practice.

A notice of commencement to the DITT will be issued to the petroleum operations team prior to commencement of DST activities being undertaken. This will be delivered through the department email under: petroleum.operations@nt.gov.au.

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