

# **FIELD ENVIRONMENT MANAGEMENT PLAN**

## **Dingo Gas Field and Surprise Oil Field For Operations and Maintenance Activities**

March 2020

### **Review record**

<b>Date</b>	<b>Reason for issue</b>	<b>Author</b>	<b>Reviewer</b>	<b>Approver</b>
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23/03/2020	Updated to address DENR comments	R. Uilly	H. Carney	B. Visser

## DISCLAIMER

This is a Central Petroleum Limited (CP) document and it has been prepared using the skill and care expected from professional scientists to provide factual and technical information and reasonable solutions to identified risks.

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CP is the custodian of this FEMP and has overall responsibility for its implementation, compliance and revision.

CP will ensure that this FEMP is reviewed and if necessary revised:




- When there is a significant change to normal operations at the DGF and SOF not covered by this FEMP
- When there is a significant change to the regulatory framework within which the operations are carried out
- When recommendations or comments from the government approval process are made
- If there is a change in circumstances (e.g. a new or increase in environmental impact or risk)
- In the event an incident causing significant environmental harm or loss occurs
- Five yearly after acceptance, unless superseded by another plan.

This document shall not be issued and/or revised without the express approval of the CP General Manager of Operations for the DGF and SOF. Likewise, any amendments to this document shall be checked and approved by the CP General Manager of Operations for both fields.

## DOCUMENT DETAILS

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## DOCUMENT CONTROL

Approvals	Company	Name	Signature	Date
<b>Author:</b>	Enviro Value	Rob Ullly		23/03/2020
<b>Reviewer:</b>	Central Petroleum	Heath Carney		23/03/2020
<b>Custodian:</b>	Central Petroleum Limited	Ben Visser		23/03/2020

<b>GLOSSARY</b>	
<b>AAPA</b>	Aboriginal Areas Protection Authority
<b>ALARP</b>	As Low As Reasonably Practicable
<b>APIA</b>	Australian Pipeline Industry Association
<b>APPEA</b>	Australia Petroleum Production and Exploration Association
<b>BECGS</b>	Brewer Estate City Gate Station
<b>CLC</b>	Central Land Council
<b>CP</b>	Central Petroleum Limited
<b>DENR</b>	Department of Environment and Natural Resources
<b>DGF</b>	Dingo Gas Field
<b>DAWE</b>	Department of Agriculture, Water and Environment
<b>DLRM</b>	Department of Land and Resource Management
<b>DoEE</b>	Department of the Environment and Energy
<b>DPIR</b>	Department of Primary Industry and Resources
<b>EIS</b>	Environmental Impact Statement
<b>EMP</b>	Environmental Management Plan
<b>EMS</b>	Environmental Management System
<b>EPA</b>	Environment Protection Authority
<b>EPBC Act</b>	Environment Protection and Biodiversity Conservation Act 1999
<b>ESD</b>	Ecologically Sustainable Development
<b>ESD</b>	Emergency Shut Down
<b>FEMP</b>	Field Environment Management Plan
<b>GIS</b>	Geographic Information System
<b>HS&amp;E</b>	Health, Safety and Environment
<b>HS&amp;E IP</b>	Health, Safety and Environmental Improvement Plan
<b>HS&amp;E MS</b>	Health, Safety and Environmental Management System
<b>IECA</b>	International Erosion Control Association
<b>IMS</b>	Incident Management System
<b>ISO</b>	International Standards Organisation
<b>L6</b>	Production Licence 6
<b>L7</b>	Production Licence 7
<b>LES</b>	Low Ecological Services Pty Ltd
<b>m</b>	Meter
<b>MNES</b>	Matters of National Environmental Significance
<b>NAFI</b>	North Australia & Rangelands Fire Information
<b>NT</b>	Northern Territory
<b>PER</b>	Public Environment Report
<b>PMP</b>	Production Management Plan
<b>PMST</b>	Protected Matters Search Tool
<b>RCCA</b>	Register and Closeout of Correcting Actions
<b>SDS</b>	Safety Data Sheet
<b>Significant Rainfall</b>	Any rainfall event over 10mm in 24 hours
<b>SOCS</b>	Site of Conservation Significance
<b>SOF</b>	Surprise Oil Field
<b>TO</b>	Traditional Owner

<b>GLOSSARY</b>	
<b>TPWC Act</b>	Territory Parks and Wildlife Conservation Act
<b>WoFS</b>	Water observations From Space
<b>WoNS</b>	Weeds of National Significance

# 1.0 Executive Summary

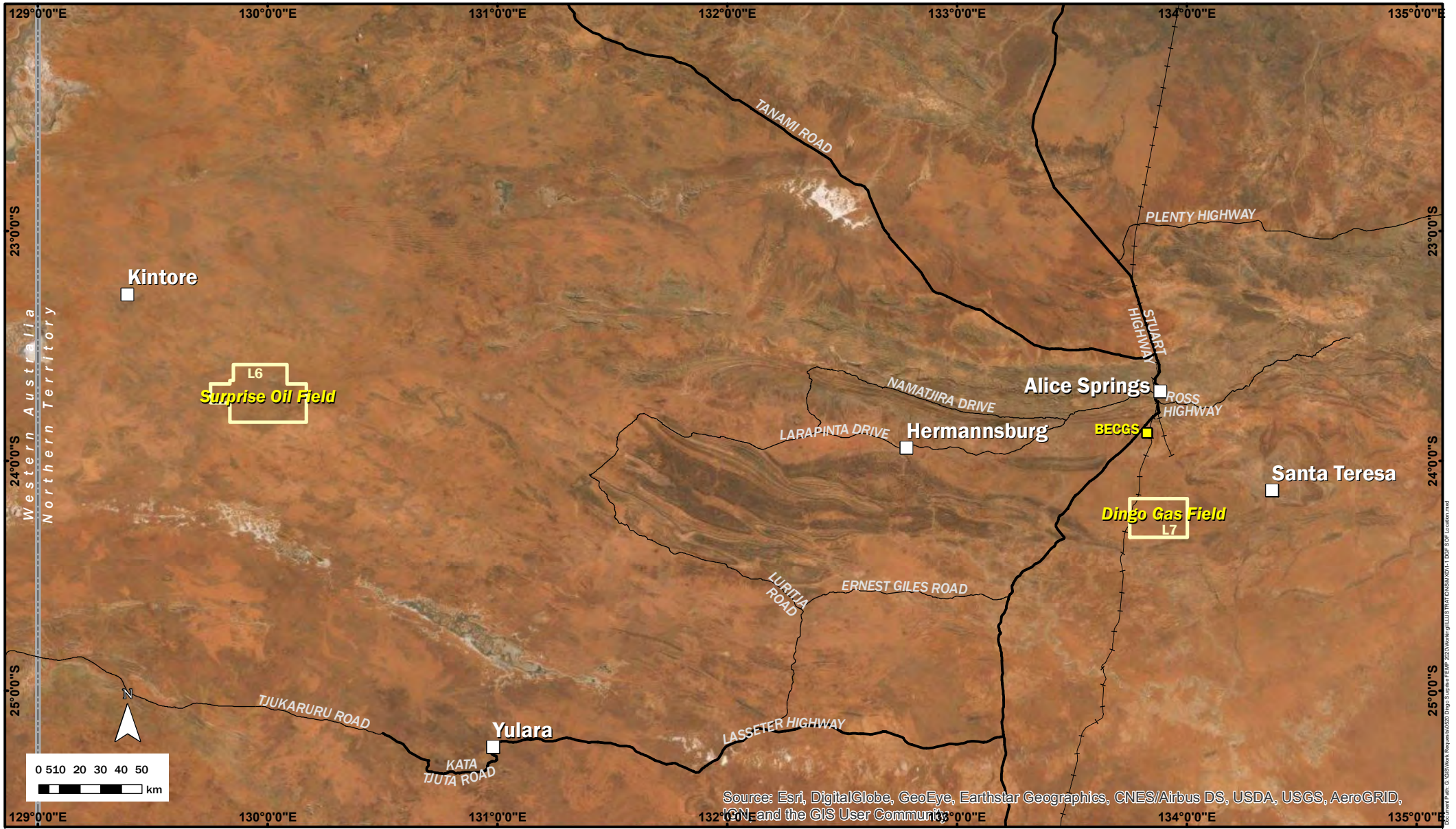
## Introduction

Central Petroleum Limited (CP) operates the Dingo Gas Field (DGF) and Surprise Oil Field (SOF) under Production Licence 7 (L7) and Production Licence 6 (L6), respectively. This Field Environmental Management Plan (FEMP) has been developed for the operations and maintenance activities associated with the DGF and the SOF.

The DGF is located in the northeast of the Amadeus Basin, approximately 60 km south of Alice Springs, Northern Territory (NT) (Figure 1-1). The DGF area is accessed from Alice Springs via the unsealed Maryvale Road South. The operations at DGF commenced in 2015 and currently supply gas to the Owen Springs Power Station via the BECGS facility and Dingo pipeline (Pipeline Licence 30).

The SOF is also located in the Amadeus Basin, approximately 450 km west of Alice Springs (refer to Figure 1-1). Access to the field from Alice Springs is via sealed and unsealed public roads and existing access roads constructed by CP during exploration of the area. The nearest populated community of Kintore lies approximately 80 km to the north-west of SOF. The SOF supported two wells, with only one well producing oil into a small tank farm located on the site. The field commenced production in March 2014, producing approximately 87,000 barrels of oil until 30<sup>th</sup> June 2015. In August 2015 the decision was taken to shut in the oil production from this field.





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 Map Scale is 1:2,510,824 when printed at A4  
 Coordinate System: GCS GDA 1994

**Figure 1-1: Location - Surprise and Dingo Fields**

- Town / Location
- Brewer Estate City Gate Station
- Permits
- Principal Road
- Secondary Road
- + Railway

Level 7, 369 Ann St Brisbane QLD 4000  
 T +61 3181 3800 F +61 3181 3855  
 W centralpetroleum.com.au



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## Description of the Environment

A summary of the physical and social environment for both fields is provided in Table 1-1.

**Table 1-1 Summary of the Environment**

Attribute	DGF	SOF
<b>Climate</b>	Semi-arid	Arid
<b>Bioregion</b>	Finke	Great Sandy Desert
<b>Sites of Conservation Significance</b>	None within. Closest is the Greater MacDonnell Ranges located to the South-west	None within. Closest is the Cleland Hills and Surrounds located to the East
<b>National Parks</b>	None	None
<b>Land Systems</b>	<ul style="list-style-type: none"> <li>Ewaning</li> <li>Simpson</li> <li>Sonder</li> </ul>	<ul style="list-style-type: none"> <li>Simpson</li> <li>Atlas_BA27</li> </ul>
<b>Geology</b>	The two main geology units are Qsp6 – Aeolian Sand and TI Chalcedonic limestone, siltstone and calcareous sandstone containing freshwater gastropods	The geology surrounding the SOF area comprises extensive sand sheets and dune fields, sometimes with calcrete rises, and minor areas of sandstone or siltstone ridges and hills in the south
<b>Soils</b>	Alkaline and neutral red earths, with lesser areas of deep sands	Predominately red earthy sands on broad interdune plains and red siliceous sands on dunes
<b>Surface Hydrology</b>	Situated within both the Finke River and Todd River Basins, both of which are within the Lake Eyre catchment.	No major watercourses in the area.
<b>Hydrogeology</b>	<p>The DGF sources gas from a reservoir within the Arumbera Sandstone, which is at a depth of 2,720m and 310m in thickness. The separation between the reservoir and closest usable aquifer in the area, the Mereenie Sandstone is at 650m deep and 350m thick is significant. The nearest active groundwater bore is RN002943 on the western edge of the lease.</p> <p>Several current bores within 10 km of the southern edge of the DGF provide water for stock watering on Orange Creek and Deep Well stations.</p>	Oil production for SOF occurred from the Stairway Sandstone, the Stairway Sandstone is separated from the Mereenie Sandstone by around 170m of the Stokes Siltstone, which is considered an aquitard. Groundwater bore (RN014297), located approximately 10 km north-west of the SOF is a water supply bore for an indigenous outstation at Nguman. Four investigation bores are drilled within the SOF
<b>Vegetation Communities</b>	Predominately Hummock Grasslands	Predominately Hummock Grasslands



Attribute	DGF	SOF
<b>Flora of Conservation Significance</b>	Six Flora of Conservation Significance may be present in the DGF	Flora of Conservation Significance considered unlikely to be present within the operational areas
<b>Introduced Flora and Weed Species</b>	Buffel grass is present within the operational areas. Five declared weeds have been detected within 20 km of the DGF. Seven priority / alert weeds are listed under the Alice Springs Regional Weed Management Plan	Buffel grass is present in operational areas. No declared weeds have been detected within 20 km of the SOF. Seven priority / alert weeds are listed under the Alice Springs Regional Weed Management Plan
<b>Fauna of Conservation Significance</b>	Thirty-one species of Fauna of Conservation Significance may be present within the DGF	Eighteen species of Fauna of Conservation Significance may be present within the SOF
<b>Introduced Fauna and Pest species</b>	Several pest fauna species identified as potentially occurring within the DGF	Several pest fauna species identified as potentially occurring within the SOF
<b>Fire History</b>	Generally low risk due to low fire fuel load	Generally low risk due to low fire fuel load
<b>Surrounding Land Tenure</b>	Pastoral	Environmental conservation
<b>Surrounding Populated Places</b>	Alice Springs approximately 40 km to the north Santa Teresa approximately 40 km to the east Titjikala (Maryvale) approximately 40 km to the south <ul style="list-style-type: none"> <li>Hermannsburg approximately 100 km to the west</li> </ul>	Kintore approximately 80 km to the north-west  Alice Springs approximately 450 km to the west
<b>Cultural Heritage</b>	No listed heritage sites	No listed heritage sites
<b>Heritage Areas identified EPBC Protected Matters Search Report</b>	No National Heritage Places	No National Heritage Places
<b>Archaeological Surveys</b>	Previously completed prior to construction of the facilities. Ground disturbance will be limited to within original disturbance footprint.  No additional surveys required	Previously completed prior to construction of the facilities. Ground disturbance will be limited to within original disturbance footprint.  No additional surveys required
<b>CLC Sacred Sites Clearance Certificate</b>	CLC 2017, Production Agreement – Dingo Gas Field.	CLC Permit 57778.
<b>Aboriginal Areas Protection Authority (AAPA) Certificate</b>	2014/49 granted to Magellan Petroleum (NT) Pty Ltd, for Dingo Wells 1, 2 and 3 and associated gas flowline and access track	No AAPA certificate. CP have applied for a certificate for this field.

Attribute	DGF	SOF
	No APPA certificate for Dingo well 4 or its access track CP have applied to amend the certificate to update the holder details and include all activities.	

## Description of the Activity

The DGF is an operating gas field and this FEMP covers the activities to undertake operational and maintenance activities through to decommissioning and rehabilitation.

SOF is a suspended, inactive oilfield. The 2 wells have been suspended and the facilities are in care and maintenance. This FEMP covers the activities to manage the facility in care and maintenance through to decommissioning and rehabilitation.

A summary of the activities for the DGF and SOF are provided in Table 1-2.

**Table 1-2 Description of Activity**

Activity	DGF	SOF
<b>Permit</b>	Production License 7	Production License 6
<b>Basin</b>	Amadeus Basin	Amadeus Basin
<b>Location</b>	Map of location provided in Figure 1-1	Map of location provided in Figure 1-1
<b>Well Status</b>	<ul style="list-style-type: none"> <li>• Dingo #1 well is suspended</li> <li>• Dingo #4 well is plugged and abandoned</li> <li>• Dingo #2 well and Dingo #3 well are in production</li> </ul>	Both the Surprise 1 Re-entry H ST1 and Johnstone West-1 wells are suspended.
<b>Operations and maintenance Activities</b>	<ul style="list-style-type: none"> <li>• Civil maintenance (including repairs) of the following:                             <ul style="list-style-type: none"> <li>○ existing roads, access tracks, well pads, hardstand areas (including associated surface facilities)</li> <li>○ gas flowlines connecting existing wells (including associated surface facilities)</li> </ul> </li> <li>• Well shutdown maintenance activities including cold venting</li> <li>• Well head maintenance and function testing (not to include the removal of any permanent barriers). Examples of this include:                             <ul style="list-style-type: none"> <li>○ Pressure testing</li> <li>○ Wireline activities (e.g. downhole gauges)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Civil maintenance (including repairs) of the existing roads, access tracks, lease pads (including associated surface facilities)</li> <li>• Well head maintenance and function testing (not to include the removal of any permanent barriers). Examples of this include                             <ul style="list-style-type: none"> <li>○ Pressure testing</li> <li>○ Wireline activities (eg. downhole gauges)</li> <li>○ Well head and valve servicing (eg. testing and lubrication)</li> <li>○ Well integrity treatment with corrosion inhibitors and biocides</li> </ul> </li> <li>• Storage, handling and transportation of chemicals, dangerous goods, hazardous materials and substances</li> </ul>

Activity	DGF	SOF
	<ul style="list-style-type: none"> <li>○ Well head and valve servicing (e.g. testing and lubrication)</li> <li>○ Well integrity treatment with corrosion inhibitors and biocides</li> <li>● Well workover</li> <li>● Well suspension / decommissioning</li> <li>● Storage, handling and transportation of chemicals, dangerous goods, hazardous materials and substances</li> <li>● Waste management</li> <li>● Environmental monitoring (including weed surveys)</li> <li>● Weed management and control</li> <li>● Rehabilitation activities.</li> </ul>	<ul style="list-style-type: none"> <li>● Waste management</li> <li>● Well decommissioning</li> <li>● Environmental monitoring (including weed surveys)</li> <li>● Weed management and control</li> <li>● Rehabilitation activities.</li> </ul>
<b>Access</b>	No additional roads or tracks are required.	No additional roads or tracks are required.
<b>Camp</b>	There is no camp in at DGF. Operators and contractors stay in Alice Springs.	Onsite camp that is utilised during site visits only.
<b>Water use</b>	Any water required for operations and maintenance activities at DGF will be sourced from the council in Alice Springs and trucked in by local registered water carters.	Water is either bought to site by personnel or sourced from a local CP bore (RN018851) for the camp water supply at SOF.
<b>Waste management</b>	Waste is segregated and a licenced contractor is used to transport listed waste to the appropriate waste/recycling facilities.	<p>Any non-listed waste produced during site visits is brought back to the DGF for disposal.</p> <p>Listed wastes are to be stored on site and a licenced contractor is used to transport listed waste to the appropriate waste / recycling facilities.</p>
<b>Produced water</b>	Produced water from the DGF is managed at the BECGS Facility.	No water being produced.
<b>Storage of hazardous fluids chemicals</b>	All chemical and hazardous materials are stored in compliance with their respective SDS. SDS are kept on site for any chemical or hazardous material stored, handled or used on site by CP staff and contractors.	All chemical and hazardous materials are stored in compliance with their respective SDS. SDS are kept on site for any chemical or hazardous material stored, handled or used on site by CP staff and contractors.
<b>Closure and rehabilitation</b>	Closure and rehabilitation will be undertaken in line with the Rehabilitation Plan contained in the FEMP	

The summary provided in Table 1-3 outlines the residual risks associated with the operations and maintenance activities of the DGF and SOF. This summary indicates that the controls are effective and have been successfully managed to ALARP. The residual risk has been accepted by CP.

**Table 1-3 Count of residual risks for the operations at DGF and SOF**

Count	Residual Risk			
	Low	Medium	High	Very High
	23	9	0	0

The key environmental aspects and the risk sources associated with the operations and maintenance works are shown in Table 1-4.

**Table 1-4 Risk Assessment Summary**

Environmental Aspect	Risk Source
Flora and Fauna	<ul style="list-style-type: none"> <li>• Civil / maintenance works:                             <ul style="list-style-type: none"> <li>○ Earthworks</li> <li>○ Light and heavy machinery operation</li> <li>○ Maintenance of assets (e.g. wells, access tracks, pipeline, etc)</li> <li>○ Rehabilitation</li> <li>○ Unintended introduction and / or spread of weeds and invasive species.</li> </ul> </li> <li>• Uncontrolled fires as a result of CPs activities via:                             <ul style="list-style-type: none"> <li>○ Spill and ignition of flammable substances at any assets</li> <li>○ Loss of containment from the wells</li> <li>○ Uncontrolled ignition source.</li> </ul> </li> <li>• Flooding due to CP activities e.g. water diversion.</li> <li>• Storage and transportation of domestic wastes.</li> </ul>
Land	<ul style="list-style-type: none"> <li>• Erosion due to maintenance work</li> <li>• Earthworks required for maintenance</li> <li>• Movement of heavy machinery and vehicles</li> <li>• Loss of containment (including spills or leaks) – facilities and well sites</li> <li>• Spill or leak from the use, transportation, handling and storage of diesel, fuel, oils and chemicals</li> <li>• Overflow of skimmer and/or evaporation pond due to heavy rainfall events</li> <li>• Release of oily and or saline water outside of containment area</li> <li>• Incorrect waste segregation and disposal (including hazardous waste).</li> </ul>
Water (Surface and Groundwater)	<ul style="list-style-type: none"> <li>• Earthworks required for maintenance</li> <li>• Unauthorised use of groundwater resources</li> <li>• Subsurface loss of containment – well sites</li> <li>• Spill or leak from the use, transportation, handling and storage of workover fluids, diesel, fuel, oils and chemicals</li> </ul>

Environmental Aspect	Risk Source
	<ul style="list-style-type: none"> <li>• Flooding</li> <li>• Overflow of interceptor and/or evaporation pond due to heavy rainfall events</li> <li>• Incorrect hazardous waste segregation and disposal</li> <li>• General use of roads and access tracks for routine operations e.g. wells monitoring.</li> </ul>
Air	<ul style="list-style-type: none"> <li>• Movement of heavy machinery and vehicles</li> <li>• Explosion or fire on lease (during operations)</li> <li>• Loss of containment of gas on workover or testing.</li> </ul>
People and Community	<ul style="list-style-type: none"> <li>• Explosion or fire in the operating lease area</li> <li>• Lack of consultation with stakeholders</li> <li>• Adverse community perception to activities</li> <li>• Traffic increase due to activities.</li> </ul>
Heritage	<ul style="list-style-type: none"> <li>• Earthworks required for maintenance</li> <li>• Movement of heavy machinery and vehicles</li> <li>• Bush fire</li> <li>• Increased public access to remote areas.</li> </ul>

All risks associated with the operations and maintenance activities have been successfully mitigated with CP's control measures and managed to ALARP, and are acceptable.

The identified stakeholders for DGF and SOF are the Ntaria Aboriginal Land Trust, Central Land Council (CLC), Department of Environment and Natural Resources (DENR) and Department of Primary Industry and Resources (DPIR). CP will follow the current and ongoing consultation process for these established facilities.

The key contact details for DGF and SOF are provided in Table 1-5.

**Table 1-5 Key Contacts**

<b>Company Name</b>	Central Petroleum Limited
<b>ACN/ABN</b>	ABN: 95 081 592 734
<b>Street Address</b>	Level 7/369 Ann Street
<b>Postal Address</b>	PO Box 292 Brisbane, Qld 4000
<b>Telephone</b>	+61 (0)7 3181 3800
<b>Facsimile</b>	+61 (0)7 3181 3855
<b>Key Contact</b>	Ben Visser
<b>Email</b>	<a href="mailto:info@centralpetroleum.com.au">info@centralpetroleum.com.au</a>
<b>Website</b>	<a href="http://www.centralpetroleum.com.au">www.centralpetroleum.com.au</a>

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## 2.0 Introduction

Central Petroleum Limited (CP) operates the Dingo Gas Field (DGF) and Surprise Oil Field (SOF) under Production Licence 7 (L7) and Production Licence 6 (L6), respectively. This document forms the Field Environment Management Plan (FEMP) for both operations.

### 2.1 Dingo Gas Field

The DGF is part of the L7 Production License, granted on 7 July 2014 and covers the same region as Retention License No. 2 did previously. A total of 4 wells have been drilled in the field; Dingo #1, #2, #3 & #4. Dingo #1 gas well is not capable of production due to a collapsed casing caused by salt diapir movement. It has been suspended and may be re-entered at a later stage. Dingo #4 encountered saline water in the reservoir and was plugged and abandoned.

Dingo wells #2 & #3 are currently operational and supplying gas to the Power and Water Corporation of the Northern Territory (NT) via the Dingo Gas Pipeline (PL30). This gas is then on-sold to Territory Generation for use at the Owen Springs Power Station.

#### 2.1.1 Field History and Overview

The DGF was developed to supply the Owen Springs Power Station and may also feed into the 145 km Alice Springs to Palm Valley gas pipeline. The Alice Springs to Palm Valley gas pipeline connects to the 1,512 km Amadeus Gas Pipeline to Darwin.

The gas from the DGF is natural gas made up of 86% methane, 3% ethane and a mix of other gases such as propane, nitrogen, butane. The low proportion of other gases makes it a 'dry' gas.

The DGF was developed and designed to produce and treat up to 2.0 petajoules (PJ) per annum of gas which is equivalent to 36,082 tonnes per year. This is expected to supply over half of Alice Springs's current energy demand of 3.3 PJ per annum for the next 20 years, depending on sales demand.

#### 2.1.2 Location

The DGF is located in the northeast of the Amadeus Basin, approximately 60 km south of Alice Springs (refer to Figure 2-1). The DGF area is accessed from Alice Springs via the unsealed Maryvale Road South for 46 km until the Santa Teresa turn off to the railway access track which turns left off the Maryvale Road and then goes directly to the edge of the DGF.

Any visitors or contractors accessing the DGF must first report to the CP offices at BECGS. Access to the BECGS is by 20 km of sealed road from Alice Springs, heading south along the Stuart Highway, then turning left into the Brewer Industrial Estate.

### 2.2 Surprise Oil Field

The SOF is a development that managed production from a horizontal production well (Surprise 1 Re-entry H ST1) into the Lower Stairway Sandstone. The original well, Surprise 1 was suspended on 10 December 2010 before reaching the target depth due to mechanical issues with the rig. The well was re-entered on 11 November 2011 and completed as Surprise 1 Re-entry on 20 December 2011. The well was re-entered again on 21 December 2011 and the horizontal production hole was drilled with well suspended as Surprise 1 Re-entry HST 1 prior to production on 13 January 2012. The Surprise 1 Re-entry HST 1 well produced oil into a



small tank farm located within the lease pad. The field commenced production in March 2014, producing approximately 87,000 barrels of oil to 30 June 2015. Production was suspended from August 2015.

The Johnstone West 1 well is also located in the SOF. The well was drilled as a vertical test of a separate structure to the northwest of the Surprise field. The well targeted the Lower Stairway Sandstone, Horn Valley Silestone and Pacoota Sandstone and was suspended on 20 September 2010. The well was perforated in the Horn Valley Siltstone and Lower Stairway Sandstone with no production of hydrocarbons.

## 2.2.1 Field History and Overview

Historically, the SOF produced oil from the Surprise 1 Re-entry HST 1 well into a small tank farm located within the lease pad. The production process involved pumping fluid to surface where it was separated into its oil, water and gas components before storage and trucking of the oil.

The suspended production facility at the Surprise 1 Re-entry HST 1 well site comprises:

- Hydraulic well head pump and hydraulic power unit
- Oil heater treater
- Oil storage (production tanks and reject oil tanks)
- Skimmer tank
- Lease automated custody transfer skid
- Load out facilities
- Evaporation pond.

Ancillary equipment includes:

- Power generator
- Safety showers
- Utility air and instrument air supply
- Emulsion breaker chemical injection
- Pumps
- Gas vent
- Diesel fuel tank
- Workshop and equipment store
- Office and accommodation facilities
- Water bore (RN018851, yield 2 litres per second, drilled March 2012)
- Remote alarming.

Previously a portable chemical, dangerous goods, hazardous materials / substances store and reverse osmosis water treatment plant were located within the production facility, these have both been transferred back to the BECGS whilst the facility has been suspended.

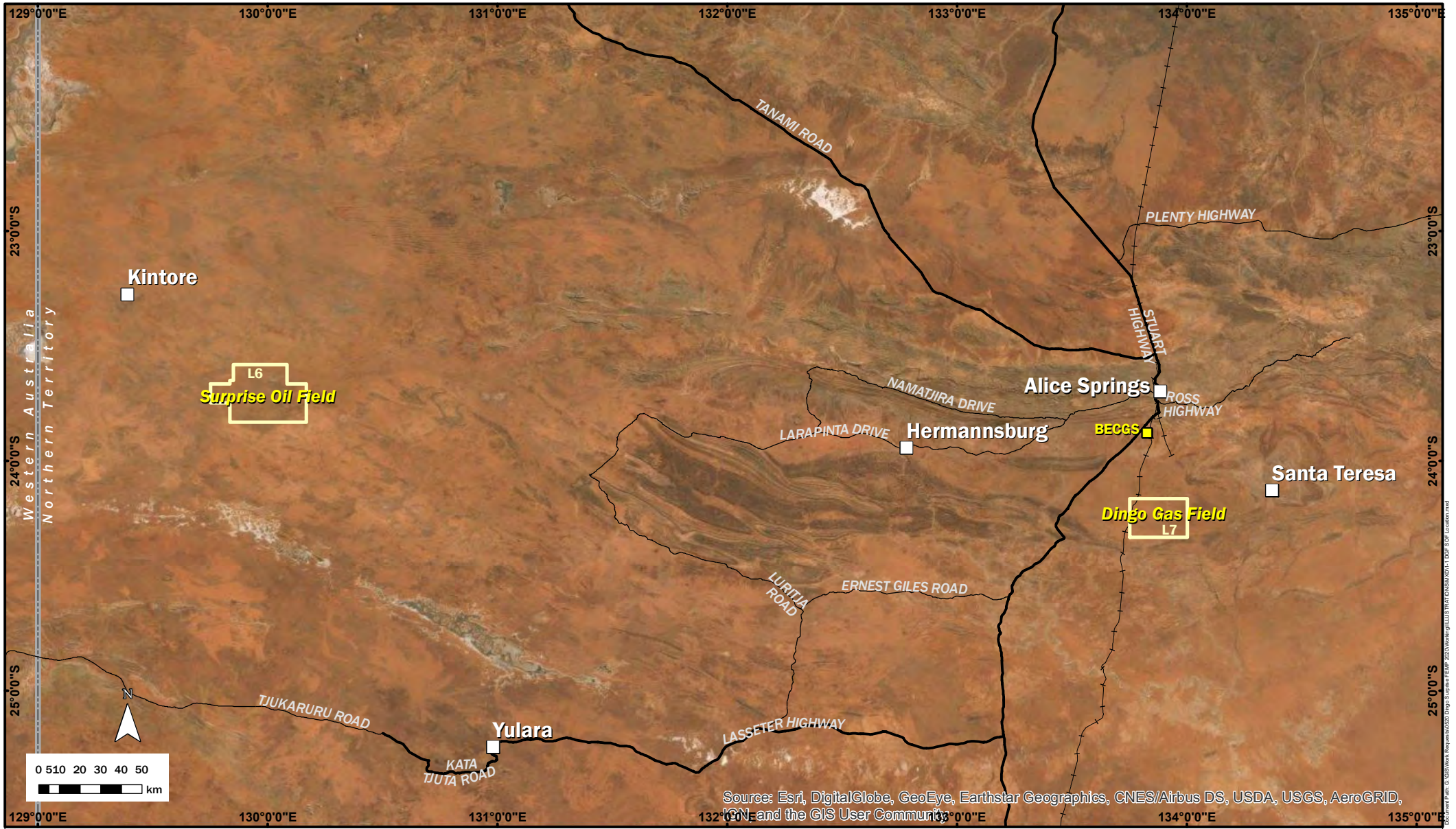
## **2.2.2 Location**

The SOF is also located in the Amadeus Basin, approximately 450 km west of Alice Springs (refer to Figure 2-1).

Access to the SOF from Alice Springs is via the tourist turnoff onto Albert Namatjira Drive from Larapinta Drive, following the Haast Bluff/Kintore Road heading towards Pupunya. Continue through Papunya township onto Liebig Rd / Gary Junction Rd for 185 kms, where CP signage will direct personnel to the Surprise 1 Re-entry H ST1 well site.

Any visitors or contractors accessing the SOF must first report to the CP offices at BECGS. Access to the BECGS is by 20 km of sealed road from Alice Springs, heading south along the Stuart Highway, then turning left into the Brewer Industrial Estate.

The nearest population is the community of Kintore, approximately, 80 km to the north-west.



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 Rev:  
 Date: 13/03/2020  
 Map Scale is 1:2,510,824 when printed at A4  
 Coordinate System: GCS GDA 1994

**Figure 2-1: Location - Surprise and Dingo Fields**

- Town / Location
- Brewer Estate City Gate Station
- ▭ Permits
- Principal Road
- Secondary Road
- + Railway

Level 7, 369 Ann St Brisbane QLD 4000  
 T +61 3181 3800 F +61 3181 3855  
 W centralpetroleum.com.au



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## 2.3 Title Holder

Table 2-1 provides details of the permit titleholder and the titleholder’s nominated liaison person. Both title holders are subsidiary companies of CP. CP is the operator of both fields.

**Table 2-1 Details of Titleholder and Nominated Liaison**

DGF Title Holder	SOF Titleholder	Nominated Liaison for DGF and SOF
Name: Central Petroleum (NT) Pty Ltd Address: Level 7/369 Ann Street, Brisbane QLD 4000 Postal Address: PO Box 292 Brisbane, QLD, 4001 ABN: 95 009 718 183 Website: <a href="http://www.centralpetroleum.com.au">www.centralpetroleum.com.au</a>	Name: Frontier Oil and Gas Pty Ltd Address: Level 7/369 Ann Street, Brisbane QLD 4000 Postal Address: PO Box 292 Brisbane, QLD, 4001 ABN: 91 103 194 136 Website: <a href="http://www.centralpetroleum.com.au">www.centralpetroleum.com.au</a>	Name: Ben Visser Position – General Manager Operations Company – Central Petroleum Limited Address: 7/369 Ann Street, Brisbane QLD 4000 Phone: +61 (0)7 3181 3800 E-mail: <a href="mailto:info@centralpetroleum.com.au">info@centralpetroleum.com.au</a>

## 2.4 Purpose

The purpose of this FEMP is to demonstrate how CP will conduct its scope of activities under the FEMP in a manner consistent with the principles of ecologically sustainable development (ESD) and such that impacts and risks are reduced to as low as reasonably practicable and acceptable levels.

## 2.5 Scope

This FEMP covers the operational activities listed in Section 2.5.1 and Section 2.5.2. with a description of each of the activities provided in Section 6.0. Note that whilst a portion of the Dingo Gas Pipeline (PL 30) is located within the DGF this FEMP does not pertain to maintenance and operational activities of the Dingo Gas Pipeline.

For the purposes of this FEMP the access tracks from the gazetted road to the DGF and SOF (as identified in Figure 6-2 and Figure 6-3 respectively) forms part of the FEMP and where the FEMP references the DGF or SOF it also includes these access tracks.

If activities that are not listed in section 2.5.1 or section 2.5.2 are required to be undertaken, CP will liaise with DENR to determine whether an amendment to this FEMP is appropriate or whether a new EMP is required to be developed.

### 2.5.1 Dingo Gas Field

The activities covered by this FEMP include the following operational activities within the DGF:

- Civil maintenance (including repairs) of the following:
  - existing access tracks, well lease pads, hardstand areas (including associated surface facilities) - as shown in Figure 6-2 under the Dingo Gas Field Infrastructure heading
  - gas flowline connecting existing wells (including associated surface facilities) – as shown in Figure 6-2



- Well shutdown maintenance activities including cold venting
- Well head maintenance and function testing (not to include the removal of any permanent barriers).  
Examples of this include:
  - Pressure testing
  - Wireline activities (e.g. downhole gauges)
  - Well head and valve servicing (e.g. testing and lubrication)
  - Well integrity treatment with corrosion inhibitors and biocides
- Well workover
- Well suspension / decommissioning
- Storage, handling and transportation of chemicals, dangerous goods, hazardous materials and substances
- Waste management
- Environmental monitoring (including weed surveys)
- Weed management and control
- Rehabilitation activities.

Descriptions of these activities are contained in Section 6.0.

This FEMP does not address general health and safety requirements for any of the above listed activities.

## **2.5.2 Surprise Oil Field**

The SOF is currently a shut-in field and activities within the SOF for this FEMP are primarily related to care and maintenance of the existing infrastructure. The activities required for the SOF include:

- Civil maintenance (including repairs) of the existing roads, access tracks, well lease pads (including associated surface facilities) – as shown in Figure 6-3 under the Surprise Oil Field Infrastructure heading
- Well head maintenance and function testing (not to include the removal of any permanent barriers).  
Examples of this include
  - Pressure testing
  - Wireline activities (e.g. downhole gauges)
  - Well head and valve servicing (e.g. testing and lubrication)
  - Well integrity treatment with corrosion inhibitors and biocides
- Storage, handling and transportation of chemicals, dangerous goods, hazardous materials and substances
- Well decommissioning
- Groundwater extraction
- Waste management
- Environmental monitoring (including weed surveys)

- Weed management and control
- Rehabilitation activities.

Descriptions of these activities are contained in Section 6.0.

This FEMP does not address general health and safety requirements for any of the above listed activities.



## **3.0 Commitment to the Environment**

### **3.1 Environmental Policy**

CP has a high standard of environmental responsibility implemented through operational quality and integrity measures above and beyond industry standards. CP has a strong environmental commitment focus through all its facilities and operations, being at the forefront of policy and management strategy developments. CP has compiled this FEMP and developed mitigation and preventative measures and standards to ensure the operation of the DGF and SOF has the smallest ecological footprint as possible. Also, to ensure that any impacts or incidents that have the potential to result in environmental degradation are identified and remediated as soon as possible. The employees and contractors of CP, both office and field, have been briefed on the company's policy, standards and expectations.

CP corporate environmental policy is provided in Plate 3.1 and the corporate Health, Safety and Environment (HS&E) policy is provided in Plate 3.2.

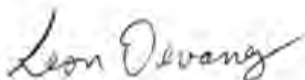


## ENVIRONMENTAL PROTECTION POLICY

Central Petroleum Limited considers protection of the natural and social environment to be of the highest priority in all its activities, both domestic and international, and conducting its operations in an environmentally responsible manner.

It is Central Petroleum's policy to:

- Comply, at a minimum, with applicable laws, regulations, standards, codes and guidelines for the protection of the environment and cultural heritage, and in their absence, adopt the best practicable means to prevent or minimise adverse environmental and cultural heritage impacts;
- Cooperate with governments and industry in the formulation of rational and practical environmental and cultural heritage guidelines and legislation;
- Continuously develop the company's environmental management system and cultural heritage management plans to identify, control and monitor risks and compliance with government regulations and industry guidelines, utilising the most appropriate technology available;
- Commit all levels of management to accept responsibility for environmental and cultural heritage management in all Central Petroleum activities;
- Promote environmental and cultural heritage awareness in all Central Petroleum employees and contractors through induction and training programs;
- Maintain cooperative and positive relationships with indigenous people with custodial responsibility for the land where Central Petroleum operates to minimise the impact of those operations on the cultural heritage of the indigenous people, and cooperate with other legitimate land users so that, where appropriate, multiple land use is possible;
- Conduct all Company operations in such a way as to minimise disturbance to the environment, protect native flora and fauna, avoid the pollution of land, water and air, and avoid disturbance of known sites of archaeological, cultural heritage, historical, natural or scientific significance; and
- Maintain an active rehabilitation program that will restore operational areas to a condition which is compatible with the prior land use.



Leon Devaney  
Managing Director  
5 September 2019

Plate 3.1 CP's Corporate Environmental Policy

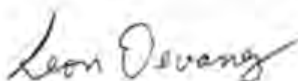


## HEALTH, SAFETY, SECURITY & ENVIRONMENT POLICY

Central Petroleum Limited believes that effective management of Health, Safety, Security and the Environment (HSSE) to be of the highest priority in all its activities and it is essential for success in its business, by:

- Providing leadership and commitment to HSSE issues and communicating our expectations to employees, contractors and other stakeholders;
- Providing clear direction and monitoring of a zero drug and alcohol tolerance to all contractors and employees at all Central Petroleum managed work sites, offices and operations.
- Zero tolerance to smoking in any workplace, except designated areas;
- Complying with national, state and local legislation;
- Providing a safe working environment for all employees, contractors and third-party personnel;
- Minimising the impact of our activities on the environment;
- Selecting and managing contractors to ensure their HSSE performance meets the statutory and Company requirements;
- Carrying out risk assessments and taking effective measures to reduce risks to as low as reasonably practicable on all our operations;
- Providing sufficient training, resources, equipment and personnel to achieve our HSSE objectives;
- Maintaining appropriate HSSE documentation;
- Monitoring HSSE performance-investigating and reporting all incidents and accidents regularly to the Board of Directors as well as relevant authorities;
- Striving for continuous improvement;
- Ensuring effective emergency response procedures are in place;
- Supporting wherever possible the advancement of local communities in areas where we operate;
- Conducting audits and reviews to assess compliance with this policy; and
- Implementing and using management systems for integrity management of plant, pipelines and equipment.

It is the responsibility of all employees and contractors to comply with this policy and to assist Central Petroleum Limited in its implementation.



Leon Devaney  
Managing Director  
5 September 2019

Plate 3.2 CP's Corporate HSSE Policy

## 4.0 Environmental Legislation and Other Requirements

### 4.1 Key Legislation

The key NT and Commonwealth legislation relevant to the activities described in this FEMP are summarised in Table 4-1.

**Table 4-1 Key legislation**

Legislation	Summary
<b>Commonwealth</b>	
<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984</i>	Provides for the protection of areas and objects in Australia that are of significance to Aboriginals in accordance with Aboriginal tradition. The Act allows the Commonwealth Environment Minister, on the application of an Aboriginal person or group of persons, to make a declaration to protect an area, object or class of objects from a threat of injury or desecration
<i>Aboriginal Land Rights (Northern Territory) Act 1976</i>	Provides for the key mechanism for the creation of Aboriginal-owned freehold land in the NT. Includes the establishment of land trusts over which Aboriginal Land Councils have oversight
<i>Australian Heritage Council Act 2003</i>	Establishes the Australian Heritage Council that is the principal adviser to the Australian Government on heritage matters. The Council's main role is to assess the heritage values of places nominated for the National Heritage List and the Commonwealth Heritage List, and to advise the Minister on promotion, research, education, policies, grants, conservation and other matters
<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Provides for the protection of the environment and the conservation of biodiversity. It regulates a development or activity if it is likely to have a significant environmental impact on matters of national environmental significance (MNES)
<i>National Environment Protection Council Act 1994</i>	Provides national standards for ambient air quality, movement of controlled wastes and contaminated sites
<i>National Greenhouse and Energy Reporting Act 2007</i>	Provides the framework for companies who exceed a minimum threshold to report greenhouse gas emissions, energy production and energy consumption data.
<i>Native Title Act 1993</i>	Provides statutory recognition and protection for the concept of native title, including provisions for reaching Indigenous land use agreements
<b>Northern Territory</b>	
<i>Bushfires Management Act 2016</i>	Provides for the protection of life, property and the environment through the mitigation, management and suppression of bushfires, and for related purposes
<i>Environmental Assessment Act 1982</i>	Establishes the framework for the assessment of potential or anticipated environmental impacts of developments and provides for protection of the environment. The NT Environment Protection Authority (NT EPA) is responsible for administering the Act. The NT EPA also determines the appropriate level of assessment for new developments or material changes to existing operations, based on the sensitivity of the local environment, the scale of the proposal and its potential impact upon the environment
<i>Heritage Act 2011</i>	Provides the mechanisms for protection of the NT's cultural and natural heritage. Sets out the process for obtaining permission to do work to heritage places.



Legislation	Summary
	Declares classes of places and objects of heritage significance to be protected. Provides for heritage agreements to encourage the conservation, use and management of heritage places and objects. Regulates work on heritage places and objects
<i>Northern Territory Aboriginal Sacred Sites Act 1989</i>	Establishes the Aboriginal Areas Protection Authority (AAPA) as the body responsible for overseeing the protection of sacred sites in the NT. The AAPA provides a process for avoidance of sacred sites and/or entry onto sacred sites and the issue of Authority Certificates, which indemnify the holder against prosecution under the Act for damage to sacred sites in the certificate area, provided works or use has occurred in accordance with the conditions of the Authority Certificate
<i>Petroleum Act 1984</i>	Is the principal legislation dealing with petroleum tenure, exploration and production activities onshore and in inland waters of the NT. The Act provides a legal framework to undertake exploration for petroleum and to develop petroleum production so that the optimum value of the resource is returned to the NT. The Act is supported by the <i>Petroleum (Environment) Regulations 2016</i> and the <i>Schedule of Onshore Petroleum Exploration and Production Requirements 2012</i> . The <i>Petroleum (Environment) Regulations 2016</i> aim to ensure that: a) onshore oil and gas activities are carried out in a manner consistent with the principles of ESD; and b) environmental impacts and risks associated with onshore oil and gas activities are reduced to a level that is ALARP and acceptable
<i>Public and Environmental Health Act 2011</i>	Makes provision to protect and promote the health of individuals and communities in the NT, and to monitor, assess and control environmental conditions, facilities and equipment and activities, services and products that impact on, or may impact on, public and environmental health. The Act calls up the Code of Practice for On-site Wastewater Management and sewerage plants need to meet the NT Code of Practice for Small On-site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent
<i>Soil Conservation and Land Utilisation Act 1969</i>	Makes provisions for the prevention of soil erosion and soil conservation and reclamation. It makes provisions for restricting construction activities that may damage or further damage land that is not environmentally stable, such as areas suffering soil erosion or areas that have the potential to erode
<i>Territory Parks and Wildlife Conservation Act 1976 (TPWC Act)</i>	Provides for the protection, conservation and sustainable utilisation of wildlife and listed threatened species in the NT
<i>Waste Management and Pollution Control Act 1998</i>	Aims to protect, and where practicable, restore and enhance the quality of the NT environment; encourage ESD; and facilitate the implementation of National Environmental Performance Measures established by the National Environment Protection Council. It is designed to prevent contamination of the surrounding environment, including soil, air, and water, and imposes a general duty on conducting an activity or action that causes or is likely to cause pollution resulting in environmental harm, or that generates or is likely to generate waste. The disposal of listed waste and discharge of water to the environment requires a licence under the Act
<i>Water Act 1992</i>	Provides for the investigation, allocation, use, control, protection, management and administration of water resources, including extraction of groundwater, wastewater management and water pollution. Provides for water allocation plans, beneficial uses within Water Control Districts, drilling licences, bore construction permits, water extraction licences and waste discharge licences
<i>Weeds Management Act 2001</i>	Aims to prevent the spread of weeds throughout the NT, ensuring the management of weeds is an integral component of land management. It is

Legislation	Summary
	<p>designed to ensure there is community consultation in the creation of weed management plans and that the landholder or interest holder takes responsibility in implementing weed management plans. If a weed is declared, all landholders, land managers and land users must comply with the declaration classification. The following are the three classes of declared weeds in the NT:</p> <ul style="list-style-type: none"> <li>• Class A – to be eradicated</li> <li>• Class B – growth and spread to be controlled</li> <li>• Class C – not to be introduced into the NT</li> </ul>

## 4.2 Key Codes of Practice and Guidelines

The key codes of practice and guidelines relevant to the activities described in this FEMP are summarised in Table 4-2.

**Table 4-2 Key codes of practice and guidelines**

Document	Summary
<i>Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019)</i>	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
<i>Code of Practice for on-site Wastewater Management (2014)</i>	Stipulates the approved sewage and sullage treatment devices and practices within the NT. Sewage and sullage produced and disposed of from the camps must be undertaken in accordance with the Code
<i>Australian Pipeline Industry Association Code of Environmental Practice – Onshore Pipelines (2017)</i>	Provides industry accepted guidance on environmental management through the planning and asset acquisition, construction, operational and decommissioning phases of a pipelines' lifecycle
<i>APPEA Code of Environmental Practice (2008)</i>	Provides an outline of environmental objectives which represent guidance on key aspects of good environmental practice in the petroleum industry
<i>Best Practice Erosion and Sediment Control (2008)</i>	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. Erosion and sediment Control Plan covering petroleum exploration activities are developed in accordance with these guidelines
<i>Weed Management Planning Guide - Onshore Petroleum Projects (2019)</i>	Provides guidance to the industry about the weed management planning required to undertake onshore petroleum projects in the NT
<i>Minimum Construction Requirements for Water Bores in Australia (2012)</i>	Provides a technical basis for, and a description of, the minimum requirements for constructing water bores in Australia.
<i>ISO 31000 Risk Management – Principles and guidelines</i>	Outlines the process to be followed to ensure the risk assessment process is undertaken in accordance with best practice requirements

## 4.3 Summary of legislative requirements

A summary of the legislative requirements, associated project approvals / consents and CP's actions for each are provided in Table 4-2

**Table 4-3 Summary of legislative requirements**

Relevant Legislation	Legislative Requirement	Responsible Agency	Actions
<i>Petroleum Act 1984</i>	Production Licence	DPIR	DGF operated under production licence 7 SOF operated under production licence 6
<i>Petroleum (Environment) Regulations 2016</i>	Approved EMP	DENR	CP will have in place an approved EMP to continue activities at the DGF and SOF
<i>Environmental Assessments Act 2013 and Administrative Procedures</i>	Notice of Intent and Formal Environmental Assessment	NT EPA	This FEMP does not constitute any material change of use at the DGF or SOF. CP therefore considers it unnecessary to refer the operations for assessment.
<i>EPBC Act</i>	Ministers approval	DAWE	CP does not consider the scope of the FEMP for the operations of the DGF or SOF is likely to have any significant impacts on MNES and will not be referring the operations for assessment at this stage.
<i>Northern Territory Aboriginal Sacred Sites Act 2013</i>	Must not enter, damage or interfere with a Sacred Site (even if not registered)	AAPA	2014/49 granted to Magellan Petroleum (NT) Pty Ltd (Magellan), for Dingo Wells 1, 2 and 3 and associated gas flowline and access track No AAPA certificate for Dingo well 4 or its access track or activities within the SOF.  CP has submitted an application to transfer 2014/49 from Magellan to CP and commits to obtaining AAPA certificates for the remaining infrastructure
<i>Water Act 1992</i>	Groundwater extraction licence	DENR	CP will obtain a groundwater extraction licence prior to taking groundwater from the bore within the SOF
<i>Heritage Act 2011</i>	Work approval (for removal or damage of archaeological sites)	DENR	All operations proposed in this FEMP will be conducted in existing disturbed areas, therefore CP do not anticipate a work approval will be required.
<i>National Greenhouse and Energy Reporting Act 2007</i>	Reporting under National Greenhouse and Energy Reporting Scheme	Australian Government - Clean Energy Regulator	CP triggers the threshold for reporting and must report greenhouse gas emissions, energy production and energy consumption data to the Federal government annually
<i>Petroleum Act 1984</i>	Land Access and Compensation Agreements	NA	Land access agreements are in place with the Orange Creek Station operators for the DGF and the Central Land Council for the SOF. No other agreements are required for activities under this FEMP



Relevant Legislation	Legislative Requirement	Responsible Agency	Actions
<i>Waste Management and Pollution Control Act 1998</i>	Licensed waste transporters	EPA	CP will ensure that any listed waste is removed from the DGF and SOF by an appropriately licensed transporter

### 4.3.1 Environmental Assessment Act 2013

Under the *Environmental Assessment Act 2013*, proposed projects that may have a significant effect on the environment are to be referred to the NT EPA for assessment. CP has conducted a self-assessment using the NT EPA Guideline Referring a Proposal to the NT EPA (2018). The assessment is based on consideration of the potential impacts of the activities on the environmental factors and objectives as outlined in the guideline.

Based on the self-assessment, CP is of the view that the activities for the DGF and SOF covered by this FEMP do not trigger referral to the NT EPA.

### 4.3.2 EPBC Act and Referral Self-Assessment

Under the EPBC Act an action that has, will have or is likely to have a significant impact on MNES, must be referred to the Australian Government Minister for the Environment (the Minister) for assessment.

A self-assessment in accordance with the EPBC Act was undertaken for DGF prior to commencement of operations in 2015 and reviewed under this FEMP. The review confirmed that significant impacts to MNES were not likely from the operations and maintenance activities at the DGF.

A self-assessment of the activities to be undertaken within this FEMP has been conducted for the SOF and determined that significant impacts to MNES were not likely to occur.

# 5.0 Description of Environment

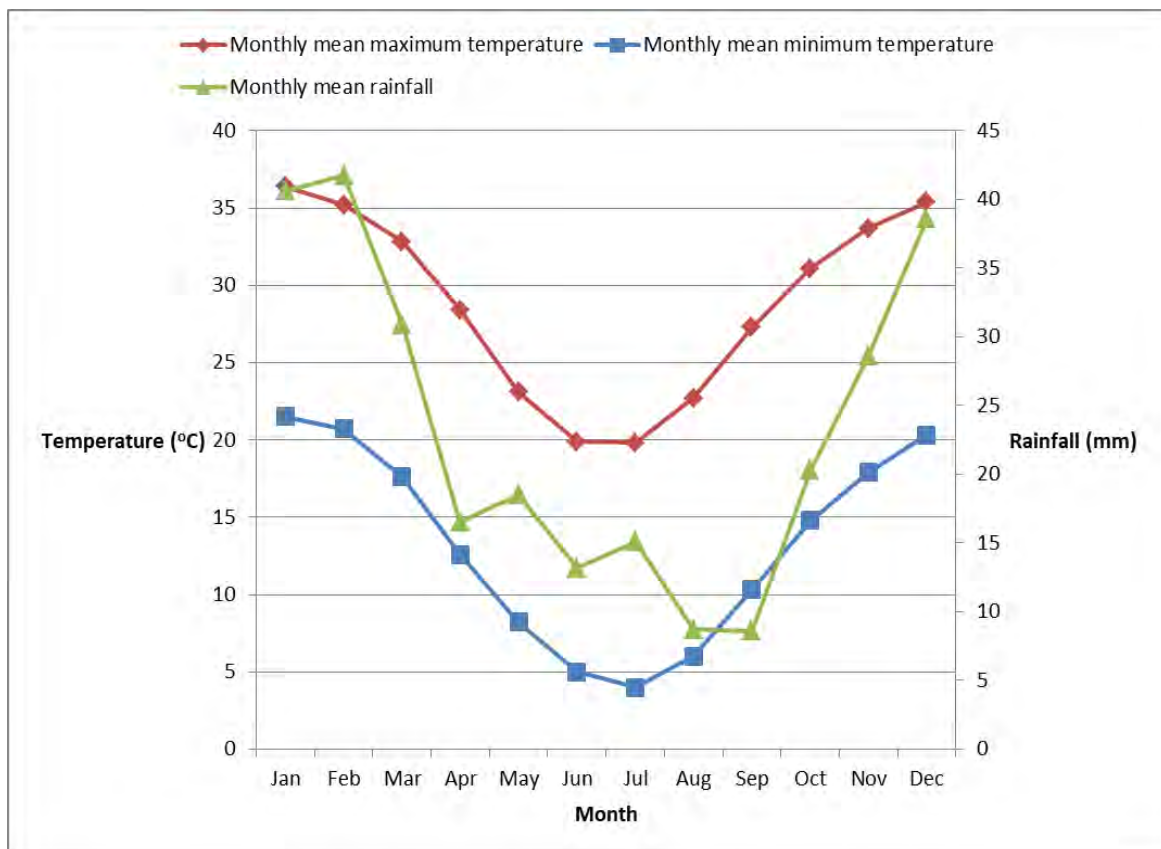
A description of the physical and socio-economic environment is provided in the following sections for the DGF and SOF.

## 5.1 Physical Environment

### 5.1.1 Climate

The climate of the DGF and SOF is described by Slatyer (1962) as semi-arid with 70% of precipitation occurring between October and March, caused mainly by monsoonal depression systems in northern Australia.

Climatic conditions for Alice Springs between 1941 and 2019 are shown in Graph 5-1 (Bureau of Meteorology, 2019). Mean annual rainfall is 281.2 mm and is highly variable with most of the long-term rainfall falling in the summer months from October through to March (Bureau of Meteorology, 2018). Summer temperatures are high with an average maximum of 35.6°C and an average minimum of 20.8°C. Winter maximum temperatures average 20.8°C, with minimum temperatures averaging 5.0°C with frosts occurring between June and August (Bureau of Meteorology, 2019).



**Graph 5-1 Alice Springs weather data showing mean highest and lowest monthly temperatures and mean monthly rainfall**

## 5.1.2 Bioregion

### 5.1.2.1 Dingo Gas Field

The DGF is located within the Finke Bioregion (refer Figure 5-1) as classified by (Baker, et al., 2005) and described in Table 5-1.

The main land types of the Finke bioregion are arid sandplains with dissected uplands and valleys, including three major rivers; Finke, Hugh and Palmer rivers, (DoEE 2008).

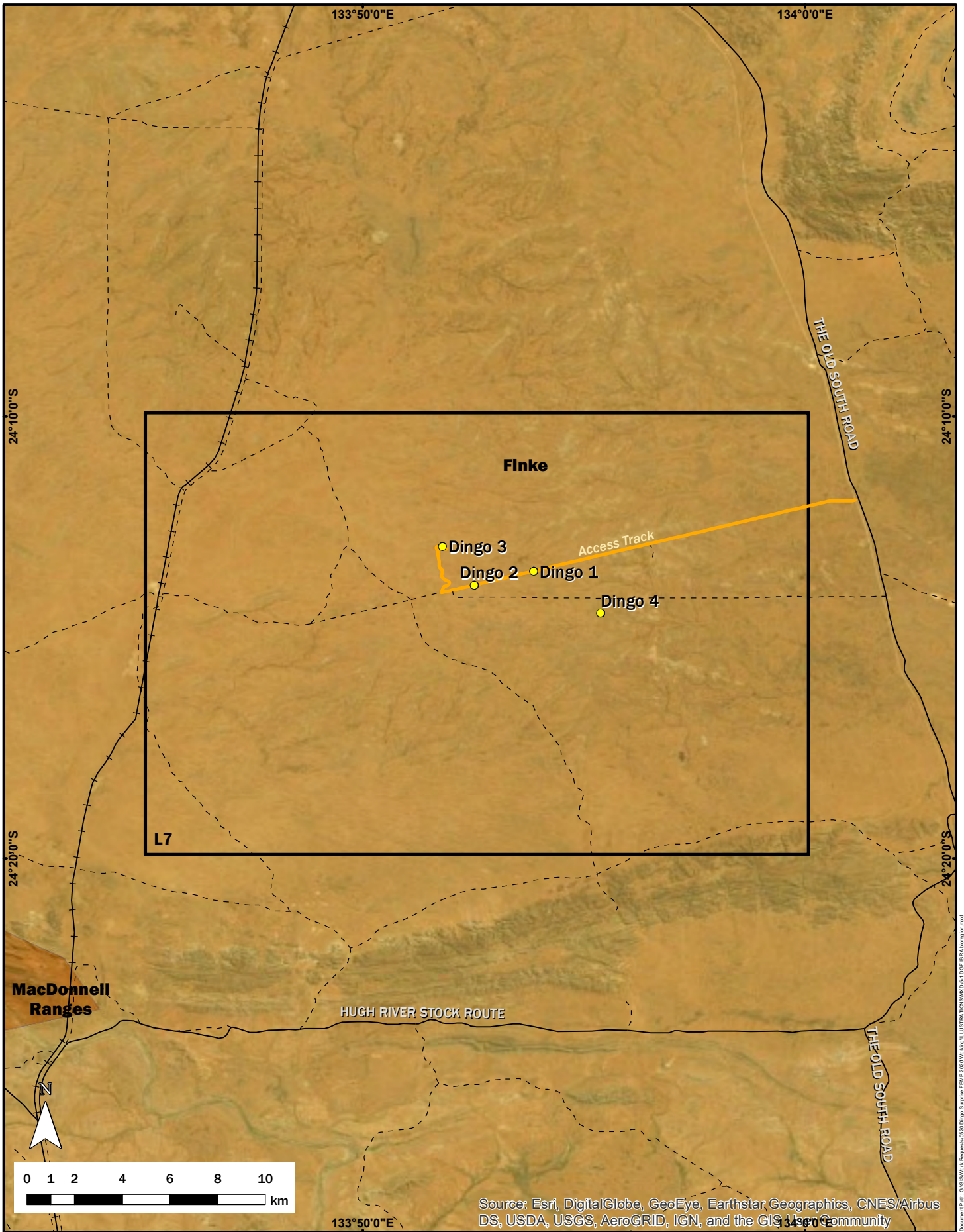
**Table 5-1 Description of DGF bioregion**

Extent in DGF	Bio-region <sup>1</sup>	Topography	Geology	Soils	Vegetation
100%	Finke	Geomorphologically variable complex of low sandstone ranges, weathered tablelands and rounded metamorphic hills, giving rise to undulating plains and low hills with extensive sand plains and sand dunes and flood outs	Lies over the Amadeus Basin and small parts of the Pedirka and Eromanga Basins. Contains sedimentary rocks of Devonian and Cambrian age	Soils are a mix of shallow and deep sands, massive earths, and red duplex saline affected soils.	Dominant vegetation includes hummock grasslands, <i>Acacia</i> shrublands and Saltbush / Bluebush open shrublands

### 5.1.2.2 Surprise Oil Field

The SOF is entirely within the Great Sandy Desert Bioregion (refer Figure 5-2) which is characterised by red sand plains, dune fields and remnant rocky outcrops. Vegetation is predominately spinifex grasslands, low woodland and shrubs (DAWE, undated).

<sup>1</sup> (Baker, et al., 2005)



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ID: 0520-5-1  
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 Interim Biogeographic Regionalisation for Australia  
 IBRA version 7.0 - Australian Government  
 Department of Sustainability, Environment, Water,  
 Population and Communities

**Figure 5-1: Dingo Gas Field Bioregion mapping**

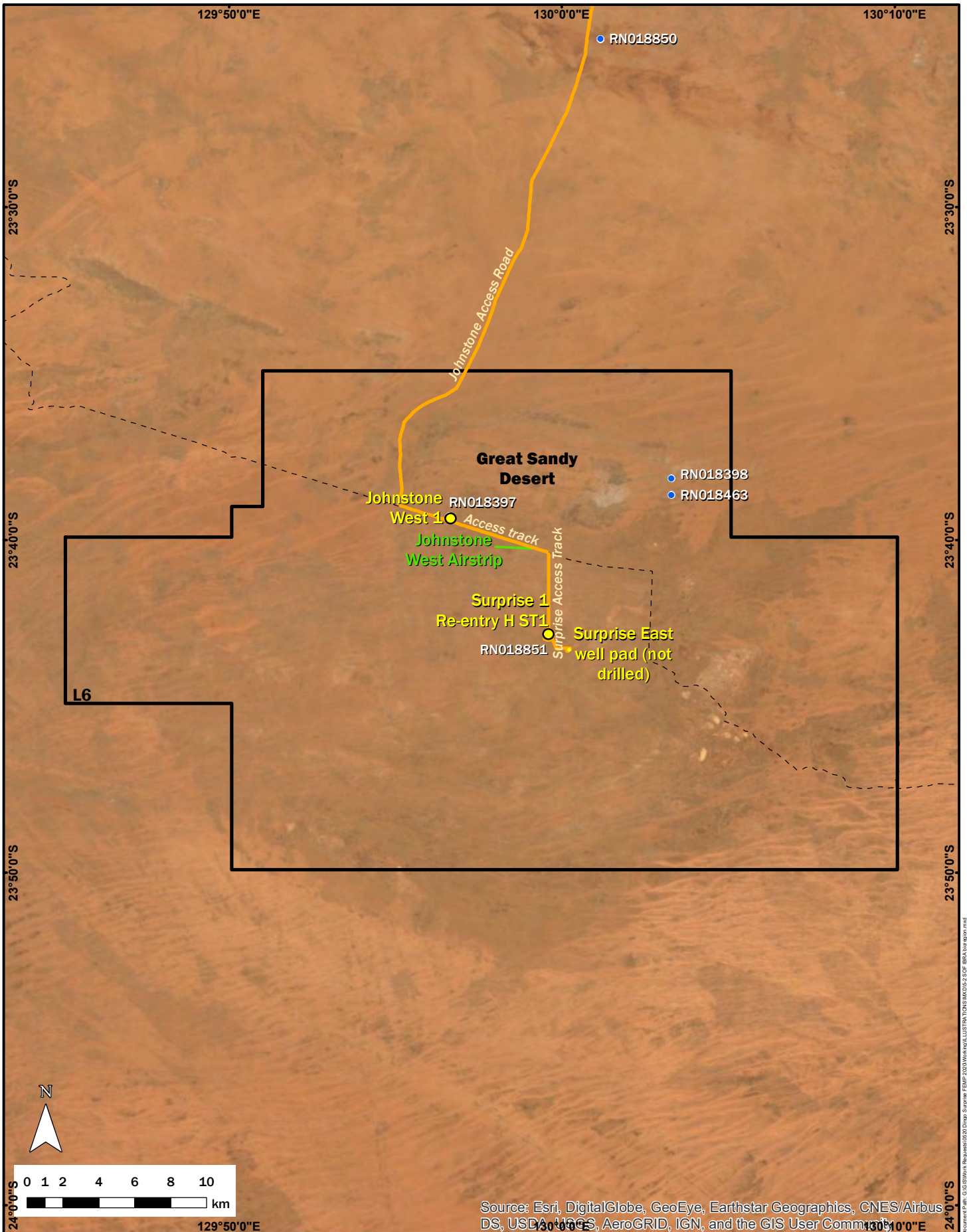
- |                   |                  |
|-------------------|------------------|
| Finke             | CTP Access Track |
| MacDonnell Ranges | Railways         |
| Wells             | Minor Road       |
|                   | Track            |
|                   | L7 permit        |

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 Interim Biogeographic Regionalisation for Australia  
 IBRA version 7.0 - Australian Government  
 Department of Sustainability, Environment, Water,  
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**Figure 5-2: Surprise Oil Field Bioregion mapping**

- Wells
- Waterbores
- CTP access tracks
- Air strip
- Track
- L6 permit
- IBRA region
- Great Sandy Desert



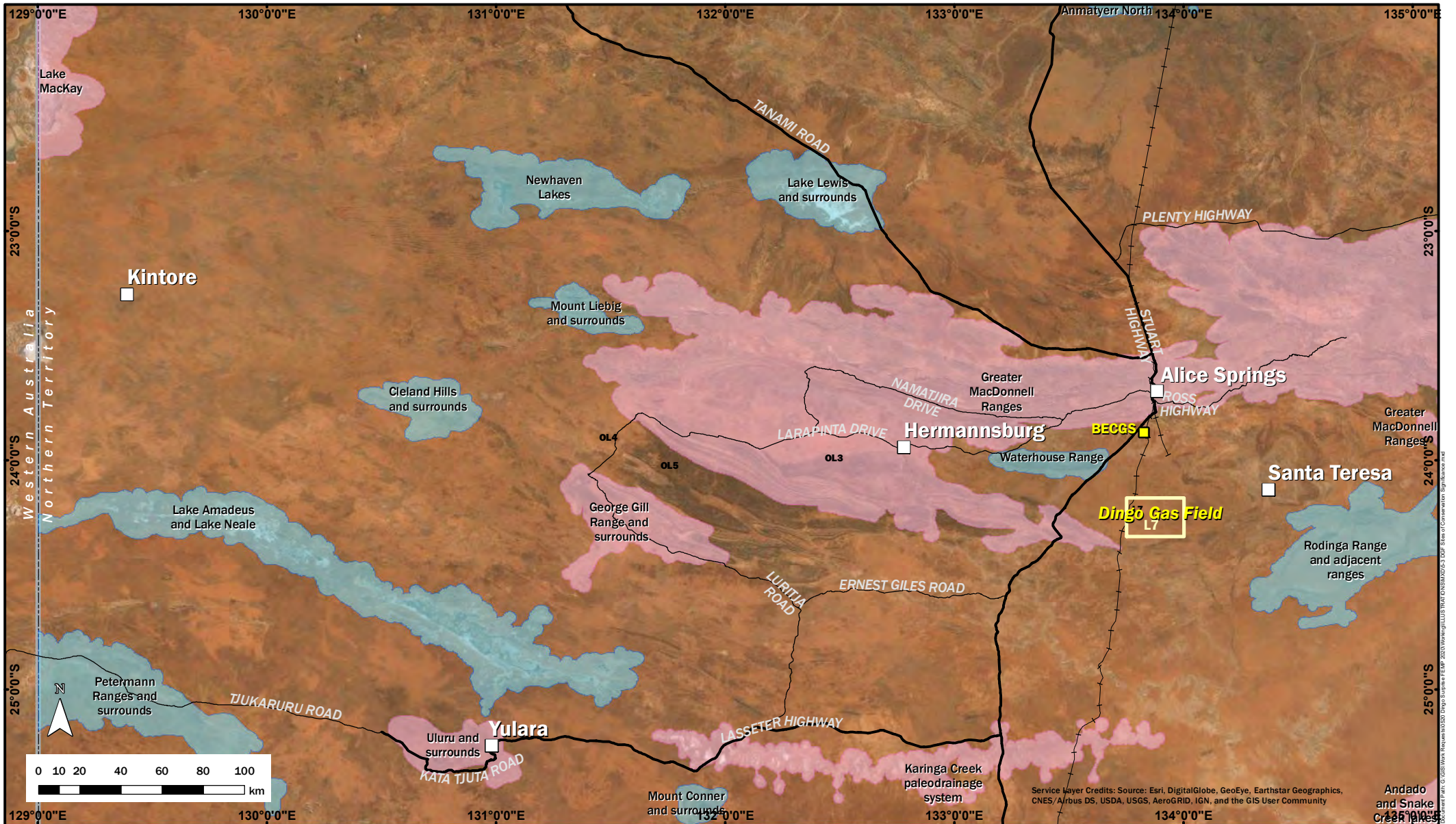
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### **5.1.3 Sites of Conservation Significance**

There are currently 67 Sites of Conservation Significance (SOCS) identified by the NT government. Neither the DGF or SOF is located within an identified SOCS.

Figure 5-3 and Figure 5-4 show the location of the DGF and SOF respectively to their nearest SOCS.





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 Sites of Conservation Significance from Department  
 of Environment and Natural Resources - Copyright  
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**Figure 5-3: Dingo Gas Field Sites of Conservation Significance**

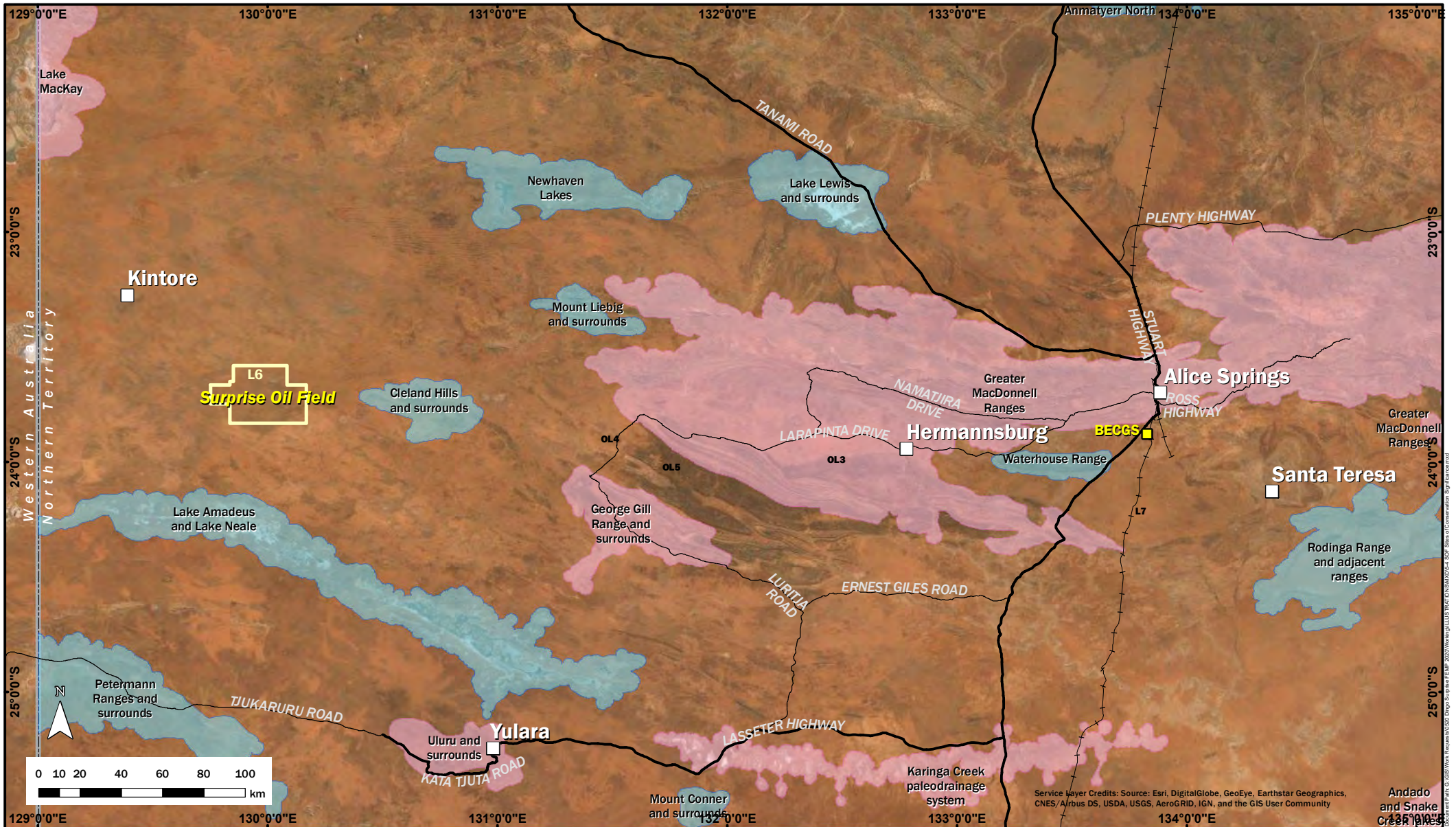
- Sites of Conservation Significance**
- International
  - National
  - Town / Location
  - Permits
  - Principal Road
  - Secondary Road
  - Brewer Estate City Gate Station
  - Railway

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**Figure 5-3: Surprise Oil Field Sites of Conservation Significance**

- Sites of Conservation Significance**
- International
  - National
  - Town / Location
  - Permits
  - Principal Road
  - Secondary Road
  - Brewer Estate City Gate Station
  - Railway



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## 5.1.4 Land Systems

### 5.1.4.1 Dingo Gas Field

The DGF is located in three land systems, Ewaninga, Simpson and Sonder as described in Table 5-2 (Perry, Mabbutt, Litchfield, & Quinlan, 1962) and shown in Figure 5-5. Development in the DGF has occurred predominately in the Simpson land system with Dingo gas well #4 and approximately 12 km of access tracks constructed in the Ewaninga land system.

**Table 5-2 Description of land systems mapped in the DGF**

Extent in DGF	Land System	Description	Soils	Erosion Hazard
24%	Ewaninga	Level to undulating sandplains with red sands	Deep red sands & loamy limestone soils	Moderate
75%	Simpson	Dunefields with parallel linear dunes, reticulate dunes and irregular or aligned short dunes	Red dune sand	Moderate
<1%	Sonder	Rugged ranges on quartzite, sandstone and conglomerate	Shallow, stony, undifferentiated soil	Moderate

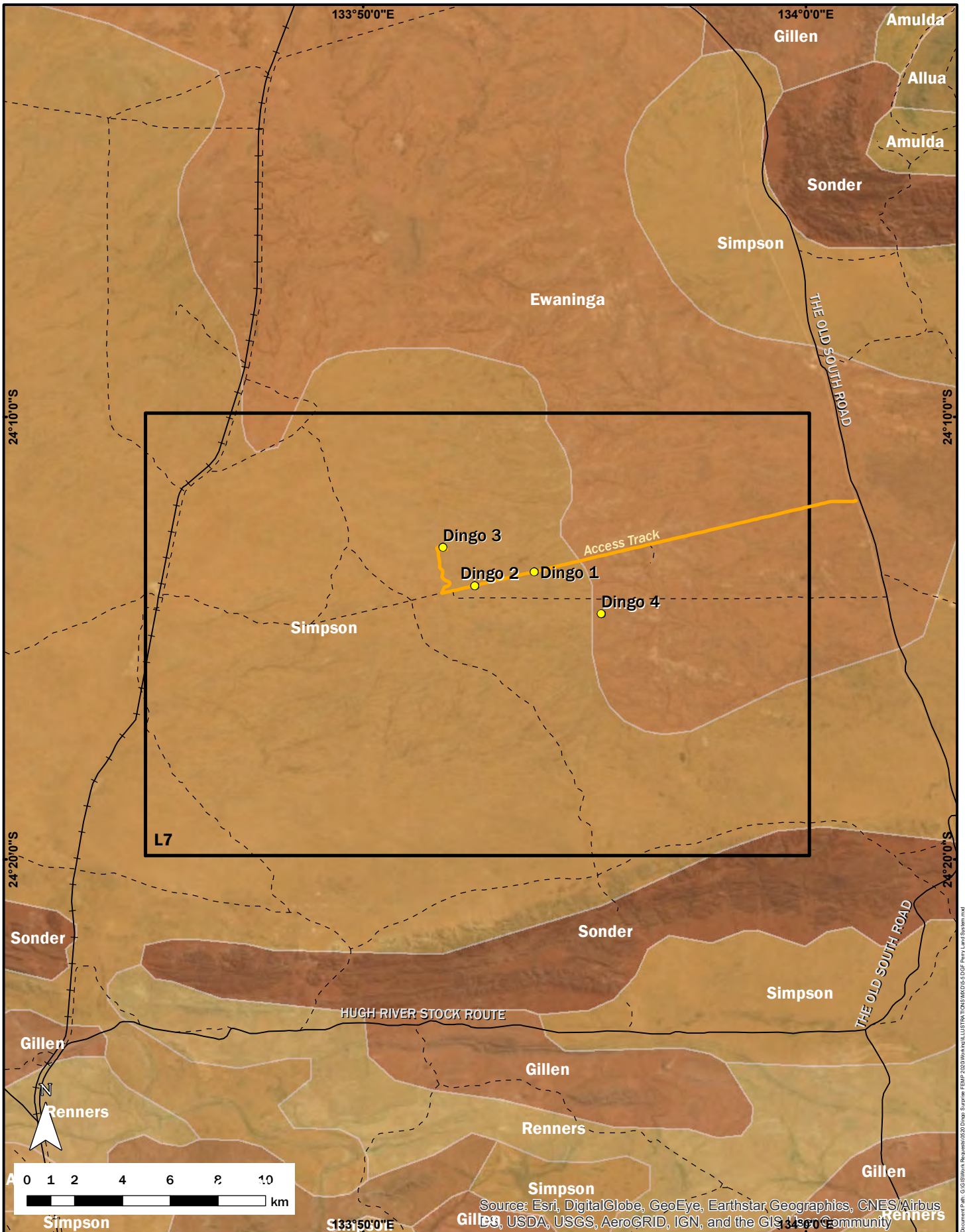
### 5.1.4.2 Surprise Oil Field

The SOF is located in two land systems: Simpson and Atlas\_BA27 as described in Table 5-3 and shown in Figure 5-6. The majority of development within the SOF has occurred in the Simpson land system with only the access track from the gazetted road to the tenure boundary being constructed in the Singleton land system.

**Table 5-3 Description of land systems mapped in the SOF**

Extent in SOF	Land System	Description	Soils	Erosion Hazard
97%	Simpson	Dunefields with parallel linear dunes, reticulate dunes and irregular or aligned short dunes	Red dune sand	Moderate
3%	Atlas_BA27	Low hills, hills and stony plateaux on sandstone, quartzite and conglomerate (deeply weathered in places)	Shallow stony soils	Moderate
<1%	Singleton	Level to undulating sandplains with red sands	Red earthy sands	Moderate





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 DigitalGlobe, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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Land Systems - Department of Environment and  
 Natural Resources

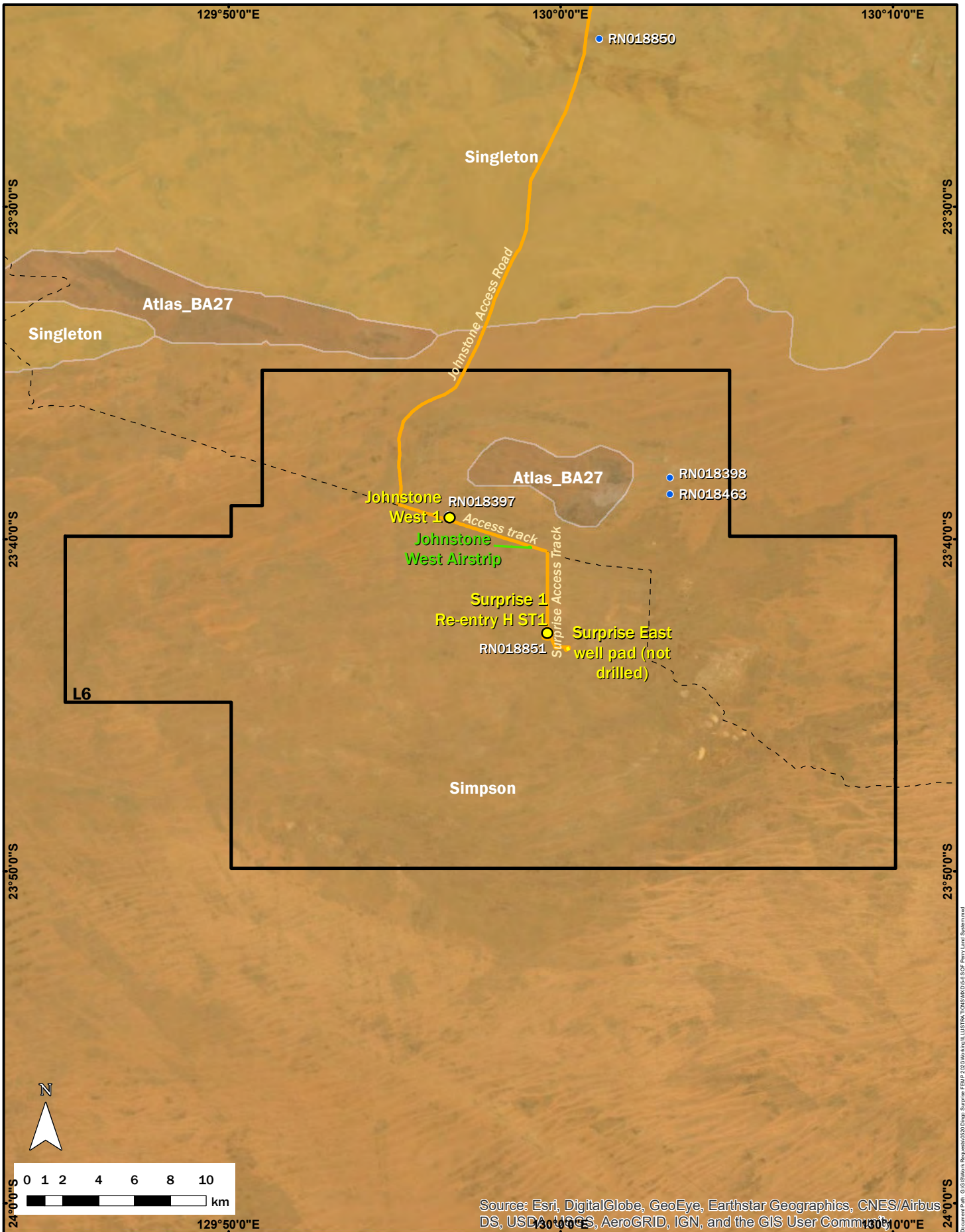
**Figure 5-5: Dingo Gas Field Perry Land System**

- Wells
- CTP Access Track
- Railways
- Minor Road
- - Track
- ▭ L7 permit
- ▭ Land System
- ▭ Allua
- ▭ Amulda
- ▭ Angas
- ▭ Changers
- ▭ Ewaninga
- ▭ Gillen
- ▭ Renners
- ▭ Simpson
- ▭ Sonder



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Land Systems - Department of Environment and Natural Resources

**Figure 5-6: Surprise Oil Field Perry Land System**

- |                   |                    |
|-------------------|--------------------|
| Wells             | L6 permit          |
| Waterbores        | <b>Land System</b> |
| Air strip         | Atlas_BA27         |
| CTP access tracks | Simpson            |
| Track             | Singleton          |



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## 5.1.5 Geology

### 5.1.5.1 Dingo Gas Field

Table 5-4 and Figure 5-7 provides an overview of the surface geology of the DGF.

**Table 5-4 Description of geological units mapped in the DGF**

Extent in DGF	Map Unit	Description of Lithology
2%	Pzr	Red-brown sandstone, pebbly sandstone
89%	Qs	Aeolian Sand
<1%	Tl	Chalcedonic limestone, siltstone and calcareous sandstone containing freshwater gastropods
8%	Ql	Calcrete

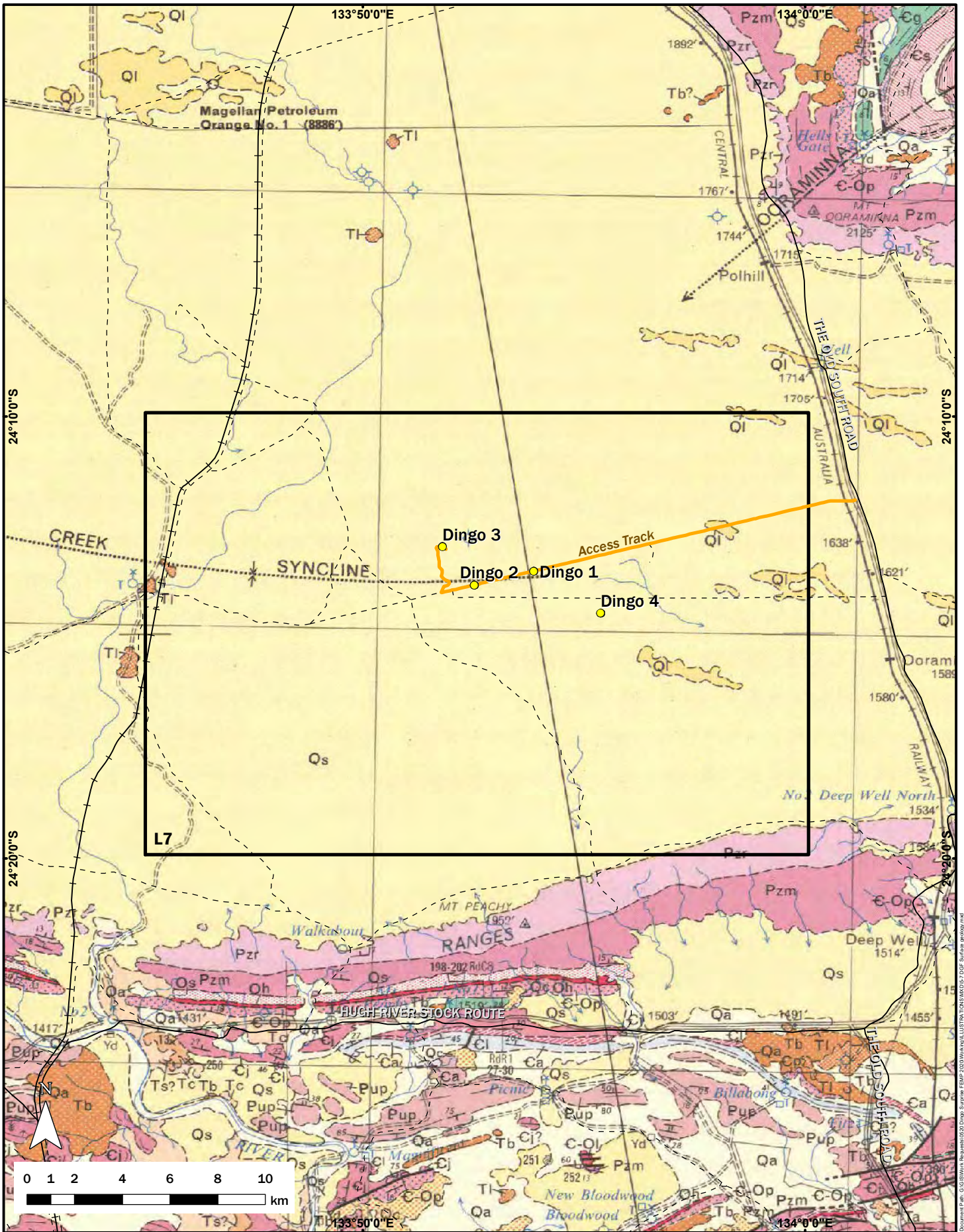
### 5.1.5.2 Surprise Oil Field

Table 5-5 and Figure 5-8 provides an overview of the geology of the SOF.

**Table 5-5 Description of geological units mapped in the SOF**

Extent in SOF	Map Unit	Description of Lithology	Extent in SOF	Map Unit	Description of Lithology
4%	Qa	Alluvial flats and scree slopes	<1%	Cop	Sandstone
3%	Qc	Calcrete, minor silcrete	4%	Czf	Talus, pebble, cobble and boulder deposits, locally lithified, often dissected
<1%	Qr	Colluvium and sheet wash plains	3%	Du	Calcareous siltstone, siltstone, sandstone
84%	Qs	Sand sheets and dune fields	<1%	Pzm	White sandstone, large scale cross bedding
<1%	Cpi	Breccia, sandstone, conglomerate, conglomeratic sandstone	<1%	Pbi	Crystalline dolostone, dolomitic limestone, limestone, siltstone, evaporates, stromatolites
<1%	Ccl	Sandstone, pebbly sandstone			





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 Rev: 23/03/2020  
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 Coordinate System: GCS GDA 1994  
 250k Surface Geology - Northern Territory  
 Geological Survey

**Figure 5-7: Dingo Gas Field Surface Geology**

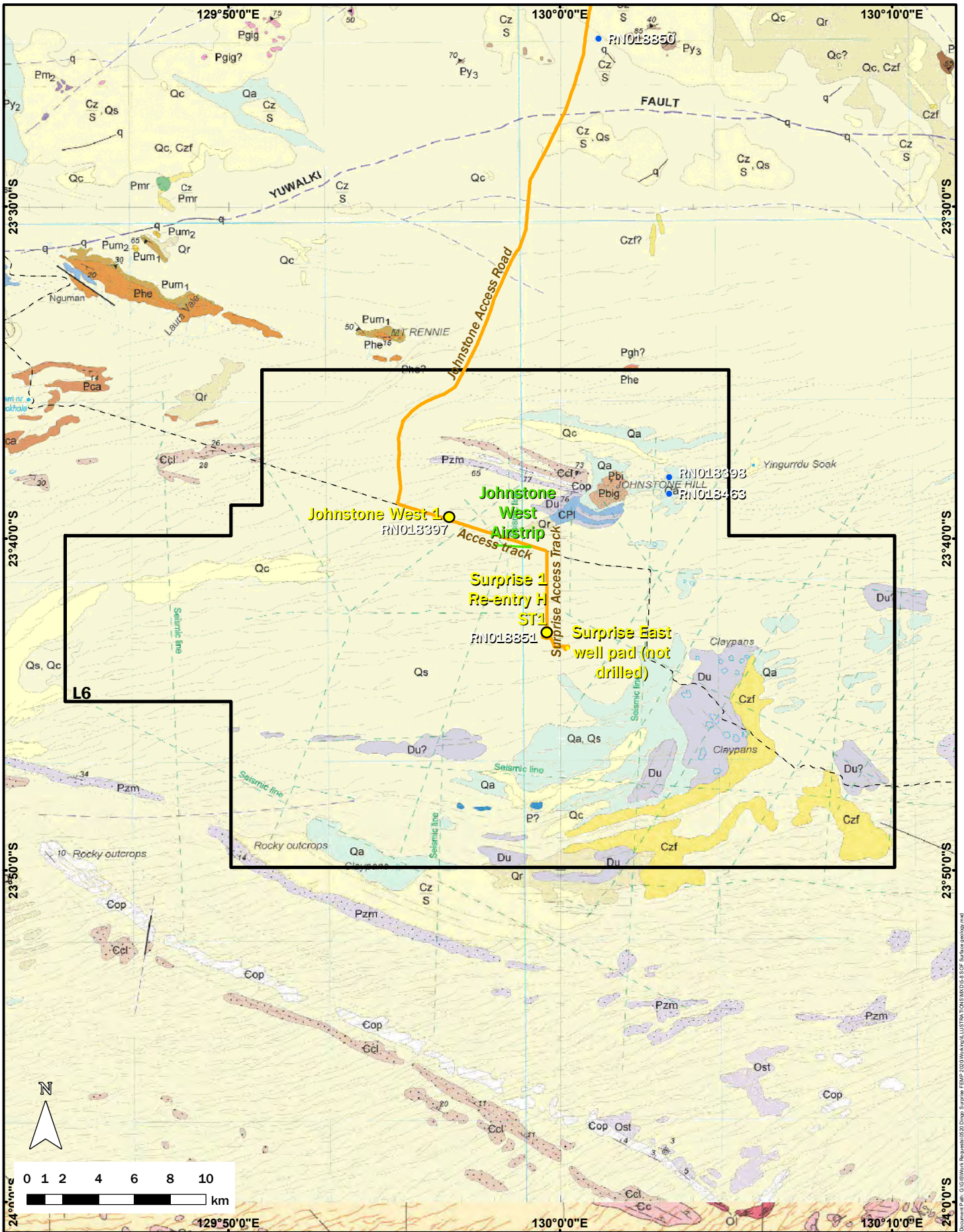
- Wells
- L7 permit
- CTP Access Track
- Railways
- Minor Road
- Track

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 Coordinate System: GCS GDA 1994  
 250k Surface Geology - Northern Territory  
 Geological Survey

**Figure 5-8: Surprise Oil Field Surface Geology**

- Wells
- Waterbores
- Air strip
- CTP access tracks
- Track
- L6 permit



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## 5.1.6 Soils

### 5.1.6.1 Dingo Gas Field

Three soil types, as mapped using data from the Digital Atlas of Australian Soils (based on Northcote, et al., 1960-1968) are present within the DGF. Table 5-6 provides a description of these soil types with Figure 5-9 showing the location of CPs activities relative to the soil types. All of CPs activities have occurred in the Mx25 soil type.

**Table 5-6 Description of soils mapped in the DGF**

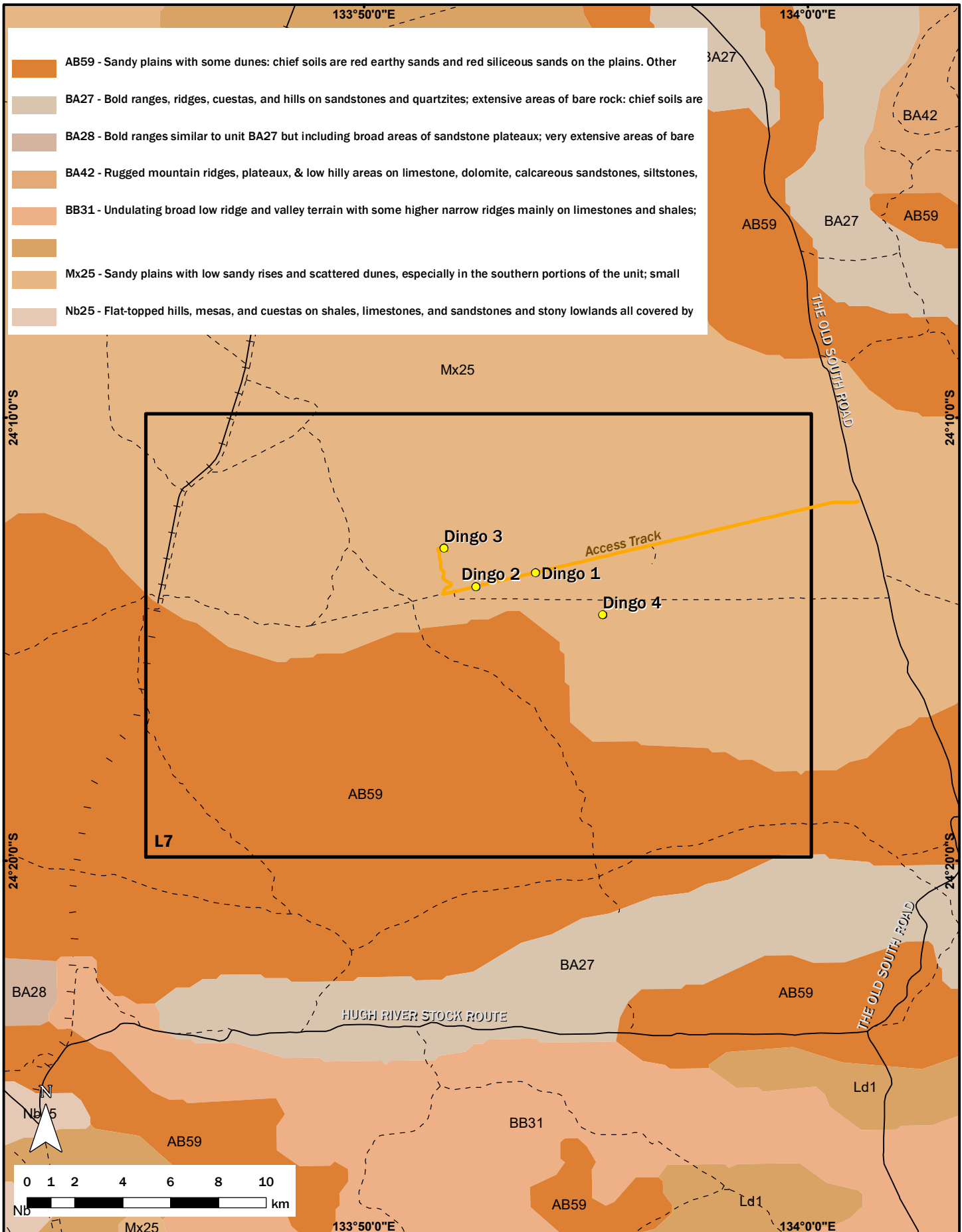
Extent in DGF	Soil Type	Landform	Soils
76%	Mx25	Sandy plains with low sandy rises and scattered dunes. Small areas of rugged rocky hills are included locally	Alkaline and neutral red earths, with lesser areas of deep sands
20%	AB59	Sandy plains with some dunes	Chief soils are red earthy sands and red siliceous sands on the plains
4%	BA27	Bold ranges, ridges, cuerdas, and hills on sandstones and quartzites. Extensive areas of bare rock	Chief soils are shallow stony sands

### 5.1.6.2 Surprise Oil Field

Three soil types, as mapped using data from the Digital Atlas of Australian Soils (based on Northcote, et al., 1960-1968) are present within the SOF. Table 5-7 provides a description of these soils types with Figure 5-10 showing the location of CP's activities relative to the soil types.

**Table 5-7 Description of soils mapped in the SOF**

Extent in SOF	Soil Type	Landform	Soils
98%	AB56	Plains covered with longitudinal dunes, some hilly residuals with rock outcrops	Chief soils are red earthy sands on interdune plains and red siliceous sands on dunes
2%	BA27	Bold ranges, ridges, cuerdas, and hills on sandstones and quartzites. Extensive areas of bare rock	Chief soils are shallow stony sands
<1%	AB57	Plains with scattered dunes	Chief soils are red earthy sands



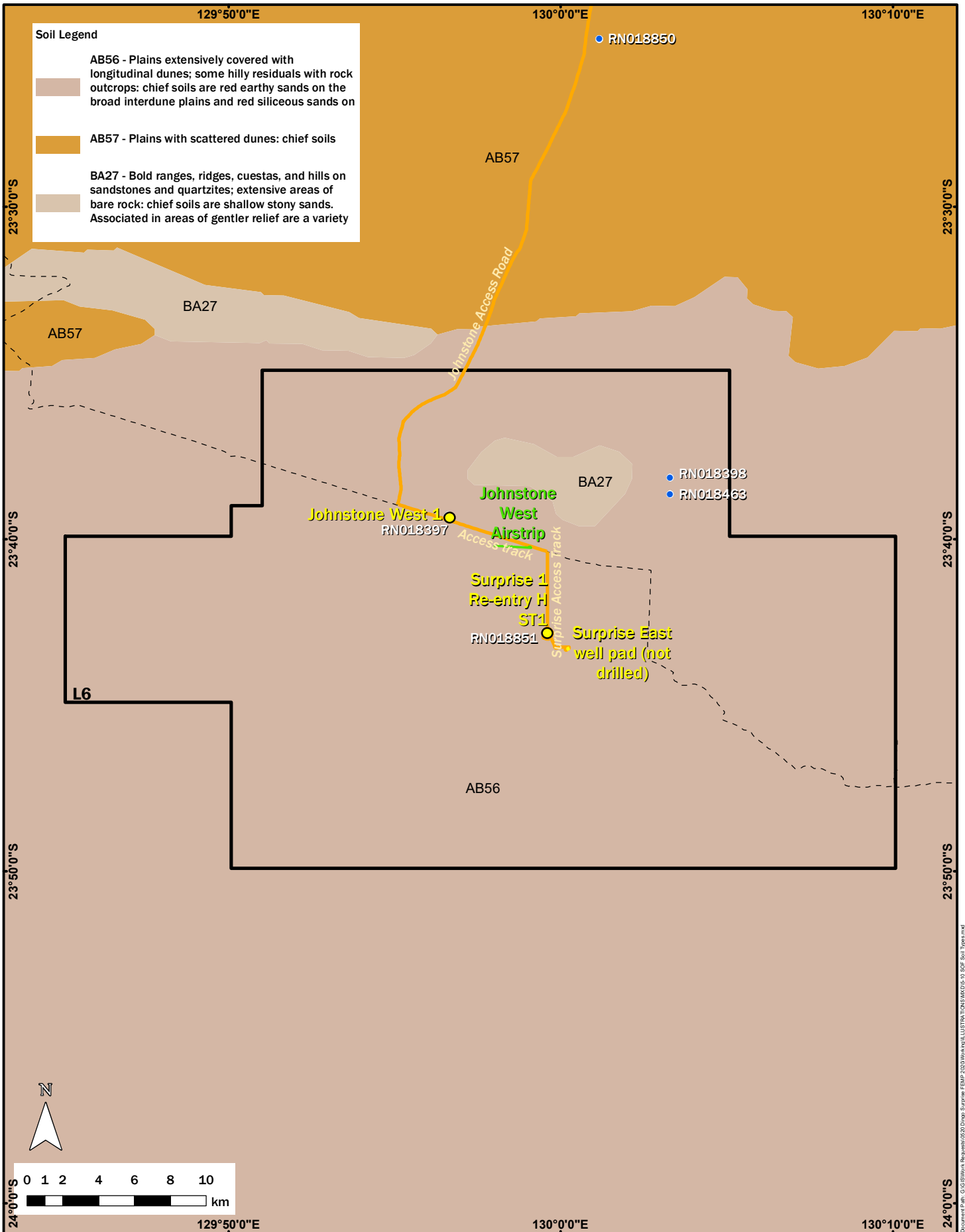
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 Rev: 23/03/2020  
 Map Scale is 1:210,083 when printed at A4  
 Coordinate System: GCS GDA 1994  
 Digital Atlas of Australian Soils - 1991

**Figure 5-9: Dingo Gas Field Soil Types**

- Wells
- CTP Access Track
- + Railways
- Minor Road
- - Track
- ▭ L7 permit



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 Digital Atlas of Australian Soils - 1991

**Figure 5-10: Surprise Oil Field Soil Types**

- Wells
- Waterbores
- Air strip
- CTP access tracks
- Track
- L6 permit



## **5.1.7 Surface Hydrology**

### **5.1.7.1 Dingo Gas Field**

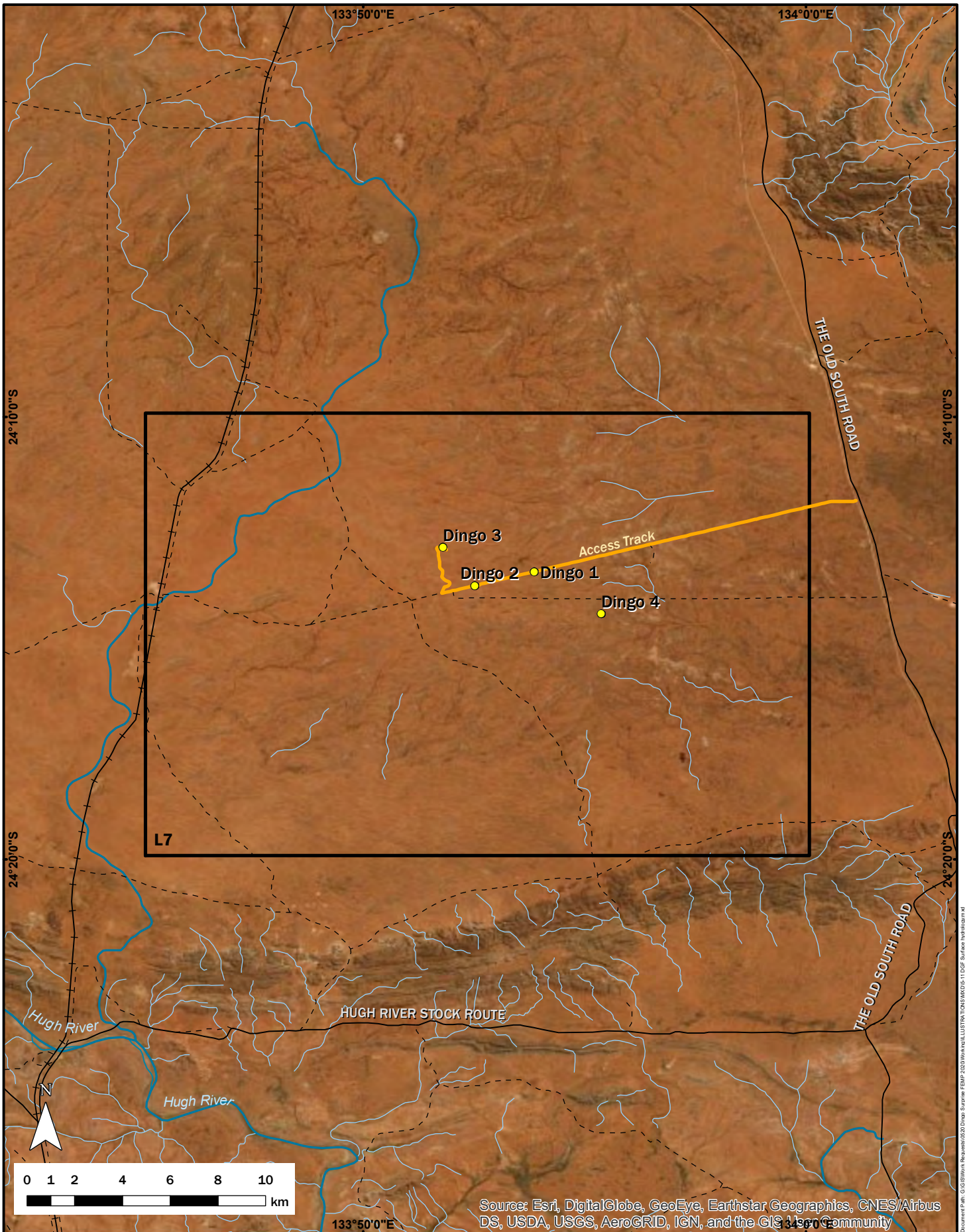
The DGF area is situated within both the Finke River and Todd River Basins, both of which are within the Lake Eyre catchment. The only major watercourse in the GDF (L7) area is an unnamed ephemeral tributary of the Hugh River. The Hugh River merges with the Finke River further downstream.

Smaller drainage lines are also present within the DGF area (refer to Figure 5-11).

### **5.1.7.2 Surprise Oil Field**

Figure 5-12 shows the surface hydrology for the SOF. There are limited mapped streams either within or adjacent to the SOF. None of the SOF infrastructure is located within 5 km of a mapped stream.





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Date: 23/03/2020

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Coordinate System: GCS GDA 1994

Northern Territory Mapped Streams - Department of Environment and Natural Resources

**Figure 5-11: Dingo Gas Field Surface hydrology**

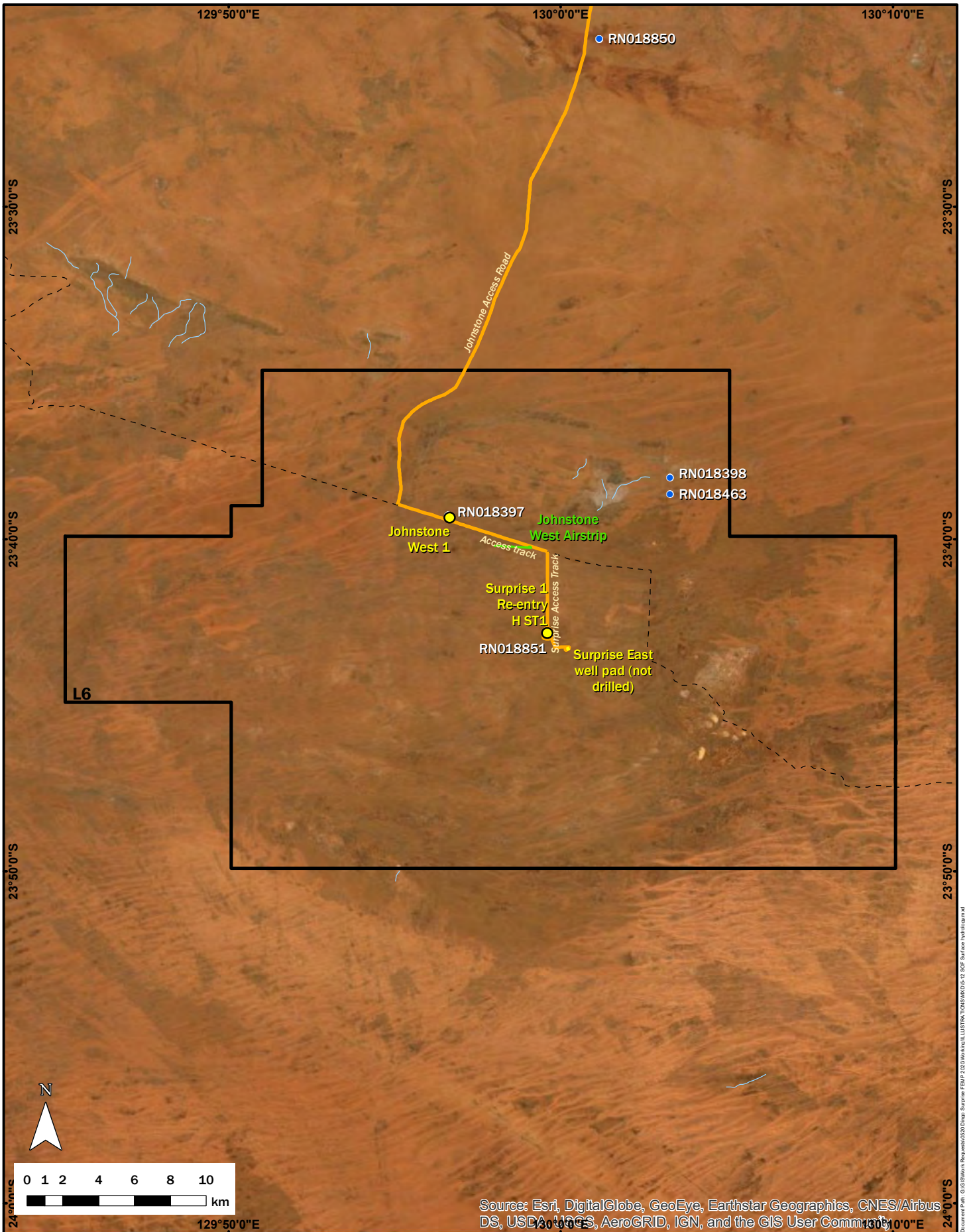
- Major Drainage
- Minor Drainage
- Streams
- Wells
- CTP Access Track
- + Railways
- Minor Road
- - - Track
- L7 permit

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ID: 0520-5-12

Rev:

Date: 23/03/2020

Map Scale is 1:280,000 when printed at A4  
Coordinate System: GCS GDA 1994

Northern Territory Mapped Streams - Department of Environment and Natural Resources

### Figure 5-12: Surprise Oil Field Surface Hydrology

- Streams
- Wells
- Waterbores
- Air strip
- CTP access tracks
- Track
- L6 permit



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## 5.1.8 Hydrogeology

The DGF and SOF are located in the Amadeus Basin, an elongated east-west aligned sedimentary basin that covers an area of approximately 170,000 km<sup>2</sup> in central Australia. Lloyd and Jacobson (1987) define two main hydrogeological domains within the Amadeus Basin: the north-central area has broad folding associated with extensive and mappable sandstone aquifers, elsewhere in the basin greater deformation has resulted in the development of a regional fractured rock aquifer.

The DGF is located in the north-central area of the Amadeus Basin and overlies a series of regional scale productive aquifers. The DGF is located within the Alice Springs Water Control District.

The SOF is located in the far-west of the Amadeus Basin, nominally within the regional fractured rock aquifer of Lloyd and Jacobson (1987), though in an area where there is a noted paucity of hydrogeological data on the Amadeus Basin formations. The SOF is not located within a Northern Territory Government groundwater management area.

### 5.1.8.1 Dingo Gas Field

The DGF is situated in the north-east of the Amadeus Basin and is centred over the Orange Creek Syncline. The DGF sources gas from a reservoir within the Arumbera Sandstone. Productive aquifers overlie the Arumbera Sandstone typically occurring at significant depth (> 500 m) beneath the DGF but become shallower to the south where they outcrop along the James Range.

The surface geology over the DGF comprises Quaternary and Tertiary aged sands, clay and limestone. In areas where valleys or depressions have been incised into the underlying Pertnjara Formation the Quaternary/Tertiary deposits have sufficient saturated thickness to form a local aquifer (e.g. RN002943 on the western margin of the DGF). However, these aquifers are typically discontinuous and rare with water bore records (see the statement of bore for RN002943) suggesting that attempts to target the shallow aquifer has resulted in over 20 unsuccessful bores across the Orange Creek plains.

Water quality at RN002943 is poor potable quality<sup>2</sup> (most recent Total Dissolved Solids (TDS) result of 1,140 mg/L) but is typically variable in these local aquifers. This bore has been sampled seven times between 1962 and 1995, with a TDS range of 1,140 – 3,590 mg/L (EC<sup>3</sup> range of 1,910 – 5,500 µS/cm), the mean across the data set is 3,060 mg/L TDS or 4,580 µS/cm EC. The population is skewed by the most recent sample collected in 1995 (1,140 mg/L TDS, 1910 µS/cm) which was unusually fresh relative to the rest of the data set). The bore was sampled by Water Resources and therefore is considered a reliable result. It is possible that the low salinity of this sample relates to either the bore not being adequately purged prior to sampling or possibly reflects a freshening of groundwater after a recharge event.

The underlying Pertnjara Formation has poor groundwater potential – the formation is not differentiated in the area around DGF, though regionally it is separated into the Brewer Conglomerate and the basal Hermannsburg Sandstone. Water bore records suggest that most groundwater bores drilled through the alluvial sequence penetrate into the Brewer Conglomerate and intersect limited groundwater flows of brackish water quality (average TDS of 9,400 mg/L). Bore RN010368 was drilled to 640 m through the Pertnjara Formation with a final yield of 0.2 L/s. During drilling of the Dingo gas wells potable groundwater was intersected in the base of the Pertnjara Formation – the flow was estimated at between 50 and 100 Bbl/hour (2.2 – 4.4 L/s) with a potable water quality of 550 µS/cm EC. It is possible that this groundwater

<sup>2</sup> The Australian Drinking Water Guidelines (ADWG, 2011) do not identify health guideline value for total dissolved solids (TDS), as there are no health effects directly attributable to TDS. However for good palatability total dissolved solids in drinking water should not exceed 600 mg/L. The ADWG identify TDS in excess of 1,200mg/L as unacceptable as it is unpalatable.

<sup>3</sup> Total dissolved solids in mg/L can be estimated from electrical conduction in µS/cm by multiplying the electrical conductivity by 0.65.



intersection was from the Hermannsburg Sandstone, which although not distinguished in the geological logs, forms an important aquifer in other parts of the Amadeus Basin.

The Meerenie Sandstone underlies the Pertnara Formations at depths in excess of 600 m. The Meerenie Sandstone is one of a series of regionally extensive aquifers that occur in the central north of the Amadeus Basin. It is of particular significance in the north of the basin where it provides the water supply for Alice Springs. In the vicinity of the DGF the groundwater flow direction in the Meerenie Sandstone is from the north and west toward the east (Tickell, 2008, Macqueen and Knott, 1982). A groundwater divide is mapped to the north of the DGF which separates the gas fields from the Roe Creek borefield which supplies Alice Springs (Tickell, 2008).

Bore yields of up to 100 L/s have been recorded in the Meerenie Sandstone at Roe Creek, though this is attributed to very high secondary permeability (Macqueen and Knott, 1982) and is not representative of the aquifer regionally. No bores have been constructed in the formation beneath the DGF, however, a flow rate of 300 Bbl/hour (13 L/s) was estimated during the drilling of Dingo well #4 with a potable water quality of 520  $\mu\text{s/cm}$  EC. Aquifer transmissivities of up to 4,000  $\text{m}^2/\text{day}$  have been observed though 600  $\text{m}^2/\text{day}$  is considered representative for the aquifer at a regional scale (Macqueen and Knott, 1982).

The Pacoota Sandstone underlies the Meerenie Sandstone and forms a regional aquifer extending from the northern margin of the basin near Alice Springs to the High River south of L7. Bore yields in the Pacoota Sandstone range from 0.1 – 80 L/s with a mean 11.4 L/s from 49 bores (Lau and Jacobson, 1991). Aquifer transmissivities range from 20 – 1,300  $\text{m}^2/\text{day}$  with a regional estimate of 600  $\text{m}^2/\text{day}$  (Macqueen and Knott, 1982). No bores are constructed in the Pacoota Sandstone in the immediate vicinity of L7, however, a formation water sample with a TDS of 500 mg/L collected during the drilling of Dingo No. 4 suggests the groundwater quality is potable beneath the lease. The groundwater flow direction in the Pacoota Sandstone across L7 is from the north-west to the south-east/east (Lau and Jacobson, 1991).

Regionally, the Goyder Formation, Shannon Formation, Hugh River Shale and Giles Creek Formation all contain significant groundwater resources though the formations occur at significant depth beneath L7 (> 1,400 m). To the southeast of the lease around Orange Creek these formations have loosely been grouped together as the Cambrian Limestone Aquifer (CCA – Short, 2018). In this area the CCA has a licensed allocation of 1,170 ML/year which supports agriculture and industry. Bore yields range from 0.1 – 31 L/s with aquifer transmissivities from 4 – 580  $\text{m}^2/\text{day}$  (Jacobson and Lau, 1991). There are no bores constructed in the CCA formations in the immediate area around L7. Grab samples of formation water taken during drilling of the Dingo gas wells indicates potable water occurs in the Goyder Formation (EC of 960  $\mu\text{s/cm}$ , ~625 mg/L TDS) but groundwater is saline within the deeper Shannon Formation and Giles Creek Formation (42,800  $\mu\text{s/cm}$ , ~27,800 mg/L TDS and 47,800  $\mu\text{s/cm}$ , ~31,000 mg/L TDS respectively). Limited information is available on flow directions within these formations but a combined potentiometric of the Pacoota/Goyder Formations suggests the groundwater flow direction is consistent with the overlying aquifers and flows toward the east/south-east.

Table 5-8 provides a summary of the stratigraphy and recorded groundwater occurrence from the surface down to the Arumbera Sandstone beneath the DGF. Figure 5-13 shows the hydrogeology of the DGF area, showing approximate depth to groundwater.

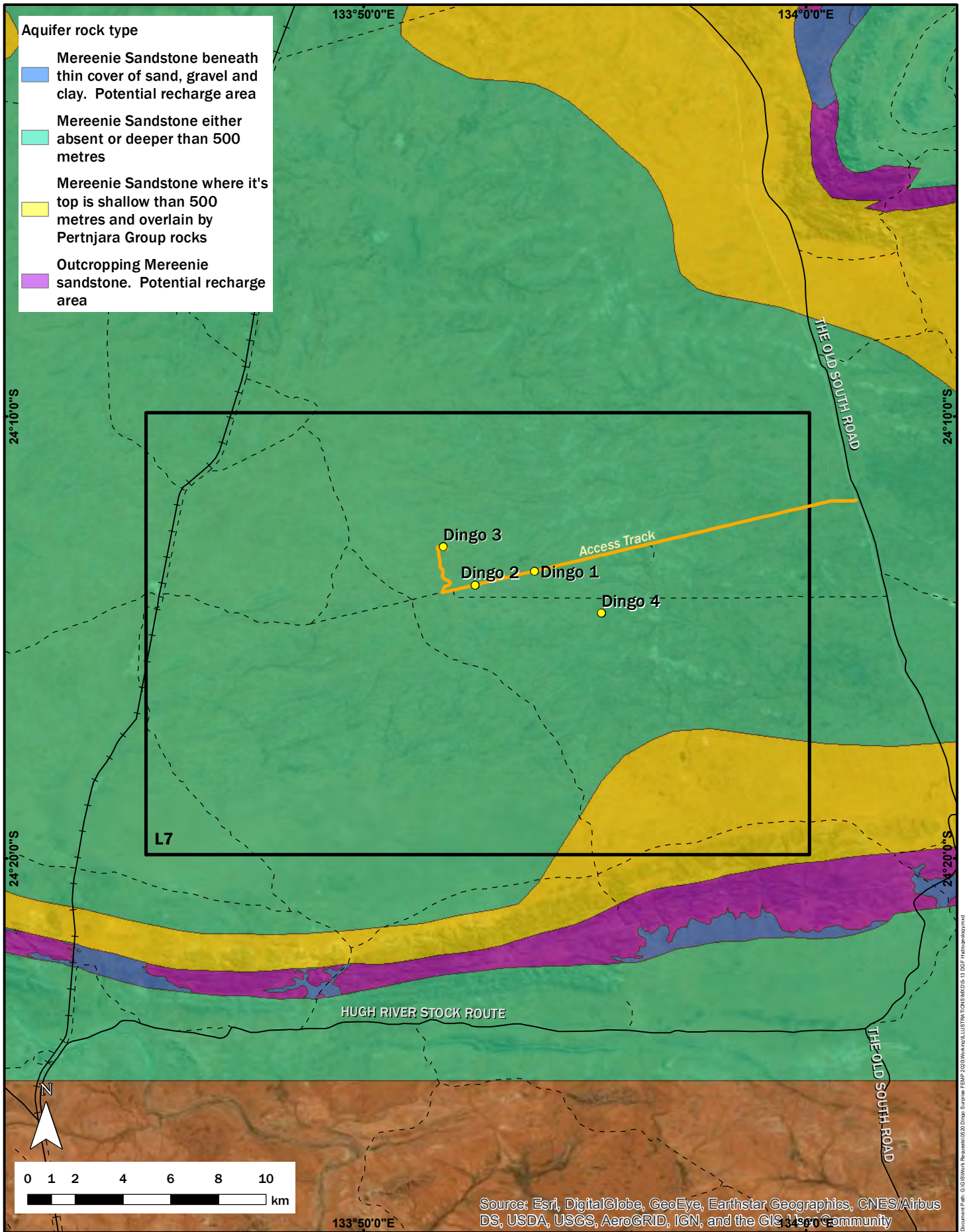
**Table 5-8 Summary of the stratigraphy and groundwater occurrence beneath the DGF**

Formation	Depth <sup>1</sup> (mBGL)	Thickness <sup>1</sup> (m)	Lithology	Groundwater Availability	Water Quality <sup>2</sup>
Quaternary/Tertiary aged sediments	Surficial	< 70	Quartz sand, clay/ limestone,	Limited, Forms local aquifer where sufficient	Fresh to brackish

Formation	Depth <sup>1</sup> (mBGL)	Thickness <sup>1</sup> (m)	Lithology	Groundwater Availability	Water Quality <sup>2</sup>
			calcareous siltstone	saturated thickness exists.	
Pertnjara Formation	Surface to 70	670	Sandstone, minor shale and siltstone	Poor	Brackish
Mereenie Sandstone	650	350	Quartz sandstone	Regional Aquifer	Fresh
Stairway Sandstone	1,000	20	Silty sandstone with interbedded siltstone	Local Aquifer (permeability from joints and fractures)	Not known
Horn Valley Siltstone	1,030	30	Shale, siltstone, dolomite	Poor	Not known
Pacoota Sandstone	1,060	360	Sandstone with siltstone and shale	Regional Aquifer	Fresh
Goyder Formation	1,420	110	Shale, siltstone and dolomite	Regional Aquifer	Fresh
Shannon Formation	1,530	390	Dolomite, shale	Regional Aquifer (Cambrian Carbonate Aquifer, after Short, 2018)	Brackish
Hugh River Shale	1,920	240	Siltstone, shale, limestone, dolomite		Brackish
Giles Creek Dolomite	2,160	300	Dolomite, siltstone, shale		Not known
Chandler Formation	2,460	240	Silty halite, minor limestone, mudstone	Poor Presence of evaporates suggests poor water quality	Saline
Todd River Equivalent	2,700	20	Mudstone	Poor (based on thickness and lithology)	Not known
Arumbera Sandstone	2,720	310	Interbedded sandstone, siltstone, shale	Gas Reservoir	Not known

<sup>1</sup> Depths and thickness based on Dingo 3 gas well

<sup>2</sup> Water quality assessment is made for aquifers based on bore data or formation water quality from Dingo well completion reports with the exception of the Chandler Formation



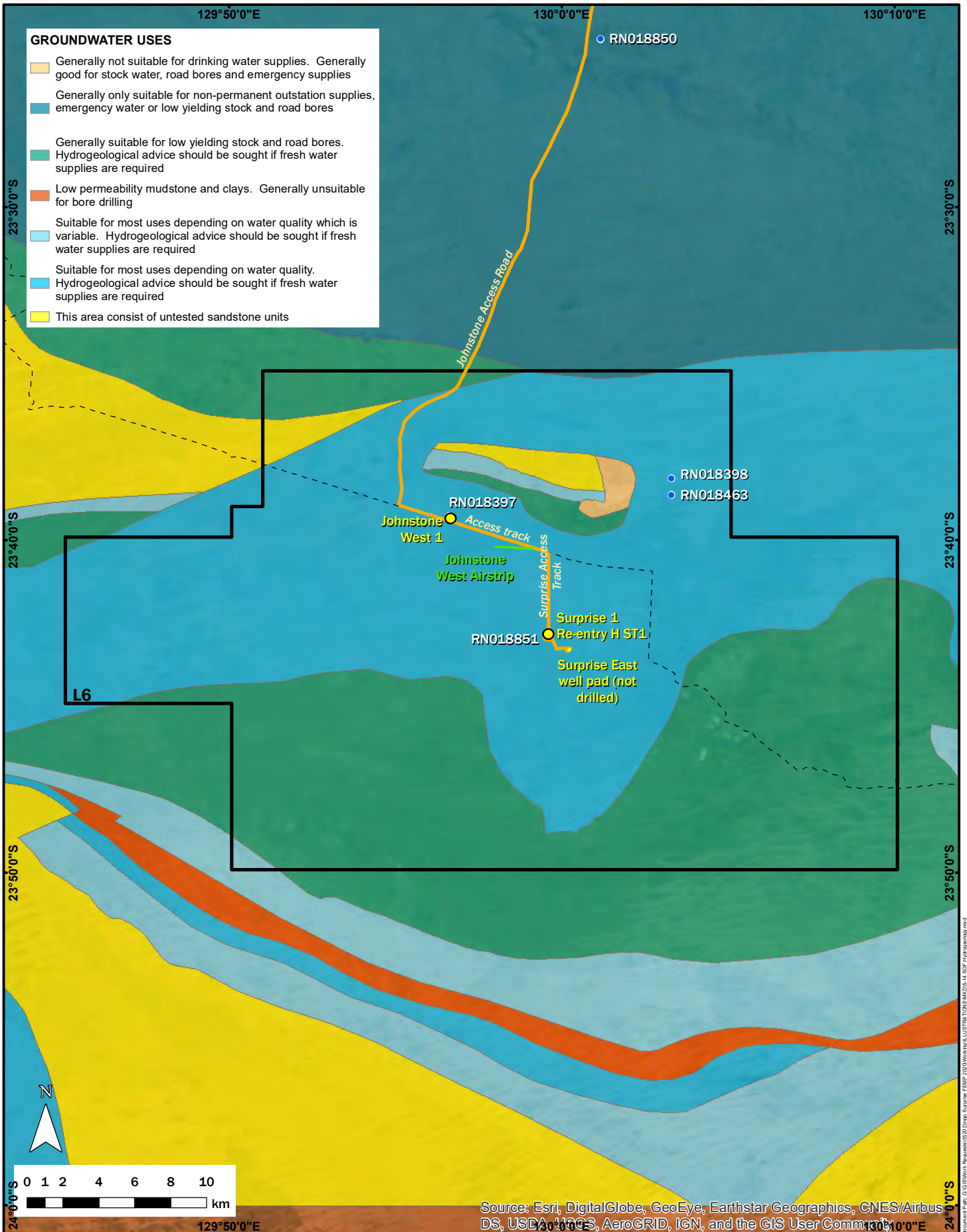
ID: 0520-5-13  
 Rev:  
 Date: 23/03/2020  
 Map Scale is 1:210,083 when printed at A4  
 Coordinate System: GCS GDA 1994  
 Alice Springs Groundwater, Northern Territory -  
 Department of Environment and Natural Resources

**Figure 5-13: Hydrogeology of the Dingo Gas Field**



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**Figure 5-14: Hydrogeology of the Surprise Oil Field**

ID: 0520-5-14

Rev:

Date: 23/03/2020

Map Scale is 1:280,000 when printed at A4  
Coordinate System: GCS GDA 1994

Hydrogeology of the Yuendumu – Papunya –  
Kintore Region NT Western Water Study  
Wiluraralja Kapi - Department of Environment and  
Natural Resources

● Wells

● Waterbores

□ Air strip

— CTP access tracks

--- Track

□ L6 permit



Level 7, 369 Ann St Brisbane QLD 4000  
T +61 3181 3800 F +61 3181 3855  
W centralpetroleum.com.au



A search of the groundwater bores on NR Maps identified ten bores within L7, of which two are associated with registered gas exploration wells (RN014732 - Dingo No. 1 and RN014733 - Dingo No. 2). The bore depth ranges from 24 – 640 m with a median depth of 79 m. Only one bore, RN002943, located on the western boundary of L7 intersected sufficient groundwater to warrant construction. This bore is constructed in a sequence of Quaternary to Tertiary aged alluvial deposits to a depth of 66.4 m with a reported yield of 2 L/s and a water quality of 1,140 mg/L (TDS). All other bores drilled through unsaturated Quaternary and Tertiary sediments into the underlying Pertnjarra Formation (locally the Brewer Conglomerate) were all either backfilled or constructed and abandoned. The groundwater level in the watertable aquifer ranges from 55 mBGL in the west of L7 to between 21 - 25 m in the centre of the L7. Figure 5-14 shows the location of bores across L7 and in the surrounding area. Bores marked with a green circle are recorded as “current” in NR Maps, while bores marked with a cross are designated as historical, and were either not constructed or have been abandoned. Note that two bores (RN005413 and RN010368) located in L7 are registered as current but were only constructed with surface casing and are no longer active.

The nearest active groundwater bore is RN002943 on the western edge of the lease. A number of current bores also occur within 10 km of the southern edge of the DGF, the majority of which provide water for stock watering on Orange Creek and Deep Well stations.

Duguid (2013) undertook a comprehensive review of wetlands within the Alice Springs Water Control District and found that the majority of wetlands in the district are intermittent and only hold water after rainfall events. The report did not identify any groundwater fed wetlands or springs in the vicinity of the DGF.

The closest groundwater monitoring bore is RN011854, which screens the Mereenie Sandstone aquifer, is approximately 5 km south-west of L7. RN011854 was monitored from 1985 to 2004 (Figure 5-15), water levels gradually decline over this period at a rate of 0.08 m/year. There is a notable increase in groundwater levels between 2000 and 2001, this was a particularly wet period in central Australia and suggests that the Mereenie Sandstone is receiving some active recharge in this area.



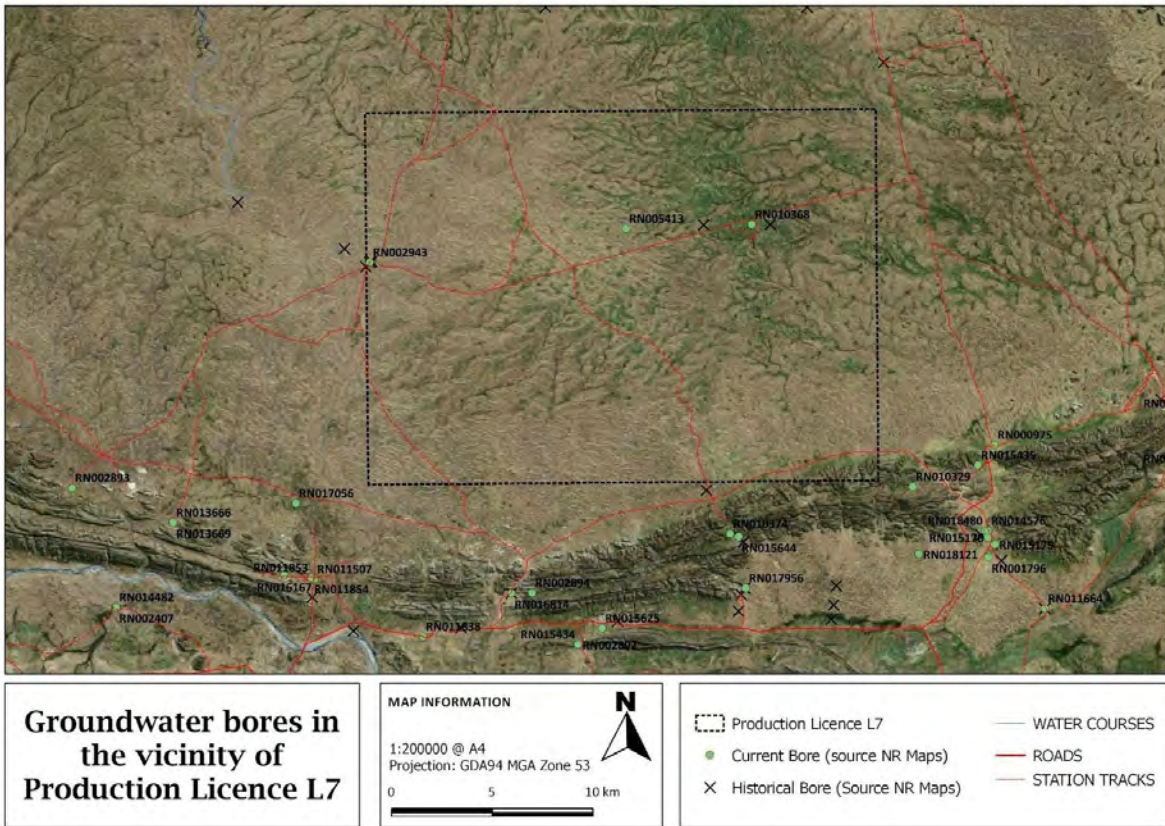


Figure 5-14 Registered groundwater bore locations in the vicinity of the DGF.

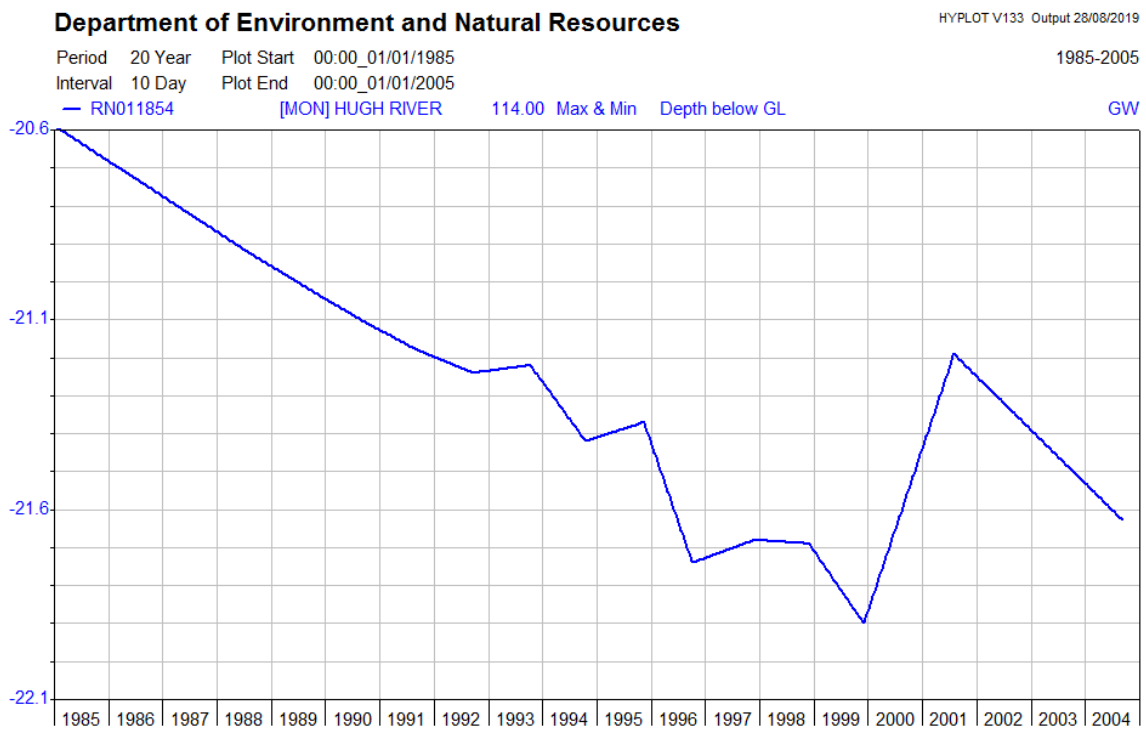


Figure 5-15 Hydrograph for RN011854 (Mereenie Sandstone) located 5 km south-west of L7.

### 5.1.8.2 Surprise Oil Field

The SOF is located in the north-west of the Amadeus Basin. The lease area straddles the northern edge of the basin with the Surprise Field situated over a north-south anticlinal feature.

The surface geology is characterised by Quaternary dune sands, clay pans, gypsum and calcrete which form local scale aquifers. Combined, they reached a thickness of 70 m when drilling the Surprise #1 well. The Mt Rennie Hydrogeological Map (Jamieson and Wischusen, 1998) categorises these deposits as having moderate bore yields (1 – 5 L/s) with fresh to saline water quality (typically brackish). Where calcrete is present there is a possibility of enhanced bore yields due to cavities. The recent sedimentary deposits overlie a thick sequence of the Pertnjara Group, Brewer Conglomerate and Hermannsburg Sandstone. Along with the underlying Parkes Siltstone these formations predominantly comprise of claystone, siltstone and shale. They have poor groundwater availability and on the basis of lithology are likely to form an aquitard unit. The Hermannsburg Sandstone, which forms a production aquifer in other regions of the Amadeus Basin is locally described as comprising fine grained siltstone (Central Petroleum, 2010) so is unlikely to form an aquifer in this area. No groundwater bores are constructed in these formations within the lease area.

The Mereenie Sandstone comprises loose, fine to very coarse grained quartz sandstone with visible porosity (Central Petroleum, 2010). Relative to the eastern Amadeus there is limited hydrogeological data available on the Mereenie Sandstone but it is presumed to form a regional scale aquifer. Jamieson and Wischusen (1998) class the formation as having moderate bore yields (1 – 5 L/s) with a typically brackish water quality. Based on the NRM maps layer “Groundwater of the Northern Territory 2M”, bore RN018463 in the north of the SOF is interpreted to likely be constructed in the Mereenie Sandstone aquifer, it has a reported yield of 15 L/s, a water quality of 6,150 µs/cm EC and a water level of 13.4 mBGL. There is insufficient water level data to establish groundwater flow directions within the Mereenie Sandstone aquifer.

Oil production within the SOF occurs from the Stairway Sandstone, which is separated from the Mereenie Sandstone by around 170 m by the Stokes Siltstone. Table 5-9 provides a summary of the formation depths, thickness and groundwater potential beneath the SOF from the surface units down to the Stairway Sandstone.

**Table 5-9 Summary of the stratigraphy and groundwater occurrence beneath L6**

Formation	Depth <sup>1</sup> (mBGL)	Thickness <sup>1</sup> (m)	Lithology	Groundwater Availability	Water Quality <sup>2</sup>
Quaternary aged sediments	Surficial	70	Dune sands, gypsum, calcrete	Local aquifer	Fresh to saline
Pertnjara Formation	70	710	Sandstone, claystone, predominantly siltstone from 230 m	Poor (Aquitard) <sup>3</sup>	Not known
Brewer Conglomerate / Hermannsburg Sandstone	780	520	Siltstone, claystone, minor sandstone	Poor (Aquitard) <sup>3</sup>	Not Known
Parkes Siltstone	1300	470	Siltstone, minor claystone	Poor (Aquitard) <sup>3</sup>	Not Known
Mereenie Sandstone	1770	510	Porous quartz sandstone	Regional Aquifer	Brackish

Formation	Depth <sup>1</sup> (mBGL)	Thickness <sup>1</sup> (m)	Lithology	Groundwater Availability	Water Quality <sup>2</sup>
Stokes Siltstone	2280	170	Claystone, siltstone	Poor (Aquitard) <sup>3</sup>	Not Known
Stairway Sandstone	2450	> 90 m	Silty sandstone with interbedded siltstone	Oil Reservoir	Not known

1. Depths and thickness based on Surprise No. 1 well

2. Water quality assessment is made for aquifers under L6 based on bore data and the Mt Rennie Hydrogeological Map

3. Designation of aquitard based on dominant lithology

A search of the groundwater bores on NR Maps identified four groundwater bores within the SOF (Figure 5-16). All four registered bores are investigation bores drilled for CP. Bore yields range from 0.7 – 2 L/s with the exception of RN018463 which yields 15 L/s and is thought to screen the Mereenie Sandstone. The bore depth ranges from 60 – 116.5 m, depth to groundwater from 8 – 16 mBGL and water quality from 1,250 – 8,000 µs/cm EC. Two relatively fresh water qualities (1,250 µs/cm and 1,530 µs/cm) are for two bores (RN018397 and RN018851) constructed in the Quaternary deposits and suggest this local aquifer is receiving recharge.

A further eight bores are located within a 25 km radius of the SOF. NR Maps records five of these as “current” bores, the remaining three were not constructed or have been abandoned. Of the five current bores four are Central Petroleum investigation bores. The remaining bore (RN014297), located approximately 10 km north-west of L6 is a water supply bore for an indigenous outstation at Nguman. Outside groundwater use by Central Petroleum, this is the only active groundwater user within 25 km of L6.

The Geoscience Australia Water Observations from Space (WoFS) product displays the percentage of observations in which surface water was detected and is derived from satellite imagery from 1987 to the present day (GA, 2019). The WoFS observations provide an indication of surface water presence, with permanence an indication of groundwater discharge. The WoFS shows that there is no permanent surface water in the vicinity of the SOF. In those areas that the presence of surface water was observed, it was generally present in a low percentage of the images (<20%) and is associated with clay pans that receive surface water run-off from rainfall events.

Historical time series groundwater level data is not available for the aquifers beneath the SOF, the closest monitoring bore is located over 50 km from the SOF.



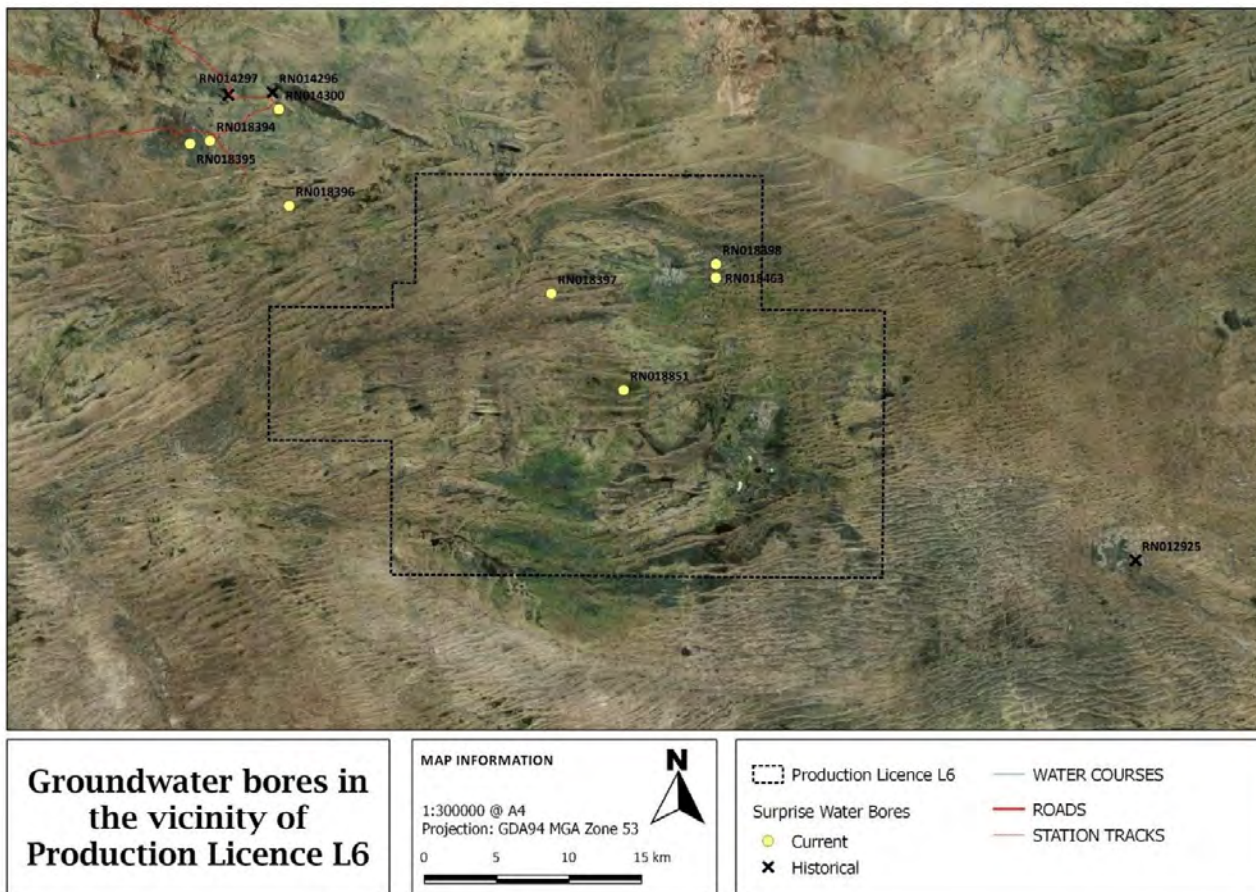


Figure 5-16 Registered groundwater bore locations in the vicinity of the SOF.



## 5.2 Biological

### 5.2.1 Vegetation Communities

#### 5.2.1.1 Dingo Gas Field

The vast majority of the DGF falls within vegetation class 83 as described by Wilson, et al (1991). A small portion of vegetation class 87 is located in the south east corner of the DGF tenure. Table 5-10 provides a description of the vegetation classes within the DGF.

All of CP's activities have been conducted within vegetation class 85.

**Table 5-10 Description of vegetation classes mapped in the DGF**

Extent in DGF	Broad Vegetation Class <sup>4</sup>	Fine Vegetation Class	Fine Vegetation Class Description	Secondary Community Descriptions	Structural Formation
95%	Hummock grasslands	85	<i>Triodia basedowii</i> hummock grassland with <i>Acacia</i> tall sparse shrubland overstorey between dunes and <i>Zygochloa paradoxa</i> open-hummock grassland on dune crests	<b>85a:</b> <i>Triodia basedowii</i> hummock grassland with <i>Acacia</i> tall sparse shrubland overstorey between dunes	S1H3 Tall sparse shrubland, Hummock grassland
				<b>85b:</b> <i>Zygochloa paradoxa</i> open-hummock grassland on dune crests	S1H2 Tall sparse shrubland, Open-hummock grassland
5%	Hummock grassland	87	<i>Triodia</i> open-hummock grassland with <i>Acacia aneura</i> tall sparse-shrubland overstorey	–	S1H2 Tall sparse shrubland, Open-hummock grassland

#### 5.2.1.2 Surprise Gas Field

Vegetation mapping of the SOF has been undertaken between 2009 and 2013 by Low Ecological Services. The majority of the SOF is within vegetation class 93 as described by Wilson, et al (1991) with a small area of vegetation class 81 located on the eastern boundary of the lease.

All of CP's activities have been conducted within vegetation class 93.

<sup>4</sup> (Wilson, Brocklehurst, Clark, & Dickinson, 1991)

**Table 5-11 Description of vegetation classes mapped in the SOF**

Extent in DGF	Broad Vegetation Class <sup>5</sup>	Fine Vegetation Class	Fine Vegetation Class Description
89%	Hard Spinifex	93	<i>Triodia basedowii</i> hummock grassland with <i>Allocasuarina decaisneana</i> (Desert Oak) open-woodland over storey between dunes
11%	Hard Spinifex	81	<i>Triodia basedowii</i> hummock grassland with <i>Acacia</i> tall sparse-shrubland overstorey

## 5.2.2 Flora and Conservation Significance

Field surveys have been undertaken of both the DGF and SOF by Low Ecological Services Pty Ltd between 2009 and 2013. A flora species is considered in this FEMP to be of conservation significance if it is:

- Listed as Extinct in Wild (EW), Critically Endangered (CE), Endangered (E), Vulnerable (VU), Near threatened (NT) or Data Deficient (DD) under the TPWC Act and has been either:
  - recorded in the NT Flora Atlas within a 10 km buffer of the DGF or SOF; or
  - has been recorded during field surveys in the DGF or SOF; or
- Listed as Critically Endangered (CE), Endangered (EN), Vulnerable (VU) or Conservation Dependent (CD) under the EPBC Act and is either:
  - identified by a Protected Matters Search Tool (PMST) report within 10km of the DGF or SOF; or
  - has been recorded during field surveys in the DGF or SOF.

### 5.2.2.1 Dingo Gas Field

Based on the results of desktop searches, previous field surveys and the Protected Matters Search Tool Report (refer Appendix 1) for the DGF, Table 5-12 provides a summary of flora species of conservation significance which may be present within the DGF and identifies the likelihood of each species occurring within the DGF.

**Table 5-12 Potential flora species of conservation significance for the DGF**

Scientific Name	Common Name	TPWC Act Status	EPBC Act Status	Survey <sup>1</sup>	Habitat in DGF	Likelihood of occurrence in the DGF
<i>Acacia undoolyana</i>	Undoolya Wattle	VU	VU	No	No	Unlikely
<i>Eleocharis papilosa</i>	Dwarf Desert Spike-rush	VU	VU	No	No	Unlikely
<i>Eremophila prostrata</i>	Rainbow Valley Fuchsia Bush	VU	VU	No	Yes	Potential but unlikely
<i>Minuria tridens</i>	Minnie Daisy	VU	VU	No	Yes	Unlikely

<sup>5</sup> Based on (Wilson, Brocklehurst, Clark, & Dickinson, 1991)

Scientific Name	Common Name	TPWC Act Status	EPBC Act Status	Survey <sup>1</sup>	Habitat in DGF	Likelihood of occurrence in the DGF
<i>Ricinocarpos gloria-medii</i>	Glory of the Centre	VU	VU	No	No	Unlikely
<i>Macrozamia macdonnelli</i>	MacDonnell Ranges Cycad	NT	VU	No	No	Unlikely

<sup>1</sup> Recorded on survey conducted by Low Ecological Services in October 2013.

### 5.2.2.2 Surprise Oil Field

Based on the results of previous field surveys and the PMST report (refer Appendix 2) for the SOF, there are no recorded flora species of conservation significance within the SOF.

### 5.2.3 Fauna and Conservation Significance

Field surveys have been undertaken of both the DGF and SOF by Low Ecological Services Pty Ltd between 2009 and 2013. A fauna species is considered in this FEMP to be of conservation significance if it is:

- Listed as Extinct in Wild (EW), Critically Endangered (CE), Endangered (EN), Vulnerable (VU), Near threatened (NT) or Data Deficient (DD) under the TPWC Act and has been either:
  - recorded in the NT Flora Atlas within a 10 km buffer of the DGF or SOF; or
  - recorded during ecological field surveys in the DGF or SOF; or
- Listed as Critically Endangered (CE), Endangered (EN), Vulnerable (VU), Conservation Dependent (CD), Migratory (MIG) or Marine (MAR) under the EPBC Act and is either:
  - identified by a PMST report within 10km buffer of the DGF or SOF; or
  - recorded during ecological field surveys in the DGF or SOF.

#### 5.2.3.1 Dingo Gas Field

Based on the results of desktop searches, ecological field surveys and the PMST report (refer Appendix 1) for the DGF, Table 5-13 provides a summary of fauna species of conservation significance which may be present in the DGF and identifies the likelihood of each species occurring within the DGF.

**Table 5-13 Fauna species of conservation significance for the DGF**

Scientific Name	Common Name	Flora Atlas Record	PMST Report	Ecology Survey <sup>1</sup>	TPWC Status	EPBC Status	Habitat in DGF	Likelihood of occurrence in DGF
<i>Amytornis modestus</i>	Thick-billed Grasswren	No	Yes	No	CR	VU	No	Unlikely
<i>Calidris ferruginea</i>	Curlew Sandpiper	Yes	Yes	No	VU	CE, MIG, MAR	No	Unlikely
<i>Erythrotriorchis radiatus</i>	Red Goshawk	No	Yes	No	VU	VU	No	Unlikely
<i>Pezoporus occidentalis</i>	Night Parrot	Yes	Yes	No	CE	EN	No	Unlikely
<i>Polytelis alexandrae</i>	Princess Parrot	Yes	Yes	No	VU	VU	Yes	Potential
<i>Rostratula australis</i>	Australian Painted Snipe	Yes	Yes	No	VU	EN	No	Unlikely
<i>Apus pacificus</i>	Fork-tailed Swift	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Motacilla cinerea</i>	Grey Wagtail	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Motacilla flava</i>	Yellow Wagtail	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Actitis hypoleucos</i>	Common Sandpiper	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Calidris melanotos</i>	Pectoral Sandpiper	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Charadrius veredus</i>	Oriental Plover, Oriental Dotterel	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Glareola maldivarum</i>	Oriental Pratincole	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Ardea alba</i>	Great Egret, White Egret	No	Yes	No	-	MAR	No	Unlikely
<i>Ardea ibis</i>	Cattle Egret	No	Yes	No	-	MAR	No	Unlikely
<i>Chrysococcyx osculans</i>	Black-eared Cuckoo	No	Yes	No	-	MAR	No	Unlikely
<i>Merops ornatus</i>	Rainbow Bee-eater	No	Yes	No	-	MAR	Yes	Potential
<i>Rostratula benghalensis (sensu lato)</i>	Painted Snipe	No	Yes	No	-	MAR	Yes	Potential
<i>Calidris canutus</i>	Red Knot	Yes	No	No	VU	-	No	Unlikely
<i>Calidris tenuirostris</i>	Great Knot	Yes	No	No	VU	-	No	Unlikely
<i>Charadrius leschenaultii</i>	Greater Sand Plover	Yes	No	No	VU	-	No	Unlikely
<i>Charadrius mongolus</i>	Lesser Sand Plover	Yes	No	No	VU	-	No	Unlikely
<i>Falco hypoleucos</i>	Grey Falcon	Yes	No	No	VU	-	Yes	Potential
<i>Limosa lapponica</i>	Bar-tailed Godwit	Yes	No	No	VU	-	No	Unlikely
<i>Macrotis lagotis</i>	Greater Bilby	Yes	No	No	VU	VU	Yes	Potential



Scientific Name	Common Name	Flora Atlas Record	PMST Report	Ecology Survey <sup>1</sup>	TPWC Status	EPBC Status	Habitat in DGF	Likelihood of occurrence in DGF
<i>Rattus tunneyi</i>	Pale Field-rat	Yes	No	No	VU	-	No	Unlikely
<i>Notocytes typhlops</i>	Southern Marsupial Mole	Yes	No	No	VU	-	Yes	Potential
<i>Petrogale lateralis</i> MacDonnell Ranges Race	Black-footed Rock-wallaby	Yes	Yes	No	NT	VU	No	Unlikely
<i>Zyomys pedunculatus</i>	Central Rock Rat	Yes	Yes	No	EN	EN	No	Unlikely
<i>Liopholis slateri slateri</i>	Slater's Skink	Yes	Yes	No	VU	EN	Yes	Potential

<sup>1</sup> Recorded on survey conducted by Low Ecological Services in October 2013.

### **5.2.3.2 Surprise Oil Field**

Based on the results of desktop searches, ecological field surveys and the PMST report (refer Appendix 2) for the SOF, Table 5-14 provides a summary of fauna species of conservation significance which may be present in the SOF and identifies the likelihood of each species occurring within the SOF.

**Table 5-14 Fauna species of conservation significance for the SOF**

Scientific Name	Common Name	Flora Atlas Record	PMST Report	Ecology Survey <sup>1</sup>	TPWC Status	EPBC Status	Habitat in SOF	Likelihood of occurrence in SOF
<i>Pezoporus occidentalis</i>	Night Parrot	Yes	Yes	No	CE	EN	No	Unlikely
<i>Polytelis alexandrae</i>	Princess Parrot	Yes	Yes	No	VU	VU	Yes	Potential
<i>Apus pacificus</i>	Fork-tailed Swift	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Motacilla cinerea</i>	Grey Wagtail	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Motacilla flava</i>	Yellow Wagtail	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Actitis hypoleucos</i>	Common Sandpiper	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Calidris melanotos</i>	Pectoral Sandpiper	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Charadrius veredus</i>	Oriental Plover, Oriental Dotterel	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Dromaius novaehollandiae</i>	Emu	Yes	No	Yes	-	-	Yes	Likely
<i>Glareola maldivarum</i>	Oriental Pratincole	No	Yes	No	-	MIG, MAR	No	Unlikely
<i>Ardea alba</i>	Great Egret, White Egret	No	Yes	No	-	MAR	No	Unlikely
<i>Chrysococcyx osculans</i>	Black-eared Cuckoo	No	Yes	No		MAR	No	Unlikely
<i>Merops ornatus</i>	Rainbow Bee-eater	No	Yes	No	-	MAR	Yes	Potential
<i>Macrotis lagotis</i>	Greater Bilby	Yes	Yes	No	VU	VU	Yes	Potential
<i>Notocytes typhlops</i>	Southern Marsupial Mole	No	Yes	No	VU	-	Yes	Potential
<i>Liopholis kintorei</i>	Great Desert Skink	No	Yes	No		VU	Yes	Potential
<i>Lagorchestes hirsutus</i>	Mala	Yes	No	No	EW	EN	Yes	Unlikely

<sup>1</sup> Recorded on survey conducted by Low Ecological Services in April 2013

## 5.2.4 Weeds

Weeds managed under this FEMP can be categorised via the following three methods:

- Weeds of National Significance (WoNS) – nationally agreed priority flora species for control and management. Weed species are determined based on rankings for invasiveness, potential to spread, and impact on socio-economic and environmental assets. There are currently 32 WoNS with each having an endorsed strategic plan which outlines tactics and actions for control.
- Declared Weeds - species which have been identified for control, eradication, or prevention of entry in all or part of the Northern Territory under the *Weeds Management Act 2001*. *Declared weeds may be either*
- Priority / alert weeds – species which have been identified as a priority or alert weed species within the Alice Springs Regional Weed Management Plan
- Invasive species – Species identified from a PMST report as being invasive.

### 5.2.4.1 Dingo Gas Field

Annual weed surveys have been conducted since 2014 within the DGF with the latest survey being conducted in March 2019. Table 5-15 provides a lists of the WoNS, declared weeds, priority / alert<sup>6</sup> weeds and invasive species recorded from either the latest weed survey, NR Maps database search (March 2020) and the PMST report (March 2020) that are within a 10 km buffer of the DGF.

Additional information on the weeds identified and control measures are provided in the Weed Management Plan in Appendix 4.

### 5.2.4.2 Surprise Oil Field

Similar to the DGF, the SOF has had annual weed surveys conducted since 2014, with the latest survey occurring in February 2020. Table 5-15 provides a lists of the WoNS, declared weeds, priority / alert<sup>7</sup> weeds and invasive species recorded from either the latest weed survey, NR Maps database search (March 2020) and the PMST report (March 2020) that are within a 10 km buffer of the DGF.

Additional information on the weeds identified and control measures are provided in the Weed Management Plan in Appendix 4.

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<sup>6</sup> Alert weeds were not detected within the 20 km buffer but have been included in the table to provide a comprehensive list

<sup>7</sup> Alert weeds were not detected within the 20 km buffer but have been included in the table to provide a comprehensive list



**Table 5-15 DGF and SOF Weeds**

Location	Scientific Name	Common Name	Priority / Alert	NT Atlas / Declared Weed Class	Invasive / WoNS	Survey <sup>1</sup>
DGF	<i>Acacia nilotica</i>	Prickly Acacia	Alert	No / A	No / Yes	No
DGF	<i>Andropogon gayanus</i>	Gamba Grass	No	Yes / A/B	Yes / Yes	No
DGF	<i>Argemone ochroleuca</i>	Mexican Poppy	No	Yes / B	No / No	No
DGF	<i>Calotropis procera</i>	Rubber Bush	Priority	Yes / B	No / No	No
DGF	<i>Carthamus lanatus</i>	Saffron Thistle	No	Yes / B	No / No	No
DGF / SOF	<i>Cenchrus ciliaris</i>	Buffel Grass	No	No / -	Yes / No	Yes
DGF	<i>Cenchrus echinatus</i>	Mossman River Grass	No	Yes / B	No / No	No
DGF	<i>Cenchrus setaceus</i>	Fountain Grass	Alert	Yes / B	No / No	No
DGF	<i>Cylindropuntia</i> spp.	Prickly Pears	Priority	Yes / A	Yes / Yes	No
DGF	<i>Opuntia stricta</i> var. <i>stricta</i>	Prickly Pears	Priority	Yes / A	Yes / Yes	No
DGF	<i>Parkinsonia aculeata</i>	Parkinsonia	Priority	Yes / B	Yes / Yes	No
DGF	<i>Prosopis velutina</i>	Mesquite	Alert	Yes / A	Yes / Yes	No
DGF	<i>Tamarix aphylla</i>	Athel Pine	Alert	Yes / B	Yes / Yes	No
DGF	<i>Xanthium spinosum</i>	Bathurst Burr	No	Yes / B	No / No	No

<sup>1</sup> Detected during weeds survey, 2019 – DGF, 2020 - SOF

## 5.2.5 Introduced Fauna and Pest Species

An introduced fauna species is considered in this FEMP to be of management concern if it is:

- Listed in the NT Fauna Atlas as “Introduced” and has been recorded within a 10 km buffer of the DGF or SOF or has been recorded on field surveys of the area; or
- Identified as an invasive species by an EPBC Protected Matters Search Tool report within a 10 km buffer of the DGF or SOF or has been recorded on field surveys of the area.

Table 5-16 lists the introduced fauna species to be of management concern for this FEMP.

**Table 5-16 Introduced fauna and pest species of management concern for the DGF and SOF**

Location	Scientific Name	Common Name	NT Atlas	PMST Report	Survey <sup>1</sup>
DGF	<i>Columbia livia</i>	Domestic Pigeon	Yes	Yes	No
DGF	<i>Streptopelia chinensis</i>	Spotted Turtle Dove	Yes	Yes	No
DGF	<i>Sturnus vulgaris</i>	Common Starling	Yes	Yes	No
DGF	<i>Streptopelia roseogrisea</i>	Barbay Dove	Yes	No	No
DGF	<i>Bos Taurus</i>	Domestic Cattle	Yes	Yes	Yes
DGF, SOF	<i>Camelus dromedarius</i>	Camel	Yes	Yes	Yes
DGF, SOF	<i>Canis lupus familiaris</i>	Domestic Dog	No	Yes	Yes
DGF	<i>Equus caballus</i>	Horse	Yes	Yes	No
DGF, SOF	<i>Felis catus</i>	Domestic Cat	Yes	Yes	Yes
DGF, SOF	<i>Mus musculus</i>	House Mouse	Yes	Yes	No
DGF, SOF	<i>Oryctolagus cuniculus</i>	European Rabbit	Yes	Yes	No
DGF	<i>Rattus norvegicus</i>	Brown Rat	Yes	Yes	No
DGF	<i>Rattus rattus</i>	Black Rat	No	Yes	No
DGF, SOF	<i>Vulpes vulpes</i>	Red Fox	Yes	Yes	No
DGF	<i>Sus scrofa</i>	Pig	Yes	No	No
DGF	<i>Equus asinus</i>	Donkey	Yes	No	No
DGF	<i>Ramphotyphops braminus</i>	Flower-pot Blind Snake	Yes	No	No

<sup>1</sup> Recorded on survey conducted by LES in April 2013 (SOF) and October 2013 (DGF)

## **5.2.6 Fire History and Regime**

### **5.2.6.1 Dingo Gas Field**

Fire frequency in the DGF area is low with all areas burnt with a frequency of at least once in the last year, last two years or not at all over the last 14 years (North Australia Fire Information, 2018). The most recent fires in 2011 burnt the majority of the DGF (North Australia Fire Information, 2018). This followed two years of well above average rainfall (2010 and first quarter of 2011) followed by three months of below average monthly rainfall (Bureau of Meteorology, 2018). A significant portion in the north of the DGF also burnt in 2002 after the high rainfall period from 1999 to 2001 (North Australia Fire Information, 2018). The fires in these two most significant fire years occurred in different seasonal conditions with fires in 2011 occurring in the late dry season and fires in 2002 occurring in the early dry and early wet seasons

Central Australia experiences an extensive fire season roughly every eight years following prolonged significant rainfall periods with small patches of fire supported every year in areas of high fuel loads.

Figure 5-17 shows the fire scar mapping for the DGF and surrounds between the years 2011 to 2019.

### **5.2.6.2 Surprise Oil Field**

Fire frequency in the SOF area is low, ranging from 2 – 3 years burnt from a period of 2000 to 2018. Fire scar mapping shows recently burnt activity south of Kintore recorded in 2018 (North Australia Fire Information, 2018).

Figure 5-18 shows the fire scar mapping for the SOF and surrounds between the years 2011 to 2019.

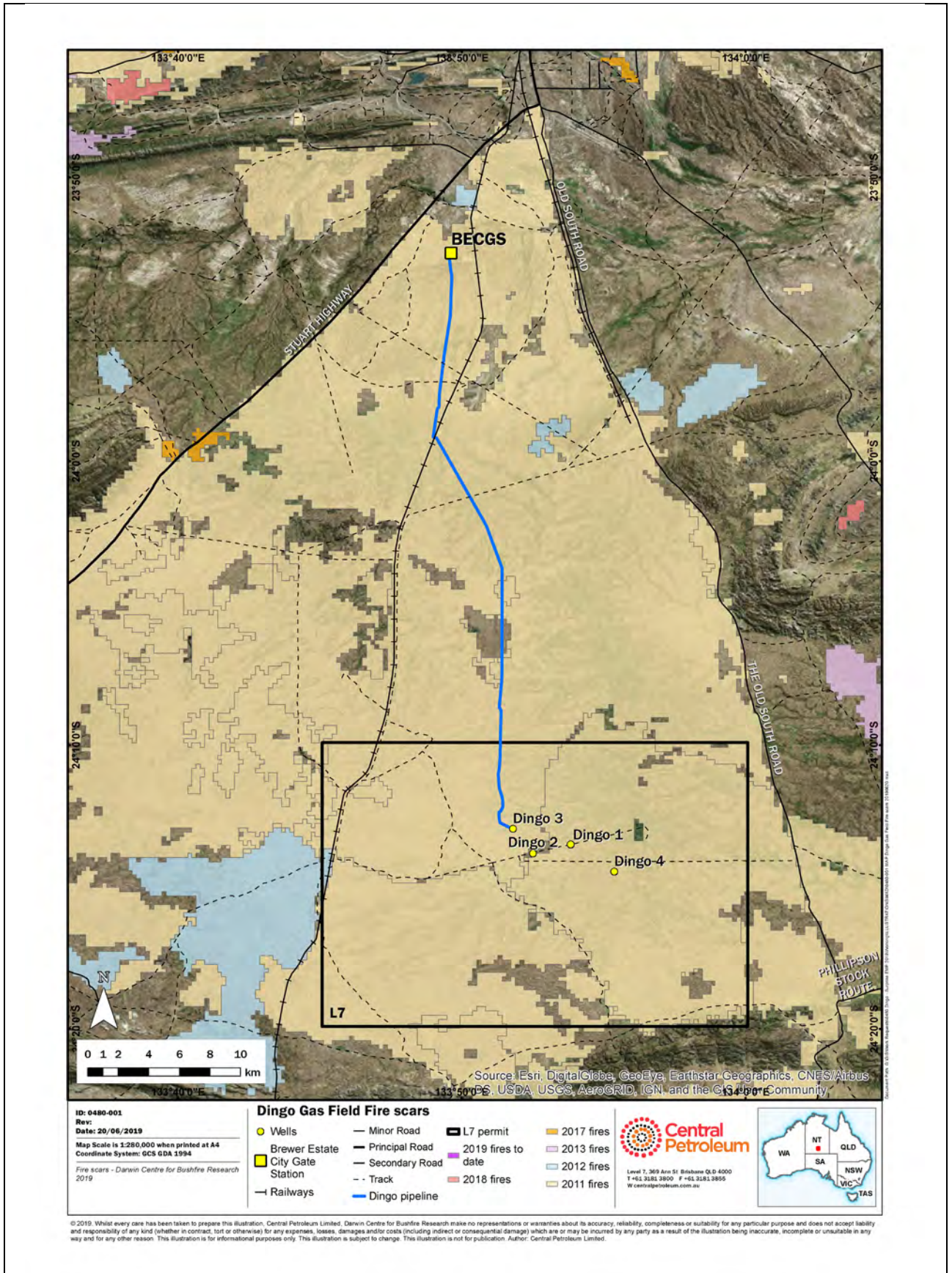
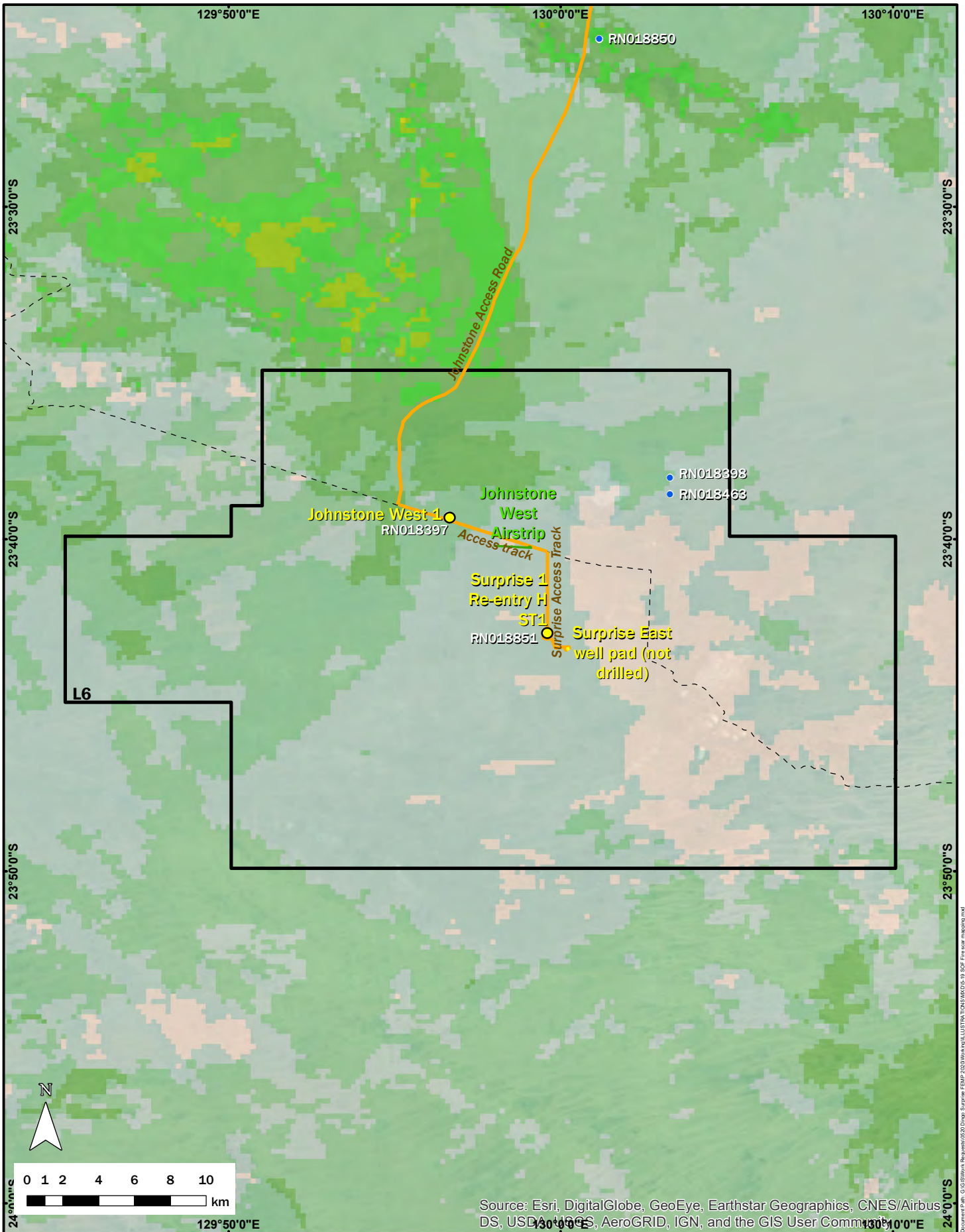


Figure 5-17 DGF Fire scar mapping





Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

ID: 0520-5-19

Rev:

Date: 23/03/2020

Map Scale is 1:280,000 when printed at A4  
Coordinate System: GCS GDA 1994

Fire frequency - Darwin Centre for Bushfire  
Research 2019

**Figure 5-18: Surprise Oil Field Fire scar mapping**

- |                   |                         |   |
|-------------------|-------------------------|---|
| Wells             | L6 permit               | 2 |
| Waterbores        | Years burnt 2000 - 2018 | 3 |
| Air strip         | Unburnt                 | 4 |
| CTP access tracks | 1                       | 5 |
| Track             |                         | 6 |



Level 7, 369 Ann St Brisbane QLD 4000  
T +61 3181 3800 F +61 3181 3855  
W centralpetroleum.com.au



## 5.3 Socio-economic Environment

### 5.3.1 Surrounding Land Tenure

#### 5.3.1.1 Dingo Gas Field

The DGF is located in the northeast of the Amadeus Basin, Northern Territory, approximately 60 km south of Alice Springs. The DGF falls under the jurisdiction of the *Petroleum Act 1984* and is regulated by the Petroleum Division within the DPIR.

The DGF encompasses two properties as listed in Table 5-17.

**Table 5-17 DGF Surrounding land tenures**

Property Name	Survey Plan Number	Land Tenure	FEMP activities conducted within property
Deep Well	S 88/194	Perpetual Pastoral Lease	Nil
Orange Creek	CP5213	Perpetual Pastoral Lease	All

#### 5.3.1.2 Surprise Oil Field

The SOF is located in the Amadeus Basin, approximately 450 km west of Alice Springs. The SOF falls under the jurisdiction of the *Petroleum Act 1984* and is regulated by the Petroleum Division within the DPIR.

The SOF encompasses one property as listed in Table 5-18.

**Table 5-18 SOF Surrounding land tenures**

Property Name	Survey Plan Number	Land Tenure	FEMP activities conducted within property
Haasts Bluff Aboriginal Land Trust	CP 004189	Freehold	All

### 5.3.2 Surrounding Populated Places

#### 5.3.2.1 Dingo Gas Field

Populated places close to the DGF are:

- Alice Springs, approximately 40 km to the north
- Santa Teresa, approximately 40 km to the east
- Titjikala (Maryvale), approximately 40 km to the south
- Hermannsburg, approximately 100 km to the west.

### **5.3.2.2 Surprise Oil Field**

Populated places close to the SOF are:

- Kintore, approximately 80 km to the north-west
- Yulara approximately 200 km to the south, south-east
- Alice Springs, approximately 450 km to the east.

### **5.3.3 Cultural Heritage**

#### **5.3.3.1 Historic and Natural Heritage**

Both the DGF and SOF are located within the MacDonnell Shire. An online search of the NT heritage register showed 18 publicly listed heritage sites in the MacDonnell Shire, none of which are located in the DGF or SOF. No non-public sites were found by the online search.

EPBC Protected Matters Search Tool reports for the DGF and SOF did not identify any World Heritage Properties, National Heritage Places, Commonwealth Heritage Places or Places on the Register of National Estate within or within a 10km buffer of either field (refer Appendix 2 and 3).

A Heritage/Archaeological Survey of the Dingo Pipeline Project was undertaken by Tim Hill in December 2013 (Hill, 2013). No archaeological sites were located during the survey.

#### **5.3.3.2 Aboriginal Sacred Sites**

A Sacred Site Authority Certificate was obtained from AAPA for the DGF in May 2014. This certificate was issued to Magellan Petroleum (NT) Pty Ltd and encompasses Dingo wells 1,2 and 3 and the associated gas pipeline and access tracks. A copy of the Authority Certificate is in Appendix 3.

CP purchased Magellan Petroleum (NT) Pty Ltd in April 2014 and the company now operates as Central Petroleum (NT) Pty Ltd, a subsidiary company of CP. An application is currently in place to amend the Authority Certificate to reflect this name change and ensure all activities described in this FEMP are included.

No Sacred Site Authority Certificates exist for the activities within the SOF or Dingo Well 4 (and associated access track within the DGF). CP is committed to working with the AAPA to ensure that it meets its legal requirements under the *Northern Territory Aboriginal Sacred Sites Act 1989* and will obtain Sacred Site Authority Certificates if required.

## 6.0 Description of Activity

### 6.1 Proposed Timetable

The DGF and SOF are established fields and the activities under the FEMP are a 'business as usual' approach. As such, many of the activities are repetitive or require certain conditions to occur (e.g. rainfall events etc) before they are triggered. Various sections within the FEMP outline the frequency of activities proposed under this FEMP (e.g. Tables 9-2 and 9-3 outline the frequency of monitoring activities).

This FEMP is for a period of 5 years from the date of approval by the NT government.

### 6.2 Activities common to both DGF and SOF

#### 6.2.1 Civil Maintenance

The well pads, hardstand areas, roads and access tracks that are owned and operated by CP are maintained to ensure safe access to the facilities in all weather. The maintenance activities include:

- Grading the access tracks to fix potholes and rough areas
- Repairing erosion, where required
- Repairing fences
- Cutting back vegetation that encroaches on the access track.

#### 6.2.2 Waste Management

At both the DGF and SOF waste is initially separated into listed and non-listed wastes. Listed waste is any waste prescribed under the *Waste Management and Pollution Control (administration) Regulations 1998* as a listed waste (refer <https://ntepa.nt.gov.au/waste-pollution/approvals-licences/listed-waste>), with non-listed waste being waste that is not prescribed under the legislation.

Listed waste is then stored onsite at either the DGF or SOF (i.e. the tenure where it was generated) until it is collected and transported off site by a licensed contractor and disposed of at an appropriately licensed facility.

Non-listed waste from the SOF is transported back to the DGF or BECGS facility for storage / recycling or disposal as appropriate.

The typical wastes that are generated at the DGF and SOF are listed in Table 6-1. Management of the waste is then undertaken in accordance with the waste management hierarchy of re-use, recycle, treat or dispose (noting avoid and reduce which are part of the hierarchy are not considered here as they are considered prior to the waste being generated).

**Table 6-1 Waste type and disposal method**

Typical waste	Disposal method
Sewage, grey water (SOF only)	Grey water and sewage treated and disposed of on-site in an approved, portable treatment system as per the Department of Health's, 'Code of Practice for small on-site sewage and sullage treatment systems and disposal for reuse of sewage effluent'



Typical waste	Disposal method
	Sludge is transported to an approved disposal facility within the NT
Food, paper, plastics	Stored in waste bins for transport and disposal at an approved disposal facility within the NT
Glass, cans, scrap metals	Stored in recycling bins for collection and transport to an approved recycling facility within the NT
Empty chemical, dangerous goods containers	Stored in a secure area and either re-used on site, returned to supplier where possible, or transported and disposed at an approved disposal facility within the NT
Timber pallets	Stored in a secure area and either re-used on site, returned to supplier where possible, or transported and disposed at an approved disposal facility within the NT
Batteries	Stored in a secure area for collection and transport to an approved recycling facility within the NT
Tyres	Stored in a secure area for collection and transported to an approved disposal facility within the NT
Oily rags, oil-contaminated material, filters, greases and any other hydrocarbon containing material	Stored in a secure area for collection and transport to an approved recycling facility or disposal facility within the NT
Spill Kits	Stored in a secure area for collection and transport to an approved disposal facility within the NT
Workover Fluids	Stored in temporary, roofed tanks. Fluid transported to an approved disposal facility within the NT

### 6.2.3 Chemicals, Dangerous Goods, Hazardous Materials and Substances Management

Where chemicals, dangerous goods, hazardous materials or substances are permanently stored at either the DGF or SOF they are stored in a designated area with adequate bunding to contain a volume not less than 120% of total stored volume. A register is kept at the DGF and SOF detailing all permanently stored chemicals, dangerous goods, hazardous materials or substances stored at the respective location.

As part of maintenance planning activities for both the DGF and SOF, the storage of any chemicals, dangerous goods or hazardous materials and substances occurs at the BECGS. Minor quantities (i.e. generally less than 205L) of any chemicals, dangerous goods, hazardous materials or substances are transported by CP personnel in the vehicles to the DGF and SOF on an ‘as needs’ basis whilst maintenance activities are being performed. These vehicles are fitted with spill kits to address any spills or leaks which may occur.

All chemicals, dangerous goods or hazardous materials and substances are stored, transported and used in compliance with their respective Safety Data Sheet (SDS). SDS for each chemical, dangerous goods, hazardous materials and substances are kept at the DGF and SOF for any chemical, dangerous goods, hazardous materials and substances stored or handled at the respective location.

If drips or leaks occur, then corrective actions are taken. At a minimum, all spills are cleaned up immediately using spill kits provided. The incident is recorded and reported to the regulator in accordance with the reporting schedule in this FEMP.

Table 6-2 provides a list of the typical chemicals used at the DGF and SOF.

**Table 6-2 Typical chemicals used at the DGF and SOF**

Substance	Hazardous Material / Substance <sup>8</sup>	Dangerous Goods <sup>9</sup>	Typical Quantity	Storage location
Anti-corrosives	Yes	Yes	200 L	BECGS
Adhesives / glues	Yes	No	500 L	BECGS
Acetone	Yes	Yes	100 L	BECGS
Thinners	Yes	Yes	200 L	BECGS
Acetylene	Yes	Yes	100 L	BECGS
Bestolife 2000	Yes	Yes	100 L	BECGS
Truck wash	Yes	No	100 L	BECGS
Priming fluids	Yes	Yes	200 L	BECGS
Diesel	Yes	Yes	500 L	BECGS
Pipe cement	Yes	Yes	100 L	BECGS
Coregas	Yes	Yes	100 kg	BECGS
Degreaser	Yes	Yes	100 L	BECGS
Paint	Yes	Yes	100 L	BECGS
Soaps	No	No	50 L	BECGS
Sealant	No	No	200 L	BECGS
Herbicide	Yes	No	200 L	BECGS
Coolant	Yes	No	100 L	BECGS
Engine oil	No	No	1,000 L	BECGS
Compressor oil	No	No	100 L	BECGS
Hydraulic oil	No	No	100 L	BECGS
Grease	No	No	100 L	BECGS
Nitrogen	Yes	Yes	100 kg	BECGS
Oxygen	Yes	Yes	100 kg	BECGS
Propane	Yes	Yes	50 kg	BECGS
Methanol	Yes	Yes	6,000 L	BECGS
Helium	Yes	Yes	100 kg	BECGS

## 6.2.4 Environmental Surveys, Monitoring

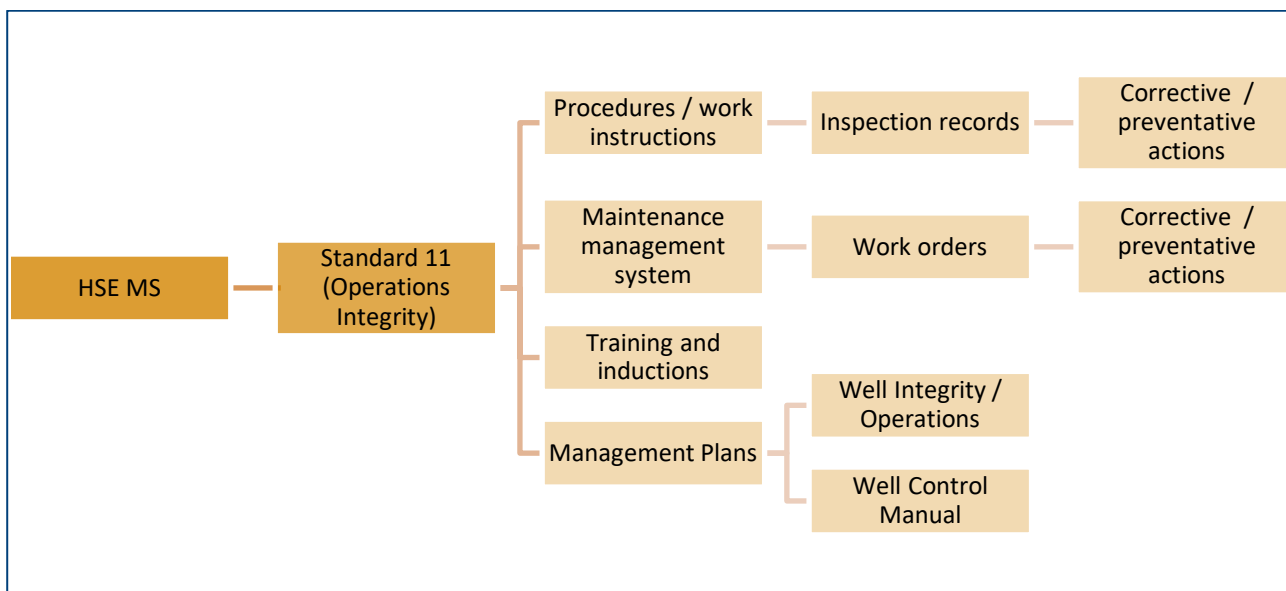
During the period of this FEMP, CP will be required to perform a number of surveys and conduct monitoring within the DGF and SOF to monitor compliance with the requirements of the FEMP. These surveys and monitoring will be non-invasive and will not result in any ground disturbance.

## 6.2.5 Integrity Management

Asset integrity management is a key focus to ensuring the DGF and SOF continue to operate in an effective and safe manner. Integrity management is a fundamental component of CP’s HSEMS (refer to section 9.1 of the FEMP) and Figure 6-1 provides an overview of CP’s asset integrity system. The asset integrity system is under continual review with Elements updated as required. CP’s approach to well integrity is consistent with section B4.1 Well Integrity Management of the Code of Practice: onshore Petroleum Activities in the Northern Territory (2019).

<sup>8</sup> As defined by Worksafe Australia

<sup>9</sup> As defined by the Australian Dangerous Goods Code



**Figure 6-1 CP Asset Integrity System**

International Standards Organization (ISO) 16530-1:2017 Petroleum and natural gas industries – Well integrity – Part 1: Life cycle governance outlines methods to effectively manage well integrity through each phase of a well’s life cycle. The phases outlined in ISO 16530-1:2017 are:

- Basis of design – Identify probable safety and environmental exposure to surface and subsurface hazards and risks that can be encountered during the well life cycle. Once identified, these hazards and risks are assessed such that control methods of design and operation can be developed
- Design - Incorporate the controls into the well design such that appropriate barriers can be established to manage safety and environmental risks
- Construction – Defines the required or recommended elements to be constructed and the verification tasks to be performed in order to achieve the intended design
- Operational – Defines the requirements or recommendations and methods for managing well integrity during operation
- Intervention (work-over) – Defines the minimum requirements or recommendations for assessing well barriers prior to and after any well intervention that involves breaking the established well barrier containment system
- Abandonment (decommissioning) – defines the requirements and recommendations for permanently abandoning a well.

CP’s asset integrity system is consistent with ISO 16530-1:2017 as it deals with the entire life cycle of an asset, including procurement requirements relating to process containment, ignition control, systems for protection, detection, shutdown and emergency response. As this FEMP relates to operation of the assets within the DGF and SOF, only those components relative to the operations, intervention and abandonment are discussed further in this FEMP.

### 6.2.5.1 Procedures / Work Instructions

Procedures and work instructions have been developed to ensure a consistent approach is undertaken by CP personnel when assessing asset integrity. The following routine operations and procedures / work instructions are implemented at DGF and SOF to reduce the potential of environmental impact due to equipment failure:

- Fuel and chemical handling and storage measures
- Ensure adequate spill clean-up material is located adjacent to fluid handling area
- Inspection and maintenance of fluid handling shut off valves
- Test and maintain function of fluid handling equipment
- Implement fauna management measures as identified as necessary in planning
- Methane emission testing
- Emergency response plan
- Oil spill response plan (SOF only)
- Hi-lo valves installed on all high-pressure wells (low pressure wells exempted)
- Review of the Well Integrity Management System
- Well site inspections
- Remote telemetry installed on all gas wells (DGF only)
- Pressure inspections.

Where a test or inspection is performed on an asset it is recorded on a proforma / checklist and retained in CP's document management system for future reference. Any actions arising from an inspection are entered into the Register and Closeout of Correcting Actions (RCCA).

#### **6.2.5.2 Maintenance Management System**

All assets are recorded in the maintenance management system and programmed to have a planned maintenance frequency. Work orders are created from the system which enables CP personnel to undertake maintenance inspections of assets in a systemic manner.

Where the work order requires a test or inspection to be performed on an asset it is recorded on a proforma / checklist and retained in CP's document management system for future reference. Any actions arising from an inspection are entered into the RCCA.

#### **6.2.5.3 Training and Inductions**

All CP personnel are required to undertake training and inductions relative to their area of employment to ensure they have the necessary skills and abilities to perform asset integrity functions.

Records of training and inductions are recorded and retained for compliance with CP's management System for training and competency requirements.

#### **6.2.5.4 Management Plans**

Separate Well Integrity and Well Operational Management Plans are currently under development and will contain the information required under the Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019). The management plans will address the entire life cycle of a well and are based on ISO 16530-1:2017. As the management plans are finalised the asset integrity system will be reviewed and updated as necessary to ensure CP's operations continue to remain effective.



As part of the development of the management plans, a Well Control Manual will also be developed and be available for inspection at each well site. The Well Control Manual will contain the information required under the Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019).

## 6.2.6 Well Suspension

Suspension activities are intended to be 'temporary', in that they are designed to secure conditions in a well so that any environmental or safety hazards are adequately controlled until the well undergoes either recompletion or a final plug and abandonment. Suspension activities are closely dependent on the condition of the well and as a result vary in their complexity.

## 6.2.7 Well Abandonment

The decision to abandon a well is made after assessing the potential value of unproduced hydrocarbons compared to the cost of remedial activities required for production of the remaining reserves. The Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019) requires a two-stage process to be followed when decommissioning a well. The process that CP undertakes is as follows:

### Stage 1

- Interest holder places downhole barriers across all identified hydrocarbon bearing zones and aquifers to be zonally isolated as per section B.4.15.2 of the Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019)
- This includes placing of casing shoe cement plug and any cased hole plugs for permanent zonal isolation in accordance with section B.4.15.3 (*Cement plug requirements and validation methods*) of the Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019)
- A surface cement plug is not placed in the well and the wellhead is not removed at this stage
- The well is left in a state that casing annuli and casing can be monitored for pressure (i.e. verify well integrity) with all downhole barriers in place
- Monitoring of pressures at an agreed frequency for duration of 1-6 months, depending on well risk and classification as per approved WOMP
- Concurrently to the well integrity monitoring, the well pad may be rehabilitated as much as practicable.

### Stage 2

- On successful validation of no well integrity issues, the interest holder completes wellhead removal and surface cement plug placement as per section B.4.15.2 of the Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019)
- These may be rigless activities as required
- Well status is officially changed to fully decommissioned once requirements of section B.4.15.2 of the Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019) are satisfied.
- Site rehabilitation may be completed.

In addition, where cement outside the casing is insufficient to provide this hydraulic isolation, remedial work to perforate the casing and squeeze or circulate additional cement into place is necessary. Cement plugs are then typically placed inside and outside of the production casing and inside the surface casing string.

## **6.2.8 Rehabilitation**

Refer to the Rehabilitation Plan in Section 13.0 for activities to be undertaken.

## **6.3 Dingo Gas Field Specific Activities**

### **6.3.1 Wellsite Operations**

Operations personnel visit producing wells frequently to monitor gas field integrity. Well control manuals are provided for inspection at well sites including but not limited to requirements for equipment level, kick detection and well control techniques, as specified by the Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019).

The flow rate from wells in the DGF is adjusted from time to time according to instructions from office-based reservoir engineers. All wells (producing) are also visited to record pressures and inspect all casing annuli. This information is recorded and forwarded to the CP management team in Brisbane.

Flaring and venting of the wells at the DGF are not expected under normal operating circumstances. Any controlled venting or flaring of gas from the DGF occurs at the BECGS facility. Where venting or flaring is required in an emergency, or as part of an operation, DPIR will be notified as a soon as possible. Any emergency venting or flaring will be in accordance with the requirements of the Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019).

### **6.3.2 Workover Operations**

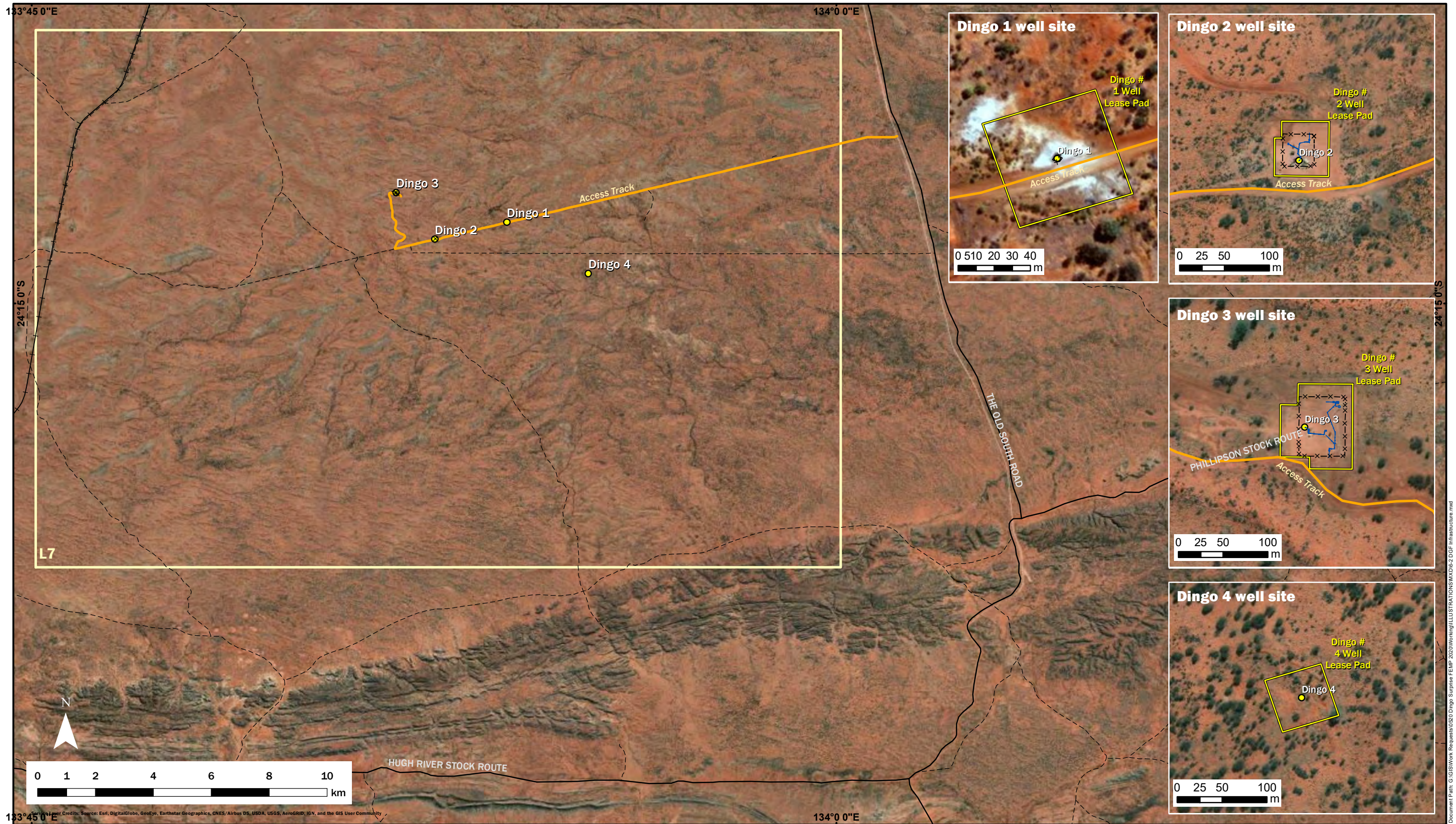
For the purposes of this FEMP, workover is a maintenance activity used to restore well bore integrity and/or increase production rates which includes re-completion activities when an existing production well is being completed in a new zone. Workovers can cover a myriad of activities depending on the nature of the well and the issue being addressed.

Workovers can include cleaning sand out of the well, fishing to recover original production equipment, installing equipment to prevent sand from entering the well, replacing liners, plugging the well, repairing casing, drilling deeper, drilling around any obstructions in the well, and re-perforating existing zones in production.

Deterioration in wellbore condition is monitored through an established surveillance program that includes remote monitoring of annuli pressures and fluid contents; the results of which are critical for the performance of safety and environmental risk assessments that provide a basis for scheduling workover priorities within the DGF.

For some workovers, limited equipment is required (for example, wireline equipment to lower tools into the hole to conduct operations), whilst others require rotation of the tubing or drill pipe, requiring a full workover rig. Pumps and storage tanks may be required for associated activities that involve circulation of workover fluids. Workover fluids would be stored as per the requirements of Section 6.1.3.





**ID: 520-6-2**  
**Rev:**  
**Date: 23/03/2020**

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 Coordinate System: GCS GDA 1994

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**Figure 6-2: Dingo Gas Field infrastructure**

- |   |   |
|---|---|
| <p><b>Dingo Gas Field Infrastructure</b></p> <ul style="list-style-type: none"> <li><span style="color: yellow;">●</span> Dingo wells</li> <li><span style="color: orange;">—</span> Access Track</li> <li><span style="color: black;">x-x</span> Fences</li> <li><span style="color: blue;">—</span> Pipework</li> </ul> | <p><b>Other Infrastructure</b></p> <ul style="list-style-type: none"> <li><span style="color: black;">+</span> Railways</li> <li><span style="color: black;">—</span> Minor Road</li> <li><span style="color: black;">- -</span> Track</li> </ul> |
|---|---|



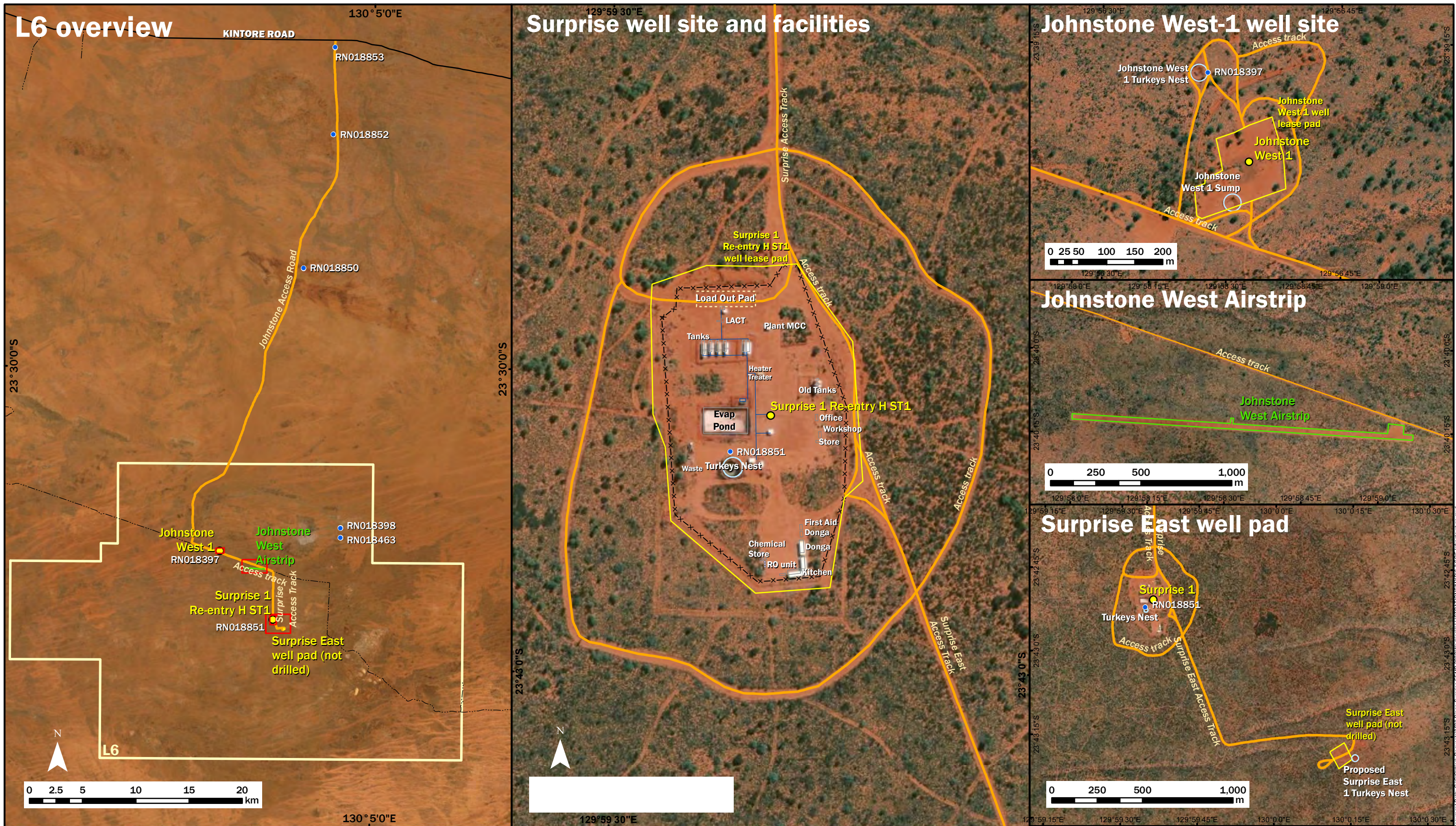
**Central  
Petroleum**

Level 7, 369 Ann St Brisbane QLD 4000  
 T +61 3181 3800 F +61 3181 3855  
 W centralpetroleum.com.au



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**Figure 6-3: Surprise Oil Field Infrastructure**

**Surprise Oil Field Infrastructure**

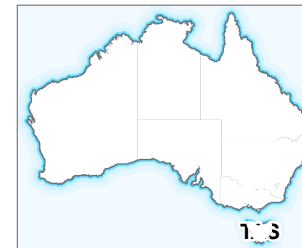
- Waterbores
- Wells
- Well lease pad
- Access tracks
- ×- Fences
- Dams
- Buildings
- Pipework

**Other Infrastructure**

- Air strip
- Minor Road
- Track



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 T +61 3181 3800 F +61 3181 3855  
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## 7.0 Environmental Risk Assessment

### 7.1 Risk Management Approach

CP ensures that risks to its business are systematically managed. Risks associated with all aspects of company operations will be:

- Identified
- Analysed and evaluated
- Logged into a suitable Risk Register (as appropriate)
- Treated in a manner commensurate with the level of risk (formal risk management plans, detailed risk treatments, routine management)
- Communicated to key stakeholders
- Monitored and reviewed in a manner commensurate with the level of risk, and the retained consequences.

Risk management processes are mandated through the CP management system, which includes a risk analysis process (Figure 7.1). The CP risk analysis process complies in all material aspects of ISO 31000 and addresses risk identification, assessment and management.

Both the DGF and SOF are isolated from other activities within their respective regions and as such CP's activities constitute the cumulative effect in the region. Where CP becomes aware that other activities are likely to contribute to a greater cumulative impact it will undertake a review of its risk assessment.


Assessment of risk is completed using CP's Risk Matrix (Section 7.6) to assess and rate risks by assessing the combination of frequency of occurrence and the severity of the outcome of an event. This allows quantification of the risk and determination can then be made about whether the risk is ALARP, or whether further mitigation is required.

CP's risk management evaluates and reviews the unmitigated risk from an activity, the residual risk once controls are applied and the likelihood and consequence of a risk event. The review includes the effectiveness of the risk controls/mitigation measures to meet CP's objective of ALARP. The CP Operations Manager is the owner of the risks associated with the DGF and SOF operational activities.

### 7.2 Hierarchy of Controls

To mitigate a risk to ALARP, CP is required to demonstrate that all reasonably practicable control measures have been identified and implemented to reduce the risk of identified hazards. CP uses the hierarchy of controls listed in Table 7-1 to determine whether a risk has been mitigated to ALARP. In determining whether a risk is at ALARP, CP considers whether the introduction of additional controls to reduce the risk are possible and if they are, would they be considered reasonable or practicable (for example if a residual risk is already at low, then it is not possible reduce the risk any further and therefore the adoption of any additional control measures would not be reasonable or practicable).

**Table 7-1 Hierarchy of Controls**

Hierarchy	Description	Effectiveness of Control
Eliminate	Hazard is physically removed	Highest  Lowest
Substitute	Hazard is replaced	
Engineering	The hazard remains but is isolated	
Administrative	People are required to change the way they work	
Personal Protective Equipment	Hazard remains but people are protected using equipment	

### 7.3 ALARP and Risk Acceptance

As part of CPs risk assessment process, each risk is mitigated to ALARP. A risk can be considered to have been reduced to ALARP when all reasonably practicable control measures have been identified and implemented to reduce the risk of identified hazards. ALARP essentially involves making a judgement about whether all reasonably practicable measures are in place to control a potential risk or impact considering the level of consequence and cost, time and resources involved to mitigate it.

To determine whether potential environmental risks and inputs are ‘acceptable’ is a matter of judgement that depends on issues such as the nature and scale of impacts and the social or economic benefits. In determining acceptability, the Regulations require consideration of the principles of ESD. It is important to note when discussing ALARP and risk acceptance that practicability and the reasonability of control measures can change over time due to changes in technology, industry standards and community acceptance.

### 7.4 Assessment of Uncertainty

To enable an accurate assessment of the potential impact and risk of the activities, the risk assessment process must include consideration of scientific uncertainty in regard to the information available to assess the risk. Uncertainty is high where confidence in the available information is low in identifying risk or the effectiveness of a management control. Additional baseline studies or other safeguards may be required to increase the accuracy of an assessment to determine the acceptability of a risk.

Scientific uncertainty is qualitatively assessed using a generic means of ranking the data available. CP uses the system described in Table 7-2 to assess the uncertainty in its risk assessment. Considerations of scientific uncertainty have been included in the risk assessment.

**Table 7-2 Scientific Uncertainty Scoring System**

Category	Description	Decision Making Tools
A (low)	Control / mitigation measures are well understood and established within the industry to ensure the risk is effectively controlled  Information available to assess the risk is current	Legislation, codes and standards exist to regulate the activity  Good industry practice includes additional controls beyond legislation, codes and standards

B (moderate)	Control / mitigation measures exist and have been demonstrated as effective in other industries  Information used to assess the risk is still valid but is either starting to date or there are information gaps	Risk based assessment tools are available for use (e.g. modelling, quantitative risk assessment, cost benefit analysis etc)
C (high)	Scarce or no data available to support the assessment of the risk	Generally, no guidance material available. The precautionary approach to management of the risk is required.

## 7.5 Professional and Stakeholder Engagement

This risk assessment has been developed based on a collaborative and iterative approach. Specialists from respective fields and impacted stakeholders have been consulted throughout the risk assessment process to develop the most practical and realistic assessment of potential environmental risk at DGF and SOF and the relative impact of mitigation and preventative measures proposed. Table 7-3 provides a list of personnel who have been involved in the risk assessment process for this FEMP.

**Table 7-3 Risk assessment workshop attendees**

Name	Organisation	Position	Experience	Role in workshop
Heath Carney	CP	Senior Environment & Compliance Advisor	20 years environmental management experience in the resources sector	Participant
Cameron Lambert	CP	Risk and Assurance Manager	21 years experience in risk management, assurance and compliance activities in the resources sector	Facilitator
Rob Ullly	Enviro-Value	Environmental Consultant	20 years environmental management experience in petroleum Industry	Participant
Brett Manuel	CP	Production Supervisor	20+ years instrumentation, refrigeration and electrical experience	Participant
Terry Wotley	CP	Senior Operator Maintainer	30+ years instrumentation and electrical experience	Participant

## 7.6 Central Petroleum Risk Matrix

Table 7-4 Central Petroleum Risk Management Approach

Risk Matrix							Remote	Unlikely	Possible	Likely	Frequent	
							Conceivable, but only in extreme circumstances	Event is unlikely to occur during the life-span of a project	Event may occur during the life-span of a project	Event likely to occur during the life-span of a project	Recurring event during the life-span of a project	
Impact Type							<1% chance of occurring within the next year.	>1% chance of occurring within the next year	>10% chance of occurring within the next year	>30% chance of occurring within the next year	>60% chance of occurring within the next year	
Impact Level												
Health and Safety												
Environment												
Community												
Legal												
Reputation												
Financial AUD\$												
Impact Level	Extreme	5 or more fatalities or life-threatening injury / illness or total permanent disability.	Extensive permanent impact on / off site or damage to critically endangered species, habitats, ecosystems.	Extensive irreversible impacts to the community or social wellbeing. Long term social unrest. Permanent damage to area/s of cultural significance.	Charges against any director or senior executive involving jail, substantial fine or loss of right to manage the company. Public inquiry – requiring considerable resources and senior executive time. Loss of an asset or loss of licence to operate an asset. Permanent non-voluntary suspension of trading CTP securities on the ASX.	Multiple stakeholder groups confirming coordinated action, as reflected in media channels with significant reach and influence. Negative international or prolonged national media (e.g. 2 weeks).	Loss of value in excess of \$20m  Cashflow impact in excess of \$5m	High	Very High	Very High	Very High	Very High
		1-4 fatalities or life-threatening injury / illness or total permanent or partial disability.	Extensive long term partially reversible impact on / off site or damage to endangered species, habitats, ecosystems.	Extensive reversible impacts to the community or social wellbeing. Prolonged community outrage. Extensive long term partially reversible damage to area/s of cultural significance.	Charges against any director, senior executive or senior manager involving fines, jail or the loss of right to manage the company. Prolonged major litigation – exposure to significant damages, fines or costs. Suspension or restrictions to the benefit of an asset or operate an asset. Prolonged non-voluntary suspension of trading CTP securities on the ASX.	Multiple stakeholder groups mobilising and encouraging other to act, as reflected in media channels with significant reach and influence. Negative media national for 2 days or more.	Loss of value >\$10m to \$20m  Cashflow impact >\$1m to \$5m	High	High	High	Very High	Very High
	Serious	Injury or illness resulting in partial disability, lost time or alternative / restricted duties.	Long term reversible impacts on / off site or to vulnerable or near threatened species, habitats, ecosystems.	Impacts to the community or social wellbeing. High levels of community tension. Long / medium term partially reversible damage to area/s of cultural significance.	Charges against any employee (not described above). Non-compliance with conditions of licence to own or operate an asset or to conduct an activity. Litigation - exposure to damages, fines or costs. Short-term non-voluntary suspension of trading CTP securities on the ASX.	More than one stakeholder group's opinion or view influencing other stakeholders, reported through media channels with some reach and influence. Negative national / state media for 1 day.	Loss of value >\$2.5m to \$10m  Cashflow impact >\$500k to \$1m	Medium	Medium	High	High	High
		Moderate	Injury or illness to 1 or more people resulting in medical treatment.	Medium / short-term impact on / off site or to low risk / least concern / common regional species, habitats, ecosystems.	Small scale impacts to the community or social wellbeing. Isolated examples of community tension. Moderate short-term impact to areas of cultural significance.	Moderate non-compliance with external mandatory obligations or breach of contractual or other legal obligations (not described above). Litigation possible. Non-compliance with internal controls with a moderate impact	A single stakeholder group drawing attention to an incident, issue, or approach conveyed through local media channels.	Loss of value >\$500k to \$2.5m  Cashflow impact >\$250k to \$500k	Low	Medium	Medium	Medium
	Minor		Injury or illness requiring first aid to 1 or more people, or no treatment recorded.	Minor near source impact on / off site – readily dealt with.	Minor community impact / short-term impact to areas of cultural significance – readily dealt with.	Minor non-compliance with external mandatory obligations or breach of contractual or other legal obligations. Non-compliance with internal controls with a minor impact.	A person or organisation within a stakeholder group signalling an interest in an incident, event or approach, using channels with limited reach or influence. Public concern restricted to local complaints.	Loss of value >\$250 to \$500K  Cashflow impact >\$50 to \$250k	Low	Low	Low	Medium



## 7.7 Risk Assessment Outcome for DGF and SOF

Table 7-5 Detailed Environmental Risk Assessment for DGF and SOF

Env Aspect	Potential impact	Causes	Consequence	Unmitigated Risk			Existing Control Measures (Control Type)	Mitigated Risk			Uncertainty Level	ALARP Discussion
				C	L	R		C	L	R		
Flora and Fauna	Activities adversely affect Flora and Fauna	Civil / maintenance works: a) Earthworks b) Light and heavy machinery operation	Injury or death of fauna	Serious	Likely	High	<ul style="list-style-type: none"> <li>Avoid driving on access roads after sunset or before sunrise where possible (administrative)</li> <li>Limit speed on unsealed access roads to 60km/hr (administrative)</li> <li>Fauna spotters to be present at any vegetation clearing (administrative)</li> </ul>	Serious	Unlikely	Medium	1	Vehicle movements are a necessary part of operations and therefore it is not possible to provide eliminate or substitute controls. Not aware of any additional engineering controls that could be implemented
		c) Maintenance of assets (e.g. wells, access tracks, pipeline, etc) d) Rehabilitation e) Unintended introduction and / or spread of weeds and invasive species	Loss of vegetation and fauna habitat			High	<ul style="list-style-type: none"> <li>Permit to work to specify that no clearing of previously undisturbed vegetation to occur (elimination)</li> <li>Conduct earthworks in accordance with the permit to work (administrative)</li> <li>Drive on designated vehicle access tracks only (administrative)</li> </ul>			Medium	1	Control measure partially eliminates hazard. Vehicle movements are a necessary part of operations. It is not reasonable or practicable to implement additional Engineering, Substitution or Elimination controls
		Increased occurrence of weeds (including invasive species)	High			<ul style="list-style-type: none"> <li>All vehicles, equipment and machinery from known weed infested areas are to be cleaned and inspected for weeds prior to attending either the DGF or SOF (engineering)</li> <li>Implement the Weed Management Plan (elimination, engineering, administrative)</li> </ul>	Medium			1	Vehicle, equipment and machinery is required for operations. It is not reasonable or practicable to implement Substitution or Elimination controls	
		Uncontrolled fires as a result of CP's activities via: a) Spill and ignition of flammable substances at any assets b) Loss of containment from the wells (DGF only) c) Uncontrolled ignition source	Injury or death of native fauna Loss of vegetation and fauna habitat	Serious	Likely	High	<ul style="list-style-type: none"> <li>4m fire breaks around fixed surface assets (engineering)</li> <li>Only fuel to be stored onsite is diesel in tanks (substitution)</li> <li>Smoking is only permitted in designated smoking areas (engineering)</li> <li>Implement emergency response plan (administrative)</li> <li>Conduct Job Hazard Analysis for any new task or new use of equipment to ensure appropriate control measures are identified and to take account of variation in fire danger ratings (administrative)</li> <li>When attending a site conduct daily toolbox meetings to advise on current fire danger, presence of fire in the area and current vegetation condition (administrative)</li> <li>Inductions to include information on the emergency response plan, designated smoking areas fire extinguisher locations (administrative)</li> <li>Fire extinguisher to be available in any vehicle which visits the DGF or SOF (PPE)</li> </ul>	Minor	Unlikely	Low	1	Elimination of the hazard is not possible. Residual risk cannot be reduced any further. No additional control types are considered reasonable or practicable to implement
		Loss of vegetation and fauna habitat	Medium			<ul style="list-style-type: none"> <li>Maintain low vegetation on cleared surfaces where possible</li> <li>Maintain drainage channels away from onsite vegetation and fauna habitat</li> <li>Where erosion / sediment loss is identified during weekly site inspections (DGF), quarterly inspections (SOF), install erosion and sediment control structures where necessary in line with best practice guidelines by DENR and IECA (engineering)</li> </ul>	Low					
		Flooding due to CP activities e.g. water diversions	Contamination of soils	Moderate	Likely	Medium	<ul style="list-style-type: none"> <li>Store minimal volumes of fuels, oils and other chemicals on site while the site is not operational (administrative)</li> <li>Ensure appropriate measures are in place (e.g. lining, bunding) to prevent fluids or other waste chemical and/or hydrocarbon fluids from contaminating water or land not specifically designated for waste disposal (engineering)</li> <li>Handle, store and otherwise manage all hazardous goods in accordance with relevant Australian Standards and Codes of Practice (administrative)</li> </ul>	Minor	Possible	Low	1	Elimination and substitution of the hazard is not possible as chemicals, dangerous goods etc are required for operations. Residual risk cannot be reduced any further. No additional control types are considered reasonable or practicable to implement
						Medium						

Env Aspect	Potential impact	Causes	Consequence	Unmitigated Risk			Existing Control Measures (Control Type)	Mitigated Risk			Uncertainty Level	ALARP Discussion
				C	L	R		C	L	R		
		Water storage in evaporation pond / turkey nests, sumps	Ground fauna entrapment and/or death	Moderate	Likely	Medium	<ul style="list-style-type: none"> <li>All lined water storages are within a fenced compound (engineering)</li> <li>Water storages outside the fenced compound are shallow with low gradient bunds (engineering)</li> </ul>	Moderate	Unlikely	Medium	1	Elimination control (i.e. removal of pond and replacement with fully enclosed tanks) is possible. Costs to implement are not considered reasonable or practicable.
		Storage and transportation of domestic wastes	Scavenging by native and pest species Pest outbreaks	Serious	Likely	High	<ul style="list-style-type: none"> <li>Suitable waste containers for waste storage are to be available at each location (engineering)</li> <li>Waste containers to be fauna and vermin proof (engineering)</li> <li>Waste storage areas are inside fenced areas to minimise fauna access (engineering)</li> <li>Each facility is maintained free of rubbish outside waste disposal receptacles (administrative)</li> <li>All waste is to be stored in waste containers (administrative)</li> <li>Any domestic waste produced in the SOF is removed when leaving the site and disposed in another CP location (administrative)</li> </ul>	Moderate	Unlikely	Medium	1	Elimination controls are not possible as waste is by product of operations. No additional controls are considered reasonable or practicable.
Land	Activities adversely affect soils and topography	Erosion due to maintenance work Earthworks required for maintenance Movement of heavy machinery and vehicles	Disruption to land use (e.g. grazing and cultural) and exposure of pipeline Disturbance to natural drainage patterns Inversion of soil profile Soil erosion and siltation of watercourses Soil compaction	Serious	Likely	High	<ul style="list-style-type: none"> <li>Requirement for erosion and sediment control structures is determined during site audits. Where determined from the audit that they are necessary they will be in line with best practice guidelines by DENR and IECA (engineering)</li> <li>Conduct Job Hazard Analysis for any new task or new use of equipment to ensure appropriate control measures are identified (administrative)</li> <li>Avoid driving on access tracks for 24 hours following significant rainfall events (i.e. &gt;10mm in 24 hours) (administration)</li> <li>Site inspections to be undertaken prior to wet season, quarterly and within 5 business days of a significant rainfall event to assess erosion issues (administrative)</li> <li>Drive on designated vehicle access tracks only (administrative)</li> </ul>	Moderate	Unlikely	Medium	1	Elimination or substitution controls not possible Maintenance activities (including along access tracks) are aimed at ensuring the facilities remain erosion free Based on historical site inspections, from 2014, maintenance activities have been effective in ensuring that any signs of erosion is rectified before control devices have been required There is no new planned ground disturbance other than maintenance of already disturbed areas under this FEMP Landforms are stable and have been since operations at the sites commenced Facilities are not located within the path of ephemeral streams or drainage lines No additional controls are considered reasonable or practicable
		Loss of containment (including spills or leaks) – facilities (SOF) and well sites	Contamination of soils	Moderate	Likely	Medium	<ul style="list-style-type: none"> <li>Asset integrity management system which includes:                             <ul style="list-style-type: none"> <li>Undertake inspection of facilities for leaks/spills and rectify where detected (administrative, engineering)</li> <li>Ensure all fittings and equipment are checked and maintained (administrative, engineering)</li> <li>Ensure that any spills, leaks or points of excessive wear are appropriately reported, and the necessary maintenance work and control measures undertaken (administrative, engineering)</li> </ul> </li> <li>Provide portable spill containment equipment (e.g. spill trays) at each of the facilities (engineering)</li> <li>Provide spill response kits appropriate for the types of spills possible at each facility (engineering)</li> </ul>	Moderate	Remote	Low	1	Elimination or substitution controls not possible Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable

Env Aspect	Potential impact	Causes	Consequence	Unmitigated Risk			Existing Control Measures (Control Type)	Mitigated Risk			Uncertainty Level	ALARP Discussion
				C	L	R		C	L	R		
		Spill or leak from the use, transportation, handling and storage of diesel, fuel, oils and chemicals	Contamination of soil	Minor	Likely	Medium	<ul style="list-style-type: none"> <li>Asset integrity management system which includes:                             <ul style="list-style-type: none"> <li>Store minimal volumes of fuels, oils and other chemicals on site while the site is not operational (administrative)</li> <li>Ensure appropriate measures are in place (e.g. lining, bunding) to prevent fluids or other waste chemical and/or hydrocarbon fluids from contaminating water or land not specifically designated for waste disposal (engineering)</li> <li>Ensure that where drips and leaks occur, corrective actions are raised, and repairs are undertaken in a timeframe commensurate with the risk of environmental harm escalating if not repaired (administrative)</li> </ul> </li> <li>Implement fuel and chemical handling and storage procedure (administrative)</li> <li>Risk assessment of road conditions for heavy vehicle transport will be conducted prior to mobilisation on unsealed roads using detailed weather forecasting (administrative)</li> <li>Provide spill response kits appropriate for the types of spills possible at each facility (engineering)</li> <li>Follow the appropriate Australian Standards and Code of Practice for the fuel / chemical being stored and used at the facility (engineering, administrative)</li> <li>On-site SDS and handling procedures for fuel / chemicals to be available at each facility (administrative)</li> <li>Pumps, tanks and transfer lines are to be located within suitably bunded and impervious areas (not applicable to temporary infrastructure) (engineering)</li> <li>In the event of a spill or leak, follow emergency response plan (administrative)</li> </ul>	Minor	Unlikely	Low	1	Elimination or substitution controls not possible. Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable
		Overflow of evaporation pond due to heavy rainfall events at SOF	Contamination of soil	Serious	Remote	Medium	<ul style="list-style-type: none"> <li>Minimum 500mm freeboard to be available (administrative)</li> <li>Pond level to be inspected each quarter and after a significant rainfall event. Where the freeboard is less than 500mm, it is to be reduced by offsite transportation and disposal by a licensed waste transporter</li> </ul>	Moderate	Remote	Low	1	Pond does not receive overland flow water. Historical maximum monthly rainfall is 356mm. Residual risk cannot be reduced any further
		Release of oily and or saline water to ground at SOF				Medium	<ul style="list-style-type: none"> <li>Ensure appropriate measures are in place (e.g. lining, bunding) to prevent fluids or other waste chemical and/or hydrocarbon fluids from contaminating water or land not approved for waste disposal (engineering)</li> <li>In the event of a spill or leak, follow the emergency response plan (administrative)</li> </ul>			Low	1	Residual risk cannot be reduced any further
		Incorrect waste segregation and disposal (including hazardous waste)	Loss of recyclable resources adding to landfill	Minor	Likely	Medium	<ul style="list-style-type: none"> <li>Segregate waste to maximise recycling and ensure other wastes are appropriately disposed of (administrative)</li> <li>Site inductions to include information on correct waste segregation and disposal (administrative)</li> <li>Removal of listed wastes for off-site disposal to be checked and signed by NT EPA approved and licensed contractor (administrative)</li> </ul>	Minor	Unlikely	Low	1	Elimination or substitution controls not possible. Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable
			Soil contamination			<ul style="list-style-type: none"> <li>Wastes stored in secured containers (engineering)</li> <li>Liquid wastes to be stored in a bunded and impervious area (engineering)</li> </ul>	1				Elimination or substitution controls not possible. Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable	

Env Aspect	Potential impact	Causes	Consequence	Unmitigated Risk			Existing Control Measures (Control Type)	Mitigated Risk			Uncertainty Level	ALARP Discussion
				C	L	R		C	L	R		
Heritage	Activities adversely affect cultural heritage sites	Earthworks required for maintenance Movement of heavy machinery and vehicles within each site	Disturbance to cultural heritage sites	Serious	Possible	High	<ul style="list-style-type: none"> <li>Site inductions to include information on location of known cultural and heritage sites and process for unexpected finds (administrative)</li> <li>Where known cultural heritage sites are within 50m of maintenance earthworks, the site will be delineated with bunting or similar (engineering)</li> <li>No earthworks to be conducted after sunset or before sunrise (administrative)</li> <li>Journey management plan filled in and approved by CP (administrative)</li> <li>Personnel access to the facility and any site/area by permit approved by the CLC and CP (administrative)</li> </ul>	Serious	Unlikely	Medium	1	Elimination or substitution controls not possible. No additional controls are considered reasonable or practicable
		Ignition of fire along assets	Disturbance to cultural heritage sites	Serious	Possible	High	<ul style="list-style-type: none"> <li>If fire detected, implement emergency response plan (administrative)</li> <li>Annual reduction of weed and vegetation at operational sites to reduce ignition load (engineering)</li> <li>Conduct Job Hazard Analysis for any new task or new use of equipment to ensure appropriate control measures are identified and to take account of variation in fire danger ratings (administrative)</li> <li>Prior to attending site, each day obtain information on current fire danger, presence of fire in the area and current weather condition from government websites (administrative)</li> </ul>	Serious	Unlikely	Medium	1	Elimination or substitution controls not possible. No additional controls are considered reasonable or practicable
Water (Surface and Groundwater)	Activities adversely affect surface water and ground water	Earthworks required for maintenance	Disturbance to natural drainage patterns Erosion and siltation of watercourses	Moderate	Unlikely	Medium	<ul style="list-style-type: none"> <li>Install erosion and sediment control structures where necessary in accordance with best practice principles and guidelines by DENR and IECA (engineering)</li> <li>Conduct Job Hazard Analysis for any new task or new use of equipment to ensure appropriate control measures are identified (administrative)</li> <li>Permit to work where required (administrative)</li> <li>Site inspections to be undertaken quarterly and within 5 business days of a significant rainfall event to assess erosion issues (administrative)</li> <li>Ensure construction operation and final constructed surface account for 1 in 100-year flooding events (engineering)</li> </ul>	Minor	Unlikely	Low	1	Elimination or substitution controls not possible Inspection frequency represents timeframes to ensure erosion issues are detected prior to having an impact Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable
		Unauthorised use of groundwater resources	Depletion of groundwater resources	Moderate	Unlikely	Medium	<ul style="list-style-type: none"> <li>If water is required from a local groundwater bore approvals will be obtained (administrative)</li> <li>Maintain a register of groundwater bores and their use (administrative)</li> </ul>	Moderate	Remote	Low	1	Elimination and substitution not possible as other water sources in the region are all groundwater based Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable



Env Aspect	Potential impact	Causes	Consequence	Unmitigated Risk			Existing Control Measures (Control Type)	Mitigated Risk			Uncertainty Level	ALARP Discussion
				C	L	R		C	L	R		
		Subsurface loss of containment – well sites	Contamination of watercourses Contamination of groundwater	Critical	Remote	High	<ul style="list-style-type: none"> <li>Asset integrity management system which includes                             <ul style="list-style-type: none"> <li>Ensure that where drips and leaks occur, corrective actions are raised, and repairs are undertaken in a timeframe commensurate with the risk of environmental harm escalating if not repaired (administrative)</li> <li>Ensure all fittings and equipment are checked and maintained</li> <li>Monitor facility pressure for quick identification of any source of leak or rupture (administrative)</li> <li>Ensure that any spills, leaks or points of excessive wear are reported, and the necessary maintenance work and control measures undertaken (administrative)</li> <li>Install, maintain and routinely test blow-out preventers (BOPs) and related well control equipment on all workover rigs (DGF only) (administrative)</li> <li>Well inspections to include tubing and annulus pressures checks and evidence of communication (administrative)</li> </ul> </li> <li>If contamination detected, implement emergency response plan (administrative).</li> <li>Well to be managed in accordance with a Well Operation Management Plan (engineering, administrative)</li> </ul>	Serious	Remote	Medium	1	Elimination and substitution controls not possible Groundwater monitoring program to be established, as determined by a suitably qualified person No additional controls are considered reasonable or practicable
		Spill or leak from the use, transportation, handling and storage of workover fluids, diesel, fuel, oils and chemicals	Contamination of surface water Contamination of groundwater	Serious	Unlikely	Medium	<ul style="list-style-type: none"> <li>Liquid wastes to be stored in a secured container in a bunded and impervious area (engineering)</li> <li>Ensure appropriate measures are in place (e.g. lining, bunding) to prevent fluids or other waste chemical and/or hydrocarbon fluids from contaminating water or land not specifically designated for waste disposal (engineering)</li> <li>Ensure that where drips and leaks occur, corrective actions are raised, and repairs are undertaken in a timeframe commensurate with the risk of environmental harm escalating if not repaired (administrative)</li> <li>Transport of hazardous material within the NT by a licensed NT EPA contractor (administrative)</li> <li>Any transport across State or Territory borders to abide by the NEPM 2013 guidelines (administrative)</li> <li>Handle, store and otherwise manage all hazardous goods in accordance with relevant Australian Standards and Codes of Practice (administrative)</li> <li>Where applicable, ensure pumps, tanks and transfer lines are located within suitably bunded and impervious areas (engineering)</li> <li>In the event of a spill or leak, follow emergency response plan (administrative)</li> </ul>	Moderate	Remote	Low	1	Elimination and substitution controls not possible as chemicals, dangerous goods etc are required for operations Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable
		Flooding	Sedimentation of watercourses	Minor	Unlikely	Low	<ul style="list-style-type: none"> <li>Separation distance from major watercourses (no major watercourses in SOF) (engineering)</li> <li>If flooding occurs, implement emergency response plan (administrative)</li> <li>Requirement for erosion and sediment control structures is determined during site audits. Where determined from the audit that they are necessary they will be in line with best practice guidelines by DENR and IECA</li> <li>Inspect operational areas following flood events to determine extent of sedimentation and remedial actions taken as required</li> </ul>	Minor	Unlikely	Low	1	Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable

Env Aspect	Potential impact	Causes	Consequence	Unmitigated Risk			Existing Control Measures (Control Type)	Mitigated Risk			Uncertainty Level	ALARP Discussion
				C	L	R		C	L	R		
			Contamination of watercourses			Low	<ul style="list-style-type: none"> <li>Separation distance from major watercourses (no major watercourses in SOF) (engineering)</li> <li>Store minimal volumes of fuels, oils and other chemicals on site while the site is not operational (administrative)</li> <li>When stored onsite, fuels, oils and other chemicals to be stored in a bunded and impervious area</li> <li>Bunded area to not be located in a flood prone area (engineering)</li> <li>If flooding occurs, implement emergency response plan (administrative)</li> </ul>			Low	1	Elimination and substitution controls not possible as chemicals, dangerous goods etc are required for operations Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable
		Overflow of evaporation pond due to heavy rainfall events (SOF only)	Contamination of surface water	Serious	Unlikely	Medium	<ul style="list-style-type: none"> <li>Separation distance from major watercourses (no major watercourses in SOF) (engineering)</li> <li>Minimum 500mm freeboard to be available (administrative)</li> <li>Pond level to be inspected each quarter and after a significant rainfall event. Where the freeboard is less than 500mm, it is to be reduced by offsite transportation and disposal by a licensed waste transporter (timing of reduction to be based on risk of overtopping event occurring within the month)</li> </ul>	Moderate	Remote	Low	1	Pond does not receive overland flow water. Historical maximum monthly rainfall is 356mm Residual risk cannot be reduced any further
		Incorrect hazardous waste segregation and disposal	Contamination of surface watercourse	Minor	Likely	Medium	<ul style="list-style-type: none"> <li>Liquid wastes to be stored in a secured container in a bunded and impervious area (engineering)</li> <li>Ensure appropriate measures are in place (e.g. lining, bunding) to prevent fluids or other waste chemical and/or hydrocarbon fluids from contaminating water or land not specifically designated for waste disposal (engineering)</li> <li>Ensure that where drips and leaks occur, corrective actions are raised, and repairs are undertaken in a timeframe commensurate with the risk of environmental harm escalating if not repaired (administrative)</li> <li>Transport of hazardous material within the NT by a licensed NT EPA contractor (administrative)</li> <li>Any transport across State or Territory borders to abide by the NEPM 2013 guidelines (administrative)</li> <li>Handle, store and otherwise manage all hazardous goods in accordance with relevant Australian Standards and Codes of Practice (administrative)</li> <li>Where applicable, ensure pumps, tanks and transfer lines are located within suitably bunded and impervious areas (engineering)</li> <li>In the event of a spill or leak, follow emergency response plan (administrative)</li> </ul>	Minor	Unlikely	Low	1	Elimination and substitution controls not possible as chemicals, dangerous goods etc are required for operations Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable
		General use of roads and access tracks for routine operations e.g. wells monitoring	Sedimentation of surface watercourses	Moderate	Unlikely	Medium	<ul style="list-style-type: none"> <li>Stick to designated speed limits (administrative)</li> <li>Monitor access tracks for signs of erosion or sedimentation occurring (administrative)</li> </ul>	Moderate	Remote	Low	1	Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable

Env Aspect	Potential impact	Causes	Consequence	Unmitigated Risk			Existing Control Measures (Control Type)	Mitigated Risk			Uncertainty Level	ALARP Discussion
				C	L	R		C	L	R		
People and Community	Activities adversely affect sensitive receptors	Explosion or fire in the operating lease area	Danger to health and safety of employees, contractors and possibly the public	Serious	Unlikely	High	<ul style="list-style-type: none"> <li>Fire extinguishers to be available at each site (PPE)</li> <li>Use of non-intrinsically safe material only allowed inside the facilities if accompanied by a gas detector and the appropriate permit (administrative)</li> <li>All staff and visitors accessing the facilities must be inducted into the emergency response plan for each facility (administrative)</li> <li>4m fire breaks around fixed surface assets (engineering)</li> <li>Implement Fire Management Plan (refer Appendix 7) (administrative, engineering)</li> <li>Chemicals, dangerous goods etc stored in secured containers and bunded areas (engineering)</li> <li>Hazardous zones for each well determined in accordance with the relevant Australian Standard (administrative)</li> <li>Only equipment authorised within the hazardous zone is used whilst on site (administrative)</li> <li>If fire occurs, implement emergency response plan (administrative)</li> </ul>	Moderate	Remote	Low	1	Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable
		Lack of consultation with stakeholders Adverse Community perception to activities	Local community and landowners' discontent and activism Disturbance or impedance of surrounding stakeholder's regular activities.	Moderate	Unlikely	Medium	<ul style="list-style-type: none"> <li>All activities to stay within the approved area (administrative)</li> <li>A full stakeholder consultation log will be maintained by CP (administrative)</li> <li>Early and ongoing Community consultation and engagement approach</li> <li>Local communities and stakeholders advised of CP contact number through multiple channels (administrative)</li> <li>Where possible, local and/or Indigenous people employed (administrative)</li> <li>All personnel and site visitors to have appropriate CLC approval and complete the appropriate inductions (administrative)</li> </ul>	Moderate	Remote	Low	1	Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable
		Traffic increase due to activities	Local community and landowners' discontent and activism Increased potential for vehicle accidents and damage to infrastructure Increased occurrence and diversity of weed species Disturbance or impedance of surrounding stakeholder's regular activities.	Moderate	Unlikely	Medium	<ul style="list-style-type: none"> <li>Minimal activities currently undertaken on site (administrative)</li> <li>Site is remote from any community members or sensitive receptors (administrative)</li> <li>Consult with surrounding stakeholders when major operations will occur (administrative)</li> <li>Approved Traffic Management Plan in effect (administrative)</li> <li>Transportation of over-width or over-dimension loads under approved Dept of Transport permit</li> <li>No unauthorised third-party access to operating leases (administrative)</li> <li>Zero alcohol and/or drugs policy with routine testing undertaken (administrative)</li> <li>No deviation from access tracks and roads (administrative)</li> <li>Staff and contractors are appropriately licensed and manage journeys in accordance with a Journey Management Plan (administrative)</li> </ul>	Moderate	Remote	Low	1	Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable

Env Aspect	Potential impact	Causes	Consequence	Unmitigated Risk			Existing Control Measures (Control Type)	Mitigated Risk			Uncertainty Level	ALARP Discussion
				C	L	R		C	L	R		
Air	Activities adversely affect air quality and climate	Movement of heavy machinery and vehicles	Dust generation	Moderate	Likely	Medium	<ul style="list-style-type: none"> <li>Implement dust control measures where appropriate including water trucks (engineering)</li> <li>Remote location unlikely to impact on surrounding users (engineering)</li> <li>Vegetation in no-use area to be left undisturbed (engineering)</li> <li>Low ground cover (&lt;10cm) to be maintained on low traffic areas and around well heads to maintain fire safety while minimising dust (engineering)</li> <li>Machinery and vehicles to stick to designated speed limits (administrative)</li> </ul>	Moderate	Remote	Low	1	Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable
		Explosion or fire on lease (during operations)	Release of particulate emissions to the atmosphere	Critical	Unlikely	High	<ul style="list-style-type: none"> <li>If fire / explosion detected, implement emergency response plan (administrative)</li> <li>Annual reduction of weed and vegetation at operational sites to reduce ignition load (engineering)</li> <li>Conduct Job Hazard Analysis for any new task or new use of equipment to ensure appropriate control measures are identified and to take account of variation in fire danger ratings (administrative)</li> <li>Prior to attending site, each day obtain information on current fire danger, presence of fire in the area and current weather condition from government websites (administrative)</li> <li>Fire management and control equipment available at each site, with personnel trained in its use (administrative)</li> <li>Use of non-intrinsically safe material only allowed inside the facilities if accompanied by a gas detector and the appropriate permit (administrative)</li> <li>Chemicals, dangerous goods etc stored in secured containers and banded areas (engineering)</li> <li>Hazardous zones for each well determined in accordance with the relevant Australian Standard (administrative)</li> <li>Only equipment authorised within the hazardous zone is used whilst on site</li> </ul>	Moderate	Remote	Low	1	Residual risk cannot be reduced any further No additional controls are considered reasonable or practicable
		Loss of containment of gas on workover or testing (DGF only)	Atmospheric pollution	Series	Remote	Medium	<ul style="list-style-type: none"> <li>Asset integrity management system which includes:                             <ul style="list-style-type: none"> <li>Install, maintain and test blow-out preventers (BOPs) and related well control equipment on all workover rigs (DGF only) (administrative)</li> <li>Well inspections to include tubing and annulus pressures checks and evidence of communication (administrative)</li> <li>Well will be managed in accordance with a Well Operation Management Plan, which includes annular pressure checks (administrative)</li> </ul> </li> </ul>	Moderate	Remote	Low	1	Infrastructure is operated in accordance with the NT Code of Practice and residual risk cannot be reduced any further No additional controls are considered reasonable or practicable
		Gas leaks from infrastructure (DGF only)				Medium	<ul style="list-style-type: none"> <li>Asset integrity management system which includes:                             <ul style="list-style-type: none"> <li>Undertake inspection of facilities for leaks and rectify where detected (administrative)</li> <li>Inspect fittings and equipment are routinely checked for excessive wear and the necessary maintenance work is undertaken (administrative)</li> <li>Monitor facility pressure for quick identification of any source of leak or rupture (administrative)</li> </ul> </li> <li>If gas leak detected, Implement emergency response plan (administrative)</li> </ul>			Low		



## 7.8 Risk Summary

Table 7-6 shows the number of unmitigated risks identified to environmental aspects associated with the operations from DGF and SOF. The count of unmitigated risks is assessed with the assumption of no control measures are in place.

Table 7-7 provides a count of the residual risks associated with the operations of the DGF and SOF, with appropriate controls implemented. This summary indicates that the controls are effective and risks have been successfully managed to ALARP and are acceptable.

**Table 7-6 Count of unmitigated risks for the operations at DGF and SOF**

Count	Unmitigated Risks			
	Low	Medium	High	Very High
	2	19	11	0

**Table 7-7 Count of residual risks for the operations at DGF and SOF**

Count	Residual Risk			
	Low	Medium	High	Very High
	23	9	0	0

## 8.0 Environmental Management

The approach taken in this FEMP is based on ESD principles. It aims to provide measurable procedures and practises, to reduce the identified environmental risks to ALARP. This will ensure that the operation of the DGF and SOF will have as minimal negative environmental impact as possible, and at completion of operations, the environment within the DGF and SOF will be returned to a suitable landscape conducive to future rehabilitation success.

There will be continual stakeholder engagement and consultation throughout the operation of and implementation of the FEMP to prevent and mitigate the identified risks and any new risks. Feedback from affected stakeholders will be used to update and enhance the risk assessment and management process.

### 8.1 Ecologically Sustainable Development

ESD is a concept based on implementing practices and principles that meet the needs of ecological process and people today without impeding on future generations to meet theirs. There is no universally accepted definition of ESD, however the Commonwealth Government of Australia suggested the following:

- Using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased' (Ecological Development Steering Committee, 1992).

The aim of ESD for CP is to utilise the natural environment to meet the current needs of CP without jeopardising the environment for future operations or other land managers. All aspects of environmental impacts have been assessed with appropriate preventative and mitigation measures implemented to ensure that all aspects of the PL area are managed and developed in accordance with the ESD concepts and this FEMP.

Forward planning and adaptation of ESD concepts from inception of development will ensure that the environmental impacts of operations at the DGF and SOF are minimised throughout the life of CP's occupation and for future land managers

### 8.2 Environmental Outcomes and Performance Standards

Based on the result of the risk assessment, CP has categorised the environmental outcomes, performance standards and measurement criteria necessary to facilitate the principles of ESD into the following broad categories:

- Biodiversity Management
- Land Management
- Water Management
- Air Quality Management
- Fire Management
- Heritage Management

- **Community Management**

The environmental outcomes, performance standards and measurement criteria for these categories are described in Table 8-1 to Table 8-7.

## 8.2.1 Biodiversity Management

Table 8-1 outlines the environmental outcomes, performance standards and measurement criteria that CP commit to under this FEMP for biodiversity management.

**Table 8-1 Biodiversity Environmental Outcomes, Performance Standards and Measurement Criteria**

Environmental Outcome	Environmental Performance Standard	Measurement Criteria
CP's activities do not impact on the viability of local conservation significant fauna / flora populations	Driving only to occur within infrastructure areas identified in Figure 6 2 and Figure 6 3	Driving only to occur within infrastructure areas identified in Figure 6 2 and Figure 6 3
	Avoid driving on access tracks within the DGF or SOF after sunset or before sunrise without approval by CP Management	No recorded incidents of unauthorised driving within the DGF or SOF after sunset or before sunrise
	Speed limited on access tracks within the DGF and SOF to 60km/hr	No recorded incidents involving vehicle related fauna strikes with speeds above 60 km/hr
	All personnel attending the DGF and SOF will be inducted on speed limits and times to avoid driving	Induction material to include information on speed limits and times to avoid driving Inductions records available for all personnel for all personnel who attended the DGF or SOF
	All vehicles, equipment and machinery from known weed infested areas are to be cleaned and inspected for weeds prior to attending either the DGF or SOF	Weed free certifications for each vehicle, equipment and machinery from known weed infested areas available
	Clearing for maintenance activities is only to occur in previously disturbed areas or areas that do not contain significant flora or is habitat for significant fauna	Permit to work records specify that no clearing of previously undisturbed vegetation to occur Permit to work documentation shows authorised work areas Ecology surveys for clearing in previously undisturbed areas conclude that it is not habitat for a conservation significant fauna species or conservation significant flora
	Weed Management Plan implemented	Annual audit results confirm Weed Management Plan is being implemented
	Evaporation pond is located within the fenced compound	Annual audit confirms compound is still fenced



## 8.2.2 Land Management

Table 8-2 outlines the environmental outcomes, performance standards and measurement criteria that CP commit to under this FEMP for land management.

**Table 8-2 Land Management Environmental Outcomes, Performance Standards and Measurement Criteria**

Environmental Outcome	Environmental Performance Standard	Measurement Criteria
CP's activities: <ul style="list-style-type: none"> <li>Avoid and control soil erosion / sedimentation</li> <li>Maintain the viability of soil through preventing contamination</li> </ul>	Requirement for erosion and sediment control devices is determined during site audits. Where determined from the audit that they are necessary they will be in line with best practice guidelines by DENR and IECA	Site audit records available Records for installed erosion and sediment control devices assessed against IECA and DENR guidelines available
	Avoid driving on access tracks for 24 hours following significant rainfall events (i.e. >10mm in 24 hours)	No recorded incidents of driving on access tracks within 24 hours of significant rainfall event
	Site inspections to be undertaken quarterly and within 5 business days of a significant rainfall event to assess erosion / sedimentation issues	Records of inspections available
	Conduct Job Hazard Analysis for any new task or new use of equipment to ensure appropriate control measures are identified	Records of job hazard analysis available
	Driving only to occur within infrastructure areas identified in Figure 6-2 and Figure 6-3	No recorded incidents of driving outside designated infrastructure areas
	Portable spill containment equipment (e.g. spill trays) to be available at each of the sites	No recorded incidents Annual site audit results confirm portable spill containment equipment is available
	Minimal volumes of fuels, oils and other chemicals to be stored on site while the site is not operational	Annual site audit results confirm quantities stored at sites
	Ensure appropriate measures are in place (e.g. lining, bunding) to prevent fluids or other waste chemical and/or hydrocarbon fluids from contaminating land	No recorded incidents Annual audit results confirm appropriate measures are in place
	Weekly inspections to be undertaken of facilities and equipment for leaks/spills. Where leaks and spills are identified, corrective actions are raised, and repairs are undertaken in a timeframe commensurate with the risk of environmental harm escalating if not repaired	Weekly inspection records available Corrective action records available

Environmental Outcome	Environmental Performance Standard	Measurement Criteria
	Implement fuel and chemical handling and storage procedure	No recorded incidents Annual site audit confirms procedure is being followed
	Risk assessment of road conditions for heavy vehicle transport will be conducted prior to mobilisation on unsealed roads using detailed weather forecasting	Risk assessment available
	Provide spill response kits appropriate for the types of spills possible at each facility	No recorded incidents of spill kits not being available Annual site audit confirms spill kits available
	Follow the appropriate Australian Standards and Code of Practice for the fuel / chemical being stored and used at the facility	No recorded incidents Annual site audit confirms relevant Australian Standards and Codes of Practice are being followed
	On-site SDS and handling procedures for fuel / chemicals to be available at each facility	SDS are available at each facility
	Pumps, tanks and transfer lines are to be located within suitably bunded areas (not applicable to temporary infrastructure)	No recorded incidents Annual site audit confirms correct storage is occurring
	Minimum 500mm freeboard to be available within the evaporation pond	Pond inspection records available
	Pond level to be inspected each quarter and after significant rainfall event. Where the freeboard is less than 500mm, it is to be reduced by offsite transportation and disposal by a licensed waste transporter	Pond inspection records available
	Wastes stored in secured containers, with liquid wastes stored in a bunded area	Weekly inspection records available
	All personnel attending the DGF and SOF will be inducted on speed limits, times to avoid driving, correct waste storage, segregation and disposal	Induction material to include information on speed limits, times to avoid driving, waste storage, segregation and disposal Inductions records available for all personnel for all personnel who attended the DGF or SOF
	Removal of listed wastes for off-site disposal to be via an NT EPA approved contractor	Waste tracking records available

### 8.2.3 Water Management

Table 8-3 outlines the environmental outcomes, performance standards and measurement criteria that CP commit to under this FEMP for water (surface and ground) management.

**Table 8-3 Water Environmental Outcomes, Performance Standards and Measurement Criteria**

Environmental Outcome	Environmental Performance Standard	Measurement Criteria
Avoid the discharge of sediment or contaminated surface water into waterways	Requirement for erosion and sediment control devices is determined during site audits. Where determined from the audit that they are necessary they will be in line with best practice guidelines by DENR and IECA	Site audit records available Records for installed erosion and sediment control devices assessed against IECA and DENR guidelines available
	Conduct Job Hazard Analysis for any new task or new use of equipment to ensure appropriate control measures are identified	Records of job hazard analysis available
	Site inspections to be undertaken quarterly and within 5 business days of a significant rainfall event to assess erosion / sedimentation issues	Records of inspections available
	Final constructed surface of infrastructure is above 1 in 100-year flooding events	Construction records
	If water is required from a local groundwater bore approvals will be obtained	No recorded incidents
	Ensure appropriate measures are in place (e.g. lining, bunding) to prevent fluids or other waste chemical and/or hydrocarbon fluids from contaminating water	No recorded incidents Annual audit results confirm appropriate measures are in place
	Weekly inspections to be undertaken of facilities and equipment for leaks/spills. Where leaks and spills are identified, corrective actions are raised, and repairs are undertaken in a timeframe commensurate with the risk of environmental harm escalating if not repaired	Weekly inspection records available Corrective action records available
	Monitor facility pressure for quick identification of any source of leak or rupture	No recorded incidents
	Well inspections to include tubing and annulus pressures checks and evidence of communication	Records of inspections available
	Install, maintain and routinely test BOPs and related well control equipment on all workover rigs	Records of tests available

Environmental Outcome	Environmental Performance Standard	Measurement Criteria
	Well to be managed in accordance with a Well Operation Management Plan	Annual site audit confirms well is operated in accordance with the well operation management plan
	Wastes stored in secured containers, with liquid wastes stored in a bunded area	Weekly inspection records available
	Waste storage bunded area not located in a flood prone area	Annual site audit confirms location is outside flood prone area
	Provide spill response kits appropriate for the types of spills possible at each facility	No recorded incidents Annual site audit confirms spill kits available
	Follow the appropriate Australian Standards and Code of Practice for the fuel / chemical being stored and used at the facility	No recorded incidents Annual site audit confirms relevant Australian Standards and Codes of Practice are being followed
	Minimum 500mm freeboard to be available within the evaporation pond	Pond inspection records available
	Pond level to be inspected each quarter and after significant rainfall event. Where the freeboard is less than 500mm, it is to be reduced by offsite transportation and disposal by a licensed waste transporter	Pond inspection records available
	Minimal volumes of fuels, oils and other chemicals to be stored on site while the site is not operational	Annual site audit results confirm quantities stored at sites
	Wastes stored in secured containers, with liquid wastes stored in a bunded area	Weekly inspection records available
	Pumps, tanks and transfer lines are to be located within suitably bunded areas (not applicable to temporary infrastructure)	No recorded incidents Annual site audit confirms correct storage is occurring



## 8.2.4 Air Quality Management

Table 8-4 outlines the environmental outcomes, performance standards and measurement criteria that CP commit to under this FEMP for air quality management.

**Table 8-4 Air Environmental Outcomes, Performance Standards and Measurement Criteria**

Environmental Outcome	Environmental Performance Standard	Measurement Criteria
CP's activities do not create a measurable decrease in air quality at sensitive receptors through: <ul style="list-style-type: none"> <li>• Dust generation</li> <li>• Emissions (gas leaks)</li> </ul>	Implement dust control measures where appropriate including water trucks	No recorded dust complaints
	Vegetation in no-use area to be left undisturbed	No recorded incidents
	Outside of firebreak areas, Low ground cover (<10cm) to be maintained on low traffic areas and around well heads to maintain fire safety while minimising dust.	No recorded incidents Annual site audit confirms low ground cover is available
	Speed limited on access tracks within the DGF and SOF to 60km/hr	No recorded incidents
	Use of non-intrinsically safe material only allowed inside the facilities if accompanied by a gas detector and the appropriate permit	No recorded incidents Permit records available
	Monitor facility pressure for quick identification of any source of leak or rupture	No recorded incidents
	Well inspections to include tubing and annulus pressures checks and evidence of communication	Records of inspections available
	Install, maintain and routinely test BOPs and related well control equipment on all workover rigs	Records of tests available
	Well to be managed in accordance with a Well Operation Management Plan	Annual site audit confirms well is operated in accordance with the well operation management plan
	Weekly inspections to be undertaken of facilities and equipment for leaks/spills. Where leaks and spills are identified, corrective actions are raised, and repairs are undertaken in a timeframe commensurate with the risk of environmental harm escalating if not repaired	No recorded incidents Annual site audit results confirm appropriate measures are in place

## 8.2.5 Fire Management

Table 8-5 outlines the environmental outcomes, performance standards and measurement criteria that CP commit to under this FEMP for fire management.

**Table 8-5 Fire Environmental Outcomes, Performance Standards and Measurement Criteria**

Environmental Outcome	Environmental Performance Standard	Measurement Criteria
CP's activities are not the cause of fires in the region	4m fire breaks maintained around fixed surface assets	Annual site audit results confirm the 4m fire break exists
	Only diesel is to be stored onsite	Annual site audit results confirm only diesel is stored onsite
	Smoking is only permitted in designated smoking areas	Designated smoking area available at DGF and SOF No recorded incidents of smoking outside designated smoking areas
	Conduct Job Hazard Analysis for any new task or new use of equipment to ensure appropriate control measures are identified and to take account of variation in fire danger ratings	Records of job hazard analysis available
	When attending a site conduct daily toolbox meetings with on-site personnel regarding current fire danger, presence of fire in the area and current vegetation condition	Records of toolbox meetings, including items discussed
	Inductions to include information on the designated smoking areas, fire extinguisher locations and emergency response plan	Induction material to include information on emergency response plan, designated smoking areas fire extinguisher locations Inductions records available for all personnel for all personnel who attended the DGF or SOF
	Fire extinguisher to be available in any vehicle which visits the DGF or SOF	No recorded incidents of vehicles not having fire extinguishers whilst at DGF / SOF Annual site audit confirms vehicles onsite are fitted with fire extinguishers
	Hazardous zones for each well determined in accordance with the relevant Australian Standard	Annual site audit confirms hazardous zones are in accordance with the relevant Australian Standard
	Only equipment authorised within the hazardous zone is used whilst on site	No recorded incidents

## 8.2.6 Heritage Management

Table 8-6 outlines the environmental outcomes, performance standards and measurement criteria that CP commit to under this FEMP for heritage management.

**Table 8-6 Cultural Heritage Environmental Outcomes, Performance Standards and Measurement Criteria**

Environmental Outcome	Environmental Performance Standard	Measurement Criteria
CP's activities avoid disturbance to or damage heritage artefacts, sacred sites or non-indigenous heritage sites	All activities undertaken in accordance with the conditions of the relevant AAPA certificate	No recorded incidents Annual site audit confirms conditions of AAPA certificate have been followed
	Site inductions to include information on location of known cultural and heritage sites and process for unexpected finds	Induction material to include information on speed limits, times to avoid driving, waste storage, segregation and disposal Inductions records available for all personnel for all personnel who attended the DGF or SOF
	Where known cultural heritage sites are within 50m of maintenance earthworks, the site will be delineated with bunting or similar	Permit to work authorisation records available Photographic evidence available of delineation method
	No earthworks to be conducted after sunset or before sunrise (administrative)	No recorded incidents
	Journey management plan approved by CP	Journey management plan records available
	Personnel access to the facility and any site/area by permit approved by the CLC and CP	Permit records available

## 8.2.7 Community Management

Table 8-7 outlines the environmental outcomes, performance standards and measurement criteria that CP commit to under this FEMP for community management.

**Table 8-7 Community Environmental Outcomes, Performance Standards and Measurement Criteria**

Environmental Outcome	Environmental Performance Standard	Measurement Criteria
CP's activities do not negatively impact on: <ul style="list-style-type: none"> <li>• Capacity of road infrastructure up to and within the DGF / SOF</li> <li>• Community relationships</li> <li>• Safety risks to the community</li> </ul>	All personnel and site visitors to have appropriate CLC approval and complete the appropriate inductions	Records available
	A full stakeholder consultation log will be maintained by CP	Records available
	Early and ongoing community consultation and engagement approach	Records available
	Local communities and stakeholders advised of CP contact number through multiple channels	Records available
	Consult with surrounding stakeholders when major operations will occur	Records available
	CP approved Traffic Management Plan in place	No recorded incidents
	Transportation of over-width or over-dimension loads under approved Department of Transport permit	No recorded incidents Permits available
	No unauthorised third-party access to infrastructure	No recorded incidents
	Routine alcohol and/or drugs testing for anyone attending the sites	No recorded breaches of CP Policy Testing results available
	Personnel are appropriately licensed to perform works	Records available
	Journey management plan approved by CP	Journey management plan records available



# 9.0 Environmental Management System Implementation

## 9.1 Central Petroleum Health, Safety and Environment Integrated Management System

The feasibility, planning and assessment of the gas field development are undertaken within the framework of the CP Health, Safety and Environment Integrated Management System (HSE MS), which incorporates environmental management. The key elements of the system include:

- Matching of legal obligations to the practical needs of all operations
- Assignment of responsibilities required to meet the commitments set out in the CP Health, Safety and Environment Policy
- Common measurement process to check that standards are complied with
- Encouragement of improvement in process and performance through feedback processes
- Appropriate and comprehensive documentary support
- Application of the system to all levels and areas of the organisation (including work by contractors), and to all working conditions and any activities that may have the potential to affect the health and safety of people or harm the environment.

The system has been constructed in a hierarchical manner, with the following tiers of documents shown in Figure 9-1.

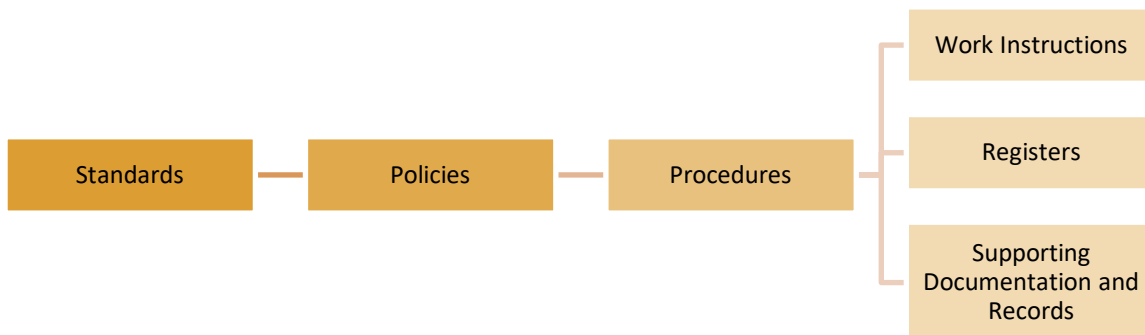


Figure 9-1 Document Hierarchy

To provide for a comprehensive HS&E MS, the Standards outlined in Table 9-1 have been developed.

**Table 9-1 HSE MS Structure**

Standard	Management Element
Standard 1	Environment, Health and Safety Policies
Standard 2	Legal and Other Obligations
Standard 3	Objectives and Targets
Standard 4	Improvement Plans
Standard 5	Responsibility and Accountability
Standard 6	Training and Competency
Standard 7	Consultation and Communication
Standard 8	Document and Record Management
Standard 9	Hazard Identification, Risk Assessment and Control
Standard 10	Contractor and Supplier Management
Standard 11	Operations Integrity
Standard 12	Management of Change
Standard 13	Emergency Preparedness
Standard 14	Monitoring, Measurement and Reporting
Standard 15	Incident Investigation
Standard 16	Management System Audit and Assessment
Standard 17	Management Review

## 9.2 Roles and Responsibilities

All field operations are managed by CP. The following subsections outline the responsibilities allocated to key personnel.

Although it is everybody’s responsibility to ensure the DGF and SOF environmental standards are maintained, the Production Supervisor at the DGF and SOF is responsible for maintaining and implementing this FEMP (which includes ensuring people are aware of their roles and responsibilities under the FEMP).

The General Manager of Operations is responsible for submitting new revisions of this document to the DENR and the CLC.

### 9.2.1 General Manager of Operations

It is the responsibility of the General Manager of Operations to ensure that:

- The FEMP is implemented, and reviews are undertaken as per the review schedule in the FEMP
- Conformance with the CP HS&E MS
- All permits and approvals to conduct activities under the FEMP are obtained and complied with
- Internal and external compliance audits are conducted
- Personnel are appointed to investigate the merit of stakeholder objections / claims
- Environmental incidents are reported to the CP management team and (where required) to the regulator
- Contractors HS&E systems are compliant with CP's HS&E MS and this FEMP
- Initiate the emergency response plan where an event has occurred
- Appropriate communications are in place between CP, the land owner and other stakeholders to keep them informed of project issues and developments that may affect their activities.

### 9.2.2 DGF and SOF Production Supervisors

It is the responsibility of the Production Supervisors to:

- Ensure that all aspects of the FEMP for their respective areas for are undertaken
- Ensure a site/project specific induction is conducted prior to any contractor commencing work on site
- Notify CP General Manager of Operations of any stakeholder objections or claims
- Ensure a *Visitor Induction* is conducted prior to allowing any casual persons (anyone who does not have work to perform on site) to enter the site
- Undertake monitoring for bushfires and alert the HS&E team and landholders
- Ensure all hazards, incidents and near misses are promptly reported, investigated and appropriate corrective action completed
- Maintain operating practices which meet CP HS&E MS standards.

### 9.2.3 CP HS&E Team

It is the responsibility of the HS&E Team to:

- Work with the General Manager of Operations and DGF and SOF Supervisors to develop and implement procedures, work instructions, registers, forms and other documents to ensure on-ground works comply with the requirements of this FEMP

- Work with the CP General Manager of Operations and DGF and SOF Supervisors to ensure contractor's HS&E management systems comply with CP's HS&E MS or a bridging document is in place and enforced
- Ensure that all new employees receive relevant corporate induction and training
- Provide ongoing training at site/s to ensure all personnel and contractors have the skills and knowledge to carry out assigned tasks in a safe and productive manner
- Ensure all employees and visitors comply with CP HS&E MS policies and procedures
- Ensure compliance with all relevant legislative requirements
- Maintain operating practices which meet CP HS&E MS standards
- Ensure all hazards, incidents and near misses are promptly reported, investigated and appropriate corrective action completed
- Identify potential hazards through regular workplace inspections and daily toolbox meetings and implement corrective action when required
- Encourage employee participation in safety/training programs and initiatives.

#### **9.2.4 Contractors / Personnel / Visitors**

It is the responsibility of the Contractors/Personnel/Visitors to:

- Follow CP's procedures and work instructions
- Complete CP's registers, inductions and forms as required
- Encourage improvement wherever possible
- Promptly report all HS&E hazards, incidents and near misses to their immediate supervisor
- Comply with CP HS&E MS policies and procedures
- Ensure that work is not undertaken for which they feel they have not received adequate information and/or instruction
- Never undertake any task that does not meet CP HS&E MS standards
- Notify the DGF / SOF Supervisors of any stakeholder objections / claims they receive
- Actively participate in CP HS&E MS and training initiatives.

### **9.3 Training and Competencies**

CP takes all steps to ensure ongoing training and awareness is conducted with all personnel and contractors. This enables CP, its workforce and contractors to cooperate effectively in developing and promoting measures to ensure a high level of HS&E knowledge and compliance. Additional training will be provided on an as required basis.

CP's HS&E MS training and awareness include:

- Compulsory site inductions



- Pre-start (Toolbox) meetings
- Routine HS&E meetings and reports
- Shift handovers
- Dissemination and display of HS&E related information.

A register of training and competencies for CP personnel and contractors is maintained for compliance with CP's management system for training and competency requirements

### **9.3.1 Site Inductions**

Site inductions are compulsory and are the key mechanism CP employs to ensure all personnel, contractors and visitors are informed of CP HS&E MS and this FEMP including legislative responsibilities.

As a minimum, CP will ensure all personnel and contractors are trained in and are aware of the following CP systems:

- Permit to Work system
- Isolation and tagging procedures
- Job Hazard Analysis
- Remote communication equipment and procedures
- Field Operations Emergency Response Plan
- Spill prevention
- Land disturbance
- Waste management
- Pest, plant and animal control
- Incident reporting
- Environmental awareness
- Speed limits
- Roles and responsibilities under this FEMP

Once approved the FEMP will be rolled out across the business by the Senior Environmental and Compliance Advisor.

A copy of the FEMP is available on site to all employees and contractors.

Visitors will receive a limited site induction that covers emergency response and this FEMP. All visitors must be signed in and be accompanied by a CP representative at all times whilst on site unless a full site induction is provided.

A register of inducted CP personnel and contractors will be maintained for auditing purposes.

### 9.3.2 HS&E Meetings

As minimum, HS&E meetings will be held six monthly with all personnel, including all contractors and visitors that are on site. HS&E meeting minutes will:

- Include a cover sheet including the names of all personnel in attendance
- Be recorded in detail on the HS&E Meeting Minutes form ensuring all items discussed are recorded and tracked for close-out as appropriate
  - Topics on environment include:
    - Environmental performance (spills and incidents)
    - Outcome of environmental incident investigations
    - Outcome of Environment inspections
    - Outcomes and corrective actions from the Annual FEMP Audit
- Itemise the main issues discussed at the meeting and agree on action items
- Assign a nominee to close out any action item.

All action items are to be transferred to the site Register and Closeout of Correcting Actions (RCCA) for tracking and close out.

HS&E meeting minutes and the updated RCCA will be displayed on the site HS&E notice boards.

### 9.3.3 HS&E Reports

CP DGF and SOF Supervisors will provide regular updates to CP Management including the CP General Manager of Operations and CP HS&E Coordinator. The update will include:

- HS&E meeting minutes
- Site HS&E statistics (including internal environmental performance metrics - recordable incidents, water produced, water consumed, and emissions released)
- RCCA
- Results of emergency simulation training exercises.

### 9.3.4 Pre-start (Toolbox) Meetings

A toolbox meeting will be held daily and prior to any change in activity commencing on the day of an activity occurring. These are designed for employees to discuss task HS&E issues and specific requirements for the day's operations, including work permits.

The meeting is designed to discuss the following issues daily:

- Operations to be conducted during the next 12 hours and any potentially hazardous activities associated to those activities and a review of the controls under the FEMP for the operational activities
- Any hazards identified in the last 24 hours that may affect the work force or operations
- Any incidents or accidents that have occurred in the last 12 hours.

### **9.3.5 Shift Handovers**

CP have developed and implemented a suitable handover procedure for shift changes and crew changes to ensure that relieving personnel are fully aware of their responsibilities and work status. Shift change handovers include the completion of checklists and other specified documentation. The handover checklist includes as a minimum:

- Any equipment damaged or out of service
- Status of current operations (inclusive of matters pertaining to the FEMP)
- Any personnel or crew issues that the relief needs to be aware of
- Third party equipment or operation in the area.

### **9.3.6 HS&E Related Information**

CP makes relevant HS&E information available by displaying on the site HS&E notice board. This may include:

- Policies and environment and safety management documentation
- Legislation, standards and guidelines
- Emergency contact information
- Appropriate signs being displayed relating to fire, safety and PPE requirements
- Emergency evacuation plans for the site
- Safety alerts and technical bulletins
- HS&E minutes; from six monthly HS&E meeting
- Emergency drill reports
- The RCCA.

## **9.4 Monitoring, Auditing and Management of Non-Compliance**

### **9.4.1 Monitoring**

The DGF and SOF are routinely monitored during operations by site personnel, external service providers, CP management. Monitoring is supported by the CP environmental personnel to ensure the management controls described in Section 8.0 are implemented and that the performance measures are achieved. Table 9-2 and Table 9-3 provide an outline of the main monitoring activities undertaken at the DGF and SOF.

All equipment used for monitoring will be calibrated in accordance with manufacturer's specifications.

**Table 9-2 Activities to monitor control effectiveness during operations for DGF**

Control	Monitoring	
	Action	Frequency
<b>ALL</b>		
Site inductions and training	Keep records of inductions and training to ensure 100% participation by all relevant personnel, contractors and visitors	For all new staff members and visitors before access to the site Annual review of training records
Job hazard analysis	Perform a job hazard analysis of any new task or new use of equipment	Prior to commencing new task or using new equipment
<b>ASSET INTEGRITY - SUBSURFACE</b>		
Gas extraction	Monitoring of wellhead pressure (producing wells)	Monthly
	Monitoring of wellhead pressures (non-producing wells)	Monthly
<b>ASSET INTEGRITY – SURFACE FACILITIES</b>		
Gas processing	Routine testing, inspection and preventative maintenance program for the DGF	Per inspection regime within CP's maintenance management system (CMMS)
	Monitoring of plant conditions	Daily
<b>CHEMICAL AND HAZARDOUS MATERIALS MANAGEMENT</b>		
Storage of chemicals, fuel and oils	Routine visual inspection of storage areas to ensure no leaks or spills	Weekly
	Visual inspection to ensure adequate bunding and containment strategies implemented	Quarterly
Spills and leaks of chemicals, fuel and oils	Routine emergency response drills	Monthly
<b>WASTE MANAGEMENT</b>		
Waste receptacles	Visual inspection of waste receptacles to ensure no fauna access to waste storage locations, lids are secure, waste are appropriately stored and there are no leaks	Weekly
Waste handling	Audit waste register to ensure all waste removal is appropriately captured and recorded	Quarterly
<b>EROSION AND SEDIMENT CONTROL</b>		
Erosion and sedimentation on site	Visual site inspection to ensure appropriate erosion and sedimentation control measures implemented	During civil maintenance works
Erosion control	Visual site inspection ensuring adequate control devices in place in accordance with DENR and IECA best practice guidelines	Following any significant rainfall events (>10mm in 24 hours)
<b>DECOMMISSIONING AND REHABILITATION MANAGEMENT</b>		
Decommission and rehabilitation activities	Visual inspection of rehabilitation areas	Yearly
Decommission and rehabilitation activities	Photographic point monitoring before, during and after rehabilitation	As required before, during and after rehabilitation works
<b>BIOSECURITY MANGAEMENT</b>		
Weed-free certification	Weed free certificates when equipment and materials are mobilised to site from known weed infested areas	When equipment / materials are brought to site from known weed infested areas
Weed management	Inspection to identify weed outbreaks	Quarterly
<b>BIODIVERSITY MANGEMENT</b>		



Control	Monitoring	
	Action	Frequency
Ecological assessment	Ecological surveys for flora and fauna	Prior to any civil maintenance
<b>BUSHFIRE PREVENTION</b>		
Fire control equipment	Inspect fire control equipment to ensure functionality	Bi-annual
Fire control	Inspect fire breaks	Yearly
<b>AIR QUALITY PROTECTION MEASURES</b>		
Emissions	Maintenance records of vehicles and equipment	Per inspection regime
Venting	Record of all venting events	During operations as required
Complaints	Record of complaints from surrounding land users in regard to air quality or visual amenity	Records kept when applicable
Dust	Monitoring of road conditions	Weekly
<b>TRAFFIC AND TRANSPORT MANAGEMENT</b>		
No unauthorised off-road driving, all drivers inducted into the potential impacts of off road driving on soil	Records kept of any incidents	During operations as required
Fauna strike	Records kept in a fauna register of any near misses or strikes	During operations as required
Zone designated speed limits	Records of any failures to comply and corrective action taken	During operations as required
<b>COMMUNITY IMPACT MINIMISATION</b>		
Complaints	Records of complaints from surrounding land users in regard to noise and vibrations from operations	Records kept of any incident when applicable
<b>CULTURAL HERITAGE AND SACRED SITES PRESERVATION</b>		
Interference with Aboriginal sacred sites, places or objects of archaeological significance.	Records kept of any incidents	Records kept of any incident when applicable
<b>SOIL</b>		
Soil contamination	Soil sampling directly after clean up at any location where spill/contamination has occurred Soil testing of any area of remediation following spill/contamination if applicable	As required, following incident, until soil is classified as remediated in accordance with the NEPM 2013 guidelines for contaminated sites
<b>SURFACE WATER</b>		
Surface water contamination	Water/soil sampling directly after incident to determine extent of contamination and following removal of contamination source	As required, following incident, until soil/water is classified as remediated in accordance with the NEPM 2013 guidelines for contaminated sites and/or appropriate surface water guidelines

SOF is a suspended facility and the monitoring has been developed to suit this status.

**Table 9-3 Activities to monitor control effectiveness during operations for the SOF**

Control	Monitoring	
	Action	Frequency
<b>ALL</b>		
Site inductions and training	Keep records of inductions and training to ensure 100% participation by all relevant personnel, contractors and visitors	For all new staff members and visitors before access to the site Annual review of training records
Job hazard analysis	Perform a job hazard analysis of any new task or new use of equipment	Prior to commencing new task or using new equipment
<b>ASSET INTEGRITY - SUBSURFACE</b>		
Oil extraction	Monitoring of wellhead pressure (producing wells)	Monthly
	Monitoring of wellhead pressures (non-producing wells)	Monthly
<b>ASSET INTEGRITY – SURFACE FACILITIES</b>		
Oil processing	Routine testing, inspection and preventative maintenance program for the SOF	Per inspection regime within CP's maintenance management system (CMMS)
	Monitoring of plant conditions	Quarterly
<b>CHEMICAL AND HAZARDOUS MATERIALS MANAGEMENT</b>		
Storage of chemicals, fuel and oils	Routine visual inspection of storage areas to ensure no leaks or spills	Quarterly
	Visual inspection to ensure adequate bunding and containment strategies implemented	Quarterly
Spills and leaks of chemicals, fuel and oils	Routine emergency response drills	Annually
<b>WASTE MANAGEMENT</b>		
Waste receptacles	Visual inspection of waste receptacles to ensure no fauna access to waste storage locations, lids are secure, waste are appropriately stored and there are no leaks	Quarterly
Waste handling	Audit waste register to ensure all waste removal is appropriately captured and recorded	Quarterly
Evaporation pond	Measure freeboard	Quarterly and after significant rainfall event
<b>EROSION AND SEDIMENT CONTROL</b>		
Erosion and sedimentation on site	Visual site inspection to ensure appropriate erosion and sedimentation control measures implemented	During civil maintenance works and Quarterly
Erosion control	Visual site inspection ensuring adequate control devices in place in accordance with DENR and IECA best practice guidelines	Quarterly
<b>DECOMMISSIONING AND REHABILITATION MANAGEMENT</b>		
Decommission and rehabilitation activities	Visual inspection of rehabilitation areas	Yearly
Decommission and rehabilitation activities	Photographic point monitoring before, during and after rehabilitation	As required before, during and after rehabilitation works
<b>BIOSECURITY MANGAEMENT</b>		
Weed-free certification	Weed free certificates when equipment and materials are mobilised to site from known weed infested areas	When equipment / materials are brought to site from known weed infested areas
Weed management	Inspection to identify weed outbreaks	Quarterly
<b>BIODIVERSITY MANGEMENT</b>		
Ecological assessment	Ecological surveys for flora and fauna	Prior to any civil maintenance that requires vegetation removal
<b>BUSHFIRE PREVENTION</b>		
Fire control equipment	Inspect fire control equipment to ensure functionality	Bi-annual

Control	Monitoring	
	Action	Frequency
Fire control	Inspect fire breaks	Yearly
<b>AIR QUALITY PROTECTION MEASURES</b>		
Emissions	Maintenance records of vehicles and equipment	Per inspection regime
Venting	Record of all venting events	When venting event occurs
Complaints	Record of complaints from surrounding land users in regard to air quality or visual amenity	Records kept when applicable
Dust	Monitoring of road conditions	Quarterly
<b>TRAFFIC AND TRANSPORT MANAGEMENT</b>		
No unauthorised off-road driving, all drivers inducted into the potential impacts of off road driving on soil	Records kept of any incidents	As required
Fauna strike	Records kept in a fauna register of any near misses or strikes	As required
Zone designated speed limits	Records of any failures to comply and corrective action taken	As required
<b>COMMUNITY IMPACT MINIMISATION</b>		
Complaints	Records of complaints from surrounding land users in regard to noise and vibrations from operations	Records kept of any incident when applicable
<b>CULTURAL HERITAGE AND SACRED SITES PRESERVATION</b>		
Interference with Aboriginal sacred sites, places or objects of archaeological significance.	Records kept of any incidents	Records kept of any incident when applicable
<b>SOIL</b>		
Soil contamination	Soil sampling directly after clean up at any location where spill/contamination has occurred Soil testing of any area of remediation following spill/contamination if applicable	As required, following incident, until soil is classified as remediated in accordance with the NEPM 2013 guidelines for contaminated sites
<b>SURFACE WATER</b>		
Surface water contamination	Water/soil sampling directly after incident to determine extent of contamination and following removal of contamination source	As required, following incident, until soil/water is classified as remediated in accordance with the NEPM 2013 guidelines for contaminated sites and/or appropriate surface water guidelines

## 9.4.2 Auditing

In addition to regular monitoring as set out in Table 9-4, inspections and audits assessing compliance with this FEMP will be undertaken by a 'suitably qualified person'<sup>10</sup>. System deficiencies, adverse or potentially adverse environmental conditions arising from site activities may be subject to the issue of environmental non-conformances. These non-conformances and the suitable corrective actions will be entered into the CP Event and Action Tracking System for tracking of action progress to closure.

<sup>10</sup> means a person who has the abilities, formal qualifications, relevant experience or potential to acquire, within a reasonable time, the skills and competencies necessary to perform a particular job

As per Table 9-4, CP undertakes site inspections weekly to assess conformance to the FEMP, every week a different aspect of the FEMP will be assessed. Assurance audits of implementation of the FEMP commitments will be completed annually and included in the annual environmental report.

**Table 9-4 FEMP Audit Schedule**

Audit Type	Scope of Audit	Frequency	Responsibility
Site Inspections	Checklists inspections of activities approved under this FEMP. Items to be actioned as required	As per Table 9-2 and Table 9-3	HSE Representative, Site Supervisor, delegate or Environmental Consultant
Annual Assurance	Compliance against FEMP commitments and risk management controls	Annually	CP HSE Representative or Environmental consultant

### 9.4.3 Continuous Improvement

CP is committed to continual improvement in its HS&E performance and develops improvement plans in accordance with HS&E Management Standard 4 – Improvement Plans (IP). The content of a HS&E Improvement Plan supports:

- Strategic improvement initiatives
- Actions necessary to address compliance deficiencies and audit findings (including from the inspections and audits required under the FEMP)
- Opportunities to improve environmental outcomes, reduce key risks and improve environmental performance through changes in process, new technologies and/or changes in implementation of an activity to meet CP’s environmental objectives.

### 9.4.4 Incident and Non-conformance Management

CP’s incident management procedures are designed to:

- Ensure all near misses and incidents are reported in a standard format so that consistency and accuracy of the process is maintained
- Identify the underlying and basic causes of all near misses and/or incidents
- Implement mechanisms to prevent the recurrence of similar near misses/incidents
- Provide information to prepare the CP near miss/incident statistics
- Identify potential losses and suitable corrective actions.

It is CP’s policy to report and investigate near misses, major hazards and incidents and to implement action to mitigate any identified contributing factors.

Incident management procedures are detailed in the CP HS&E MS.



Environmental incidents that may arise during the DGF and / or SOF operations include:

- Well control event
- Well integrity failure
- Detection of unplanned (minor or significant) methane releases
- Petroleum, saline produced water, grey water, chemical or sewerage spills (including uncontrolled escapes);
- Introduction and spread of weeds, invasive species or flora and fauna diseases
- Fauna injury/fatality (vehicle collisions)
- Vegetation die back adjacent to the operational site
- Uncontrolled fire
- Clearing of threatened flora species
- Clearing of threatened fauna species habitat
- Disturbance to heritage areas.

All environmental incidents and near misses that arise due to the presence of hazards on site are reportable to CP management for inclusion in the incidents/near misses register. External reporting will follow the requirements set out in Section 10.2.

## 9.5 Emergency Preparedness

CP's emergency planning includes:

- Emergency response plan, manual and procedures (refer Appendix 6)
- Dedicated trained emergency response personnel
- Dedicated emergency response vehicles and equipment
- Emergency simulation training exercises (drills); and
- Preventative maintenance programs.

Types of emergency situations that may arise during activities at the DGF and SOF include:

- Spills – chemical or hazardous substance (particularly hydrocarbons and saline water)
- Fire (bushfire or as a result of operations)
- Medical
- External Communications (E.g. bomb threat).

CP will ensure all personnel, contractors and visitors are aware of the emergency response framework and are adequately trained in emergency response procedures relevant to their role/position.

CP's Emergency response plan, manuals and procedures are reviewed and updated to incorporate new information arising from incidents, near misses and emergency simulation training sessions.

## **9.6 Record Keeping**

The list of environmental records that will be kept on site includes:

- Induction records
- Waste stream records including type and quantity
- Incident register
- Hazardous materials manifests
- Diesel fuel usage
- Weed species control efforts
- Non-compliances and corrective action records
- Internal audits and inspection records
- External audits
- Vehicle and plant maintenance records
- Site access register
- Road and infrastructure maintenance records
- Water usage
- Produced water volumes
- Volume of produced water used in dust suppression
- Environmental survey and sampling work results.

# 10.0 Reporting

## 10.1 Routine Reporting

The reports in Table 10-1 will be maintained and submitted to the DENR as stipulated (and DPIR where relevant) for compliance.

**Table 10-1 Routine Reporting Frequency**

Report	Internally Recorded	Submitted
Annual Environmental Report	Collate daily, weekly and monthly reports	Annually
Quarterly recordable incident reporting	As per CP HSEMS – incident reporting and management procedure	Quarterly

### 10.1.1 Annual Environmental Report

Annual environmental reporting of the DGF operations will be prepared for continual operational and environmental management improvement and submitted annually to DENR (and where relevant, to the DPIR as part of the Annual Field Operations Report). The scope of the report will include:

- Operational activity and facility status/changes
- Environmental incidents (recordable and reportable); investigation and close out summary
- Environmental monitoring status and results
- Rehabilitation (see Section 11.4)
- Stakeholder Consultation
- Environmental programs and studies
- Results of audits and regulator visits
- Annual Greenhouse Gas emissions reporting, as provided to the Clean Energy Regulator following NGER 2008 framework methodology
- Annual results from leak detection surveys as required by clause d.6.2.e of the Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019).

## 10.2 Incident Reporting

Internal incident management and reporting requirements are outlined in Section 9.

In accordance with legislative requirements, environmental incidents at the DGF and SOF may also be reportable to external stakeholders (government, the CLC, non-government organisations, etc.).

All required incident reports shall be made formally in writing to external stakeholders with copies sent to applicable CP managers, with incident details registered into the database.

### 10.2.1 Reportable Incidents

For environmental incidents that occur off of the DGF and SOF (e.g. an incident that occurs on a road not under the control of CP) as defined under Section 14 of the *Waste Management and Pollution Control Act*, CP will report to the NT EPA on their Pollution Hotline 1800 064 567 as soon as possible (at most within 24 hours).

*Under the Petroleum (Environment) Regulations 2016*, a reportable incident means an incident arising from a regulated activity that has caused, or has the potential to cause, material environmental harm or serious environmental harm as defined under the Petroleum Act Division 2.

In this case, CP will notify (this may be oral or in writing) the Minister of a reportable incident as soon as practicable but no later than 2 hours after the first occurrence of the incident or after the time CP becomes aware of the incident (if orally notified a written notification must follow within 24 hours).

The notification will include at a minimum:

- Details of the interest holder
- All material facts and circumstances
- Information about any action taken to avoid or mitigate material environmental harm
- Information about the corrective action that has been taken.

If it is confirmed that the incident is a reportable incident, a written report must be submitted within three (3) days. The report will contain:

- All material facts and circumstances about the incident and the results of any investigations
- The nature and extent of the material environmental harm
- Information about any corrective actions necessary to prevent re-occurrence of a similar incident
- Any actions taken, or proposed to be taken to rehabilitate an affected area
- Details and timing of any further corrective actions required (such as a full root cause analysis and investigation).

In addition, CP will provide a final report about a reportable incident 30 days after the clean up or rehabilitation of the area affected by the reportable incident is completed.

The final report must include a comprehensive and detailed root cause analysis of the reportable incident. At no longer than 90-day intervals, progress reports will be submitted about the incident investigation and steps taken to mitigate any environmental harm.

### 10.2.2 Recordable Incidents

The *Petroleum (Environmental) Regulations 2016* define a recordable incident as an incident that is not a reportable incident and arises from the activity that:

- Has resulted in an environmental impact or environmental risk not specified in the FEMP or



- Has resulted in a contravention of an environmental performance standard specified in the FEMP  
or
- Is inconsistent with the environmental outcomes specified in the FEMP.

CP will maintain a register of recordable incidents and report them to the DENR in accordance with section 35 of the *Petroleum (Environment) Regulations 2016*.

# 11.0 Methane Emissions Management Plan

## 11.1 Purpose

The Methane Emissions Management Plan aims to reduce emissions via emissions detection and management in the gas field. Monitoring and measurement is undertaken to quantify and reduce fugitive methane emissions from the sites' operations.

## 11.2 Leak Inspection Frequency

Operational wells in the DGF are checked weekly, and leak detection forms part of the procedure for the quarterly checks undertaken at SOF. The procedure for the inspections includes a check sheet that lists the equipment at each well site to be inspected, including potential sources of emissions such as vent caps, valves and metering instruments.

Where a leak has been detected at a particular asset the frequency of inspections for the asset will be re-assessed and may be increased where a risk assessment determines an increased frequency is required.

Leak detection is only undertaken by personnel who have been appropriately trained and are competency assured.

## 11.3 Leak Detection Instruments

Operators undertaking weekly well site inspections carry personal gas detectors to detect leaks by identifying any ambient methane around the surface facilities. Operators currently carry a Dräger X - am 2500 Detector, which features:

- Detection of flammable gases and vapours, as well as O<sub>2</sub>, CO, NO<sub>2</sub>, SO<sub>2</sub> and H<sub>2</sub>S; and
- Detection of methane as low as 500ppm (1% of the lower explosive limit (LEL)).

Gas detectors are calibrated and bump tested in line with manufacturer's recommendations.

## 11.4 Leak Detection Procedure

Leak detection is undertaken in accordance with the USEPA Method 21. The following is a summary of the process CP undertakes for leak detection:

- Prior to commencing monitoring the gas detector is calibrated.
- The operator then undertakes the following monitoring at each of the wells sites and along the gathering system (vents, drains, metering instruments, manifolds):
  - Place the probe at the surface of the component interface where leakage could occur
  - Move the probe along the interface periphery while observing the instrument readout
  - Locate the maximum reading by moving the probe around the interface (note that where a leak is detected the operator is to make a determination as to whether it is safe to remain in the area to continue monitoring
  - Keep the probe at the location of the maximum reading for 2 times the response factor

- Record the reading and source of the leak (if a leak is detected)
  - If a leak is detected also record whether it is a minor or significant leak (as per Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019)) and implement corrective actions
- If a liquid petroleum leak is detected and it is safe to do so, record the estimated volume of leaked liquid and the source of the leak.

## **11.5 Leak Remediation and Notification**

When a leak is detected the source will be isolated immediately and rectified. Remediation of the leak (including timeframes) will be undertaken in accordance with section D5.6 of the Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019).

The leak will also be recorded in CP's internal reporting system and reported to the Regulator as required under Section 5.6.2 of the Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019).

## **11.6 Venting and Flaring**

No gas is routinely vented or flared within the DGF or SOF. Any controlled venting or flaring of gas from the DGF occurs at the BECGS facility. Although not included in the scope of this FEMP, venting and flaring at BECGS is recorded in the Daily Production Report, which is then aggregated into the Monthly Production report submitted to DPIR. This data is also used in calculation of emissions for the annual emissions reporting prepared under the requirements of the National Greenhouse and Energy Reporting Scheme.

Where venting or flaring is required in an emergency, or as part of an operation, DPIR will be notified as a soon as possible. Any venting or flaring will be in accordance with the requirements of the Code of Practice: Onshore Petroleum Activities in the Northern Territory (2019).

# 12.0 Erosion and Sediment Control Plan

## 12.1 Scope

This Primary Erosion and Sediment Control Plan (ESCP) has been developed for the prevention and management of erosion and sedimentation at the DGF and SOF, in accordance with:

- Code of Practice for Petroleum Activities in the Northern Territory (DENR, 2019)
- Best Practice Erosion and Sediment Control (IECA, 2008)
- Erosion and Sediment Control Guidelines for Rural Development Environment Fact Sheet (DLRM, 2018).

The DGF is currently operational and the SOF is currently shut in and not operational, both areas have no plans for new disturbance. As such, the ESCP has been developed to provide guidance in the implementation of erosion and sediment controls (ESC) for the maintenance and monitoring of the existing operational sites.

## 12.2 Objective

The objective of the ESCP is to:

- Outline the appropriate ESC for DGF and SOF area to identify and minimise degradation of land and water from uncontrolled erosion and sedimentation from operational activities.

## 12.3 Area Erosion Susceptibility

Erosion hazard of the DGF and SOF has been evaluated with respect to land system (topography, geology and soils) – discussed in Section 5.1.5 onwards. Erosion risk is also determined by average rainfall volumes, which are highest during the summer periods (refer section 5.1.1).

Given no new disturbance is planned for the CP assets and historically minimal erosion rectification works over the operational area life have been required, the residual risk of erosion and sedimentation was determined to be medium (8.2.2) and risk controls effective.

## 12.4 Environmental Actions and Monitoring

Table 12-1 details the actions required to meet the environmental outcome for erosion and sediment management.

**Table 12-1 Erosion and sediment control measures**

Activity	Control Measure
Site Management	<ul style="list-style-type: none"> <li>• Driving to be restricted to designated access tracks as identified in Figure 6-2 and Figure 6-3</li> <li>• Inspection of operational area before and after wet season (and after significant rainfall events) to identify occurrence of erosion and sedimentation. Maintenance activities to be carried out where erosion is identified with appropriate erosion and sediment controls implemented to reduce future erosion risk</li> </ul>



Activity	Control Measure
	<ul style="list-style-type: none"> <li>• Inspect operational area following significant rainfall events for erosion and rectify as required. Rectification may include erosion and sediment controls devices</li> <li>• Where erosion and sediment control devices are required, they are to be maintained and installed as per the best practise guidelines by the DENR and IECA</li> <li>• No unauthorised clearing works</li> </ul>

## 12.5 Erosion and Sediment Control Devices

Any erosion or sediment control device that is required to be installed will be based on IECA’s Best Practice and Sediment Control document with the appropriate device to be determined by a suitably qualified person. Examples of erosion and sediment control devices are below with the complete list contained in IECA’s Best Practice and Sediment Control document:

- Erosion – compost blankets, diversion banks, gravelling, mulching (including rock), revegetation, soil binders, surface roughening
- Sediment – sediment traps/basins, fibre rolls, grass filter strips, straw bales, filter dams, filter fences, berms.

## 12.6 Records

Inspections records must be kept to demonstrate compliance with control measure, photographic evidence is required where erosion risk is identified.

# 13.0 Rehabilitation Management Plan

## 13.1 Scope

The rehabilitation management plan applies to the DGF and SOF, post decommissioning activities (in accordance with the Petroleum code of practice for wells and all associated surface infrastructure will be removed and disposed of appropriately). Rehabilitation management of the site to include:

- Well plug and abandonment
- All cleared surfaces and disturbed sites
- Residual contamination
- Removal of access roads
- Soil stability
- Revegetation
- Monitoring.

## 13.2 Objectives

- Progressively rehabilitate significantly disturbed land which is not required for ongoing operations
- Return all disturbed areas to a safe and stable landform as close as possible to the surrounding environment
- Ensure significantly disturbed land is re-established to its pre-disturbed condition
- No residual contamination
- No land management issues for future land managers.

## 13.3 Environmental Actions and Monitoring

Table 13-1 details the actions required to meet the environmental requirements for rehabilitation and monitoring in order to determine that these objectives have been achieved. An auditing schedule is to be included in a more detailed Decommissioning and Rehabilitation Plan developed closer to the time of closure.

**Table 13-1 Environmental Actions and Monitoring**

Activity	Factors Assessed/Actions	Timing
Analogue sites	Identify appropriate analogue sites for the DGF and SOF	6 months prior to undertaking rehabilitation activities
Post Decommissioning	<ul style="list-style-type: none"> <li>• Removal of above ground infrastructure</li> <li>• Removal of rubbish</li> <li>• Re-spread vegetation</li> <li>• All RCCA items closed out to satisfaction of the DENR</li> </ul>	Commence within 12 months of site/infrastructure closure
Soil Stability	<ul style="list-style-type: none"> <li>• Remove any flow concentration points that may block overland sheet flow</li> <li>• Re-instate natural drainage channels</li> <li>• Return soil profile with topsoil replaced as final layer where possible</li> </ul>	Commence within 12 months of site closure

Activity	Factors Assessed/Actions	Timing
	<ul style="list-style-type: none"> <li>• Deep ripping and contouring of access roads, cleared and compacted areas</li> <li>• Ensure all cleared areas have a rough surface to aid in water and seeds catchment</li> <li>• Re-spread vegetation</li> <li>• Erosion and sedimentation devices maintained and installed as appropriate to best practise guidelines by the DENR and IECA</li> </ul>	
Contaminated soil	Undertake remediation of contaminated soil	As soon as practical after land contamination has been identified during investigation of spills / leaks
Revegetation	Active re-seeding with local natives	To be assessed 12 months after initial seeding
Monitoring	<p>Establish photographic monitoring points prior to commencing rehabilitation activities so to benchmark against in later surveys.</p> <p>The following monitoring program is proposed:</p> <ul style="list-style-type: none"> <li>• <u>Immediately after rehabilitation works completed:</u> <i>Check for integrity of works and ability for future rehabilitation success</i></li> <li>• <u>Following first wet season:</u> <i>Stability of soil, landform, vegetation type and re-growth and appearance of weed</i></li> <li>• <u>One year after rehabilitation:</u> <i>Rehabilitation progress</i></li> <li>• <u>Yearly inspection:</u> <i>weed, erosion &amp; sediment control and management</i></li> <li>• <u>Three years after:</u> <i>Soil stability, landscape and vegetation re-growth and type after several wet seasons</i></li> <li>• <u>Five years after:</u> <i>Long term rehabilitation success measured by landform stability and vegetation re-growth.</i></li> </ul> <p>Photographic monitoring to be conducted at each monitoring event listed above to compare progress.</p>	As prescribed

## 13.4 Rehabilitation Success

Rehabilitation will be considered a success when the following criteria are met:

- Landholder and DENR agree in writing that the land supports the pre-disturbance land use
- Soil suitability and stability is equivalent to the surrounding soil units
- No subsidence or erosion is evident for a period of 3 years post rehabilitation
- A minimum of 80% foliage cover and diversity of analogue sites is maintained in the rehabilitated sites for at least 3 years
- Maintain a density of habitat structures (litter cover, fallen woody material and hollow logs etc) similar to analogue sites

## 13.5 Rehabilitation Reporting

As part of the Annual Environmental Report (Section 10.1), CP will submit to the DENR an annual rehabilitation report with information including:

- Area of disturbed land available for rehabilitation at the start of the reporting period
- Area of disturbance that occurred during the reporting period
- Area where rehabilitation commenced during the reporting period
- Area of disturbed land remaining to be rehabilitated at the end of the reporting period (including land not currently available for rehabilitation<sup>11</sup>)
- Photographic monitoring point GPS locations and results of monitoring undertaken during the reporting period
- Monitoring of progressive rehabilitation, including flora type and density, fauna activity and soil stability
- Any erosion and sedimentation issues
- Any stakeholder consultations and results of discussions related to rehabilitation
- Any issues noted and remedial actions taken (RCCA)
- Monitoring of contaminated sites (RCCA)
- Weed monitoring.

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<sup>11</sup> land not currently available for rehabilitation means land that is still required for the activities to be undertaken under this FEMP

# 14.0 Stakeholder Consultation

## 14.1 Stakeholder Management

CP is committed to upholding its reputation with a range of stakeholders including:

- Community
- Landholders
- Indigenous
- Government
- Other key non-commercial external stakeholders (e.g. NGOs and industry bodies)
- Industrial Relations stakeholder
- Other commercial external stakeholders
- Internal stakeholders.

CP seeks to establish and maintain enduring and mutually beneficial relationships with the communities of which it is a part; ensuring that our activities generate positive economic and social benefits for and in partnership with these communities.

To achieve this CP holds an annual liaison committee meeting between CLC and local traditional owners and undertakes ongoing activities in accordance with the Local Content Plan and Social Performance Plan.

In the case of new projects and activities, CP will prepare a Stakeholder Management Plan (SMP) in accordance with the requirements of the *Petroleum (Environment) Regulations 2016* to ensure effective engagement and management of stakeholders. The principal objectives of the SMP are:

- Identification of relevant stakeholders
- Initiation and maintenance of communications
- Identification of stakeholder engagement tools
- Establishment of an open and transparent process for input
- Provision of a means for recording all initiatives in which communication and/or consultation is undertaken, issues raised, and responses recorded
- Establishment of a sense of ownership in the project by stakeholders.

Stakeholders may be engaged through:

- Public release of key documents including any EMPs
- Stakeholder needs survey
- Project newsletters
- Public displays
- Staffed Environmental Impact Statement displays
- Regular updates to central website
- Fact sheets
- Native Title Representative Body meetings and briefings
- Advertising and/or articles in relevant print media
- Media briefings, releases, and monitoring
- Responding to media enquiries



- Community workshops
- Public information sessions and meetings
- Project Information Line and email
- Written enquiry forms
- Face to face meetings with stakeholders and stakeholder groups
- Other direct and indirect engagement mechanisms.

## 14.2 Assessment of Merit of Stakeholder Objection or Claim

To date there have been no written response or grievances from stakeholders against CP for the DGF or SOF. There have been no stakeholder incidents or complaints made that CP need to address. If a written or verbal objection response grievance is lodged, then CP will take all means to address the issue and mediate an effective solution. The process that CP will undertake in assessing a stakeholder objection / claim that it receives is:

- All stakeholder objection / claims are to be provided to the General Manager of Operations
- General Manager of Operations to appoint a person to undertake the following:
  - Confirm that the objection / claim relates to the DGF or SOF
  - Confirm that the objection / claim relates to an activity being conducted by CP within the DGF or SOF
- General Manager of Operations to notify the stakeholder of the results of the above findings (this will generally be via written communication)
  - If the results confirm that the objection / claim is not related to CP no additional action is required by CP
  - If the results confirm that the objection / claim is related to CP follow the remaining dot points
- General Manager of Operations to appoint a person to investigate the stakeholder objection / claim
- Person appointed to investigate the objection / claim is to investigate and provide a documented report to the General Manager of Operations
- Once the report is accepted by the General Manager of Operations, they will provide a response to the stakeholder that reflects the outcomes of the investigation (including any actions that CP have/will undertake to address the objection / claim – if required)
  - This response will generally involve a verbal discussion with the stakeholder on the outcomes of the investigation and be followed up with written correspondence. The General Manager of Operations will determine the appropriate method to respond to each stakeholder

## 14.3 Details of Changes Due to Engagement

Any changes in operations, policy or procedures because of stakeholder consultation or other engagement will be recorded in writing. CP Management will review and assess any changes for merit and if deemed necessary to be undertaken these changes will be approved by CP management before any action is taken. Where required, CP management will submit details of the proposed changes to the regulator for approval. A summary of any changes to operations that derive from stakeholder consultation or other engagement will be included in the annual environmental report and reflected in future versions of this FEMP.

## 14.4 Ongoing Consultation

CP maintains a record of all ongoing interactions and communications with stakeholders and affected parties to the DGF and SOF. This information is maintained in a Communication Log. A copy of this will be submitted to the DENR on request. The communication log to date is provided in Appendix 5, recorded with the following details:

- Date
- Topic discussed
- Type of engagement
- CP contact
- Primary stakeholder
- Outcomes – Any issued resolved or identified.

Additionally, Appendix 5 contains the meeting minutes from the 2019 meeting with the CLC in regards to ongoing production at the DGF and SOF.

In addition to the communication log, during the period of the FEMP, CP will also record the following:

- Copy of information provided to any stakeholder
- If written responses have been received by any stakeholders, a summary and copy of each response
- An assessment of the merits of any objection or claim made by a stakeholder about the anticipated environmental impact of the proposed activity
- A statement of CP's response to each objection or claim made by a stakeholder
- Details of changes made by CP as a result of stakeholder engagement

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# Appendices