Mereenie Oil and Gas Field

FIELD ENVIRONMENT MANAGEMENT PLAN

2017

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1 INTRODUCTION

1.1 Project

This document is the Field Environment Management Plan (FEMP) for Central Petroleum Limited's (CTP) operations at Mereenie Oil and Gas Field (MRN) in Operating Licences 4 and 5, henceforth referred to as OL4, OL5 or the OL area (combined).

- Central Petroleum took over operatorship (50%) of the field 1st September 2015 from Santos
- Santos agreed to sell the other 50% of the Assets (which includes Mereenie to Alice Springs Pipeline) to Macquarie group 1st January 2017.
- CTP has had approval from the Department of Industry and Resources (DPIR) to operate under the Santos approved FEMP
- This is the first FEMP submitted by CTP for this field

1.2 Location

The MRN is in the Amadeus Basin, approximately 280 km west of Alice Springs (by road) in the Northern Territory (NT).

Access to the field from Alice Springs is via a network of sealed and unsealed public and private roads, heading west from Alice Springs along Larapinta Drive/Red Centre Way to Hermannsburg, and then continuing towards Kings Canyon. The turn off to the MRN is left off the Red Centre Way; approximately 175 km past Hermannsburg.

Figure 1-1 shows the location of the MRN in relation to Alice Springs and CTP's other developments in the area.

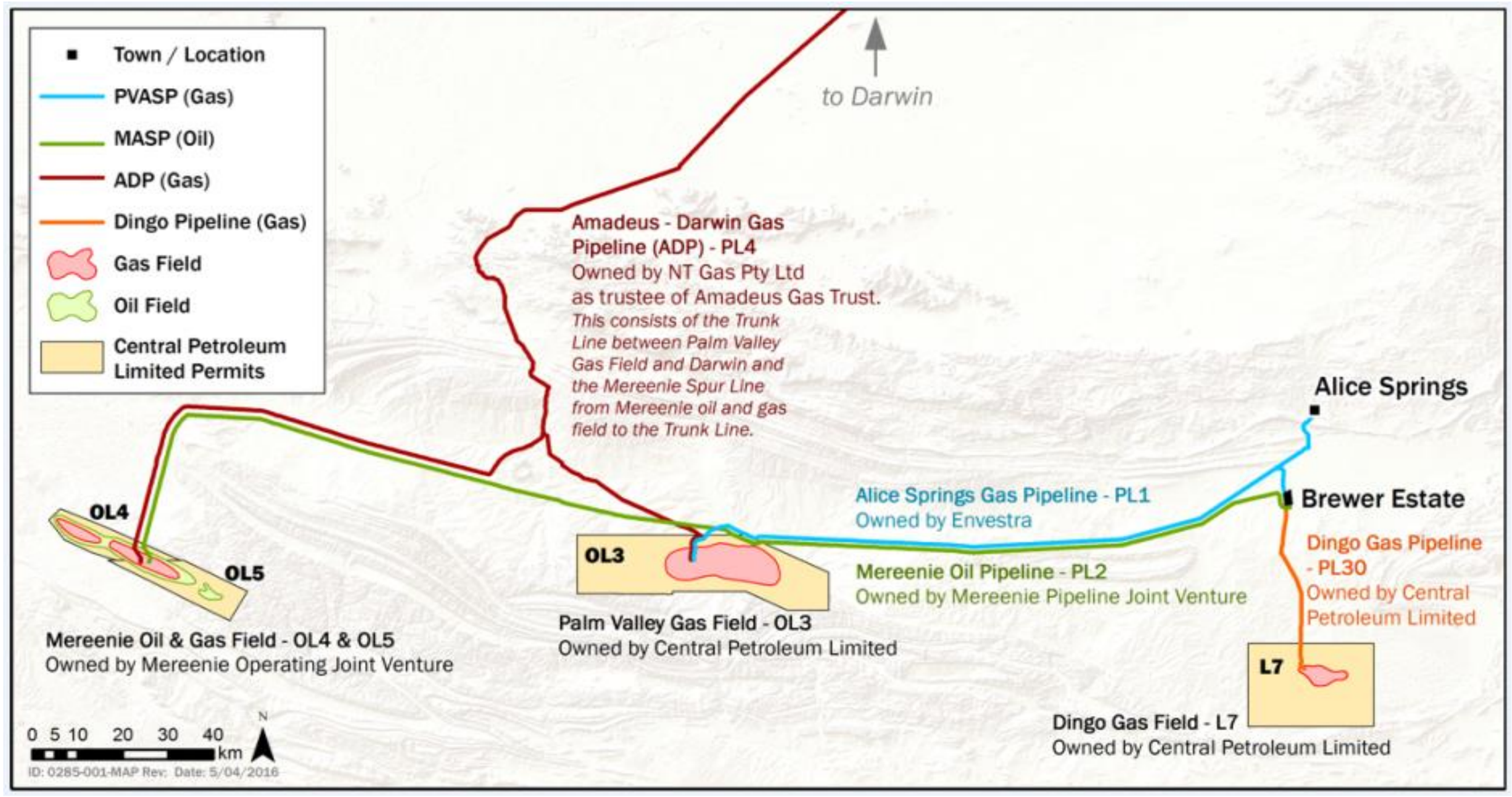


Figure 1-1 Location of the Mereenie Oil and Gas Field in relation to Alice Springs and CTP's other petroleum developments in the area.

1.3 Proponent

CTP is an Australian Securities Exchange (ASX) listed junior exploration and production company registered on the 7th March 2006 under the Corporations Act 2001. CTP operates the largest holding of prospective onshore acreage in Australia totalling over 229,000 km^2, c.57 million acres. This acreage includes permits already awarded and acreage under application with 209,000 km^2 under *Petroleum Acts* and 20,000 km^2 under *Mining Acts* mainly in the Northern Territory with smaller holdings in Western Australia, South Australia and Queensland.

Table 1-1 Central Petroleum company details

Company Name	Central Petroleum Limited
ACN/ABN	ABN: 95 081 592 734
Street Address	Level 7/369 Ann Street
Postal Address	PO Box 292 Brisbane, Qld 4000
Telephone	+61 (0)7 3181 3800
Facsimile	+61 (0)7 3181 3855
Key Contact	James van Rooyen – Acting as General Operations Manager
Email	jamesvanrooyen@centralpetroleum.com.au
Website	www.centralpetroleum.com.au

1.4 Purpose

The purpose of this FEMP is to:

- Provide information to the NT Department of Primary Industry and Resources (DPIR) – Energy Directorate as required under Section 45 (1) (f) of the *Petroleum Act*;
- Provide additional information as outlined in the NT Petroleum (Environment) Regulations.2016;
- Provide information to the Northern Territory Environment Protection Authority (NT EPA) to make an assessment under the *Environmental Assessment Act,* if required;
- Communicate environmental aspects, risks, management measures and responsibilities to CTP personnel and contractors; and
- Provide a basis for environmental audits of the MRN.

1.5 Scope

This FEMP covers the environmental hazards and management measures relevant to MRN operations based on routine activities, conducted by its personnel and contractors hired by CTP to work on site. Where activities are outside of the normal operations i.e. drilling operations (including completions and workover), and fracture stimulation, separate EMPs will be developed. The operations covered by this FEMP include:

- Road, track and lease construction, maintenance and access;
- Well bore management;
- Gas and oil systems;
- Pipeline and flow line operations;
- Processing facilities;
- Fuel and chemical storage, handling and transportation; and
- Waste management.

Any drilling, hydraulic fracture, seismic or clearing activities will be covered by separate EMPs drafted as required for approval from the DPIR.

Section 8 outlines the management approach for key environmental issues relevant to MRN operations. The management approach is based on Ecological Sustainable Development (ESD) principles to ensure all identified risks in this FEMP have been reduced to As Low As Reasonable Possible (ALARP).

- Biodiversity – Flora and fauna of conservation significance and weeds;
- Land and soil – Erosion and sediment control;
- Water – Hydrology and hydrogeology;
- Waste – Operational and produced;
- Air and noise – Emissions, vibration, lighting and fire; and
- Culture and heritage – Indigenous and non-indigenous.

To ensure the FEMP contains adequate information to fulfil the purpose, consideration has been given to following documents:

- DPIR "*Petroleum (Environmental) Regulations: An Explanatory Guide"* (July 2016);
- DPIR *"Environmental Plan Requirements Guideline"* (July 2016);
- DPIR "Checklist – Onshore Petroleum Development" as advised by DPIR;
- Unpublished advice *"Essential features of a Field Environment Management Plan"* as advised by DPIR;
- NT EPA *"Environmental Assessment Guidelines: When a Notice of Intent is not required for onshore petroleum exploration or production proposals submitted under the Petroleum Act"* (April 2014); and
- NT EPA *"Guideline for the Preparation of an Environmental Management Plan"* (May 2015).

This FEMP does not address general health and safety.

1.5.1 Petroleum Environmental Regulations

Table 1-2 is a document map between this FEMP and the NT Petroleum (Environmental) Regulations.

Table 1-2 Document map between this FEMP and the NT Petroleum Environmental Regulations

Regulations		**MRN FEMP**
Schedule 1		
Part 1		
1. Description of Activity	a. Location	
	b. General Layout	Section 1.1, Figures 7-1 – 7-9
	c. Outline of proposed activities	Section 6.2
	d. Hydraulic fracturing	NA
2. Description of the Existing Environment	a. Description of existing environment that may be affected by activities	Section 5
	b. Details of any potential values or sensitivities	Section 5
	c. Identification of knowledge gaps	Section 5
3. Risk Assessment		
1. Plan to include	a. Risk assessment	Section 7
	b. Methodologies	Section 7
2. Assessment must be of	a. Aspects of activities or emergencies	Section 7.4
	b. Cumulative effects	Table 7-2
4. Environmental Outcomes and Performance Standards	a. Environmental outcomes in relation to the regulated activity	Section 8
	b. Performance standards against which performance against achieving outcomes can be measured	Section 8.3 to 8.9
	a. Measurement criteria to ensure outcomes and standards are met	Section 8.3 to 8.9
Part 2 Implementation		Section 9
5. Strategy		Section 9.1
6. Details of systems, monitoring, tests etc.		Section 9.5 and 9.6
1. Implementation plan must provide	a. Ongoing monitoring and review	Section 9.5 and 9.6
	b. Monitoring, audit and review of non-conformance and environmental penalties	Section 9.5 and 9.6
2. Must give details of	a. Specific systems, practices and procedures to ensure outcomes and performance standards are met	Section 9.4

Regulations		MRN FEMP
	b. i. Monitoring of environmental impacts	Section 9.4
	ii. Monitoring of emissions and discharges	Section 9.4
	iii. Carrying out and recording of the monitoring in an accurate, auditable way.	Section 9.5
	iv. Test of equipment to carry out monitoring and interval of testing	NA
7. Personnel	a. Clear chain of command including during emergencies	Section 9.2
	b. Roles and responsibilities of personnel in relation to implementation, management and review of the FEMP.	Section 9.2
	c. Each employee/contractor is aware of their responsibilities to the FEMP and has appropriate competences and training	Section 9.2
8. Emergency Contingency Plan	a. Specifies arrangements for emergency	Section 9.8
	b. Provision for implementation of plan	Section 9.8
Part 3 Other Matters		
9. Stakeholders		Section 12
1. **Stakeholder Engagement**	a. List of stakeholders and contact details	Section 12
	b. Copy of information provided from stakeholder engagement	Section 12 and Appendix 8
	c. Summary of any matters discussed	Section 12
	d. Assessment of merit of an objection or claim	Section 12
	e. Statement of intent holder's response	Section 12
	f. Record of communication	Appendix 8
	g. Details of changes due to engagement	Section 12
2. Future engagement plans		Section 12
10. Legislative Requirements	a. Specify any legislative requirements	Section 4
	b. Outline how these will be met	Section 4
11. Recording, Monitoring and Reporting		Section 10
1. A plan must specify	a. Arrangements for recording monitoring and reporting the details of	Section 10

Regulations		MRN FEMP
	b. Interval of reporting (at least annually)	Section 10
2. All reports in the FEMP plus any other law in force in the Territory		Section 10 and 4
12. Before Drilling, Seismic or Construction, inform	a. The minister	Section 12.2
	b. Occupant of land	Section 12.2
	c. Owner of land	Section 12.2

1.6 Objectives

CTP has a strong commitment to the development of and adherence to environmental work practices. This FEMP has been written to increase environmental awareness and improve environmental management at the MRN through accomplishing the following objectives:

- Describe the environmental of the OL area;
- Identify environmental sensitivities of the OL area;
- Identify the potential environmental impacts and risks of the MRN; and
- Describe the management system/s that will be implemented to ensure the environmental risks are adequately assessed and appropriately managed to minimise the environmental impacts of the operations.

2 DOCUMENT CONTROL

DISCLAIMER

This document has been prepared by Low Ecological Services (LES) for CTP in accordance with an agreement with CTP. LES has prepared this document using the skill and care expected from professional scientists to provide factual and technical information and reasonable solutions to identified risks. It does not constitute legal advice.

2.1 Document Ownership and Revision

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

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

- When there is a notable change to operations not covered by this FEMP;
- When there is a notable change to the regulatory framework within which the operations are carried out;
- When recommendations or comments from the government approval process are made;
- In the event an incident causing significant environmental harm or loss occurs; or
- Five yearly after acceptance, unless superseded by another plan.

This document shall not be issued and/or revised without the express approval of the CTP General Manager of Operations at MRN. Likewise, any amendments to this document shall be checked and approved by the CTP General Manager of Operations at MRN.

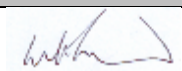
ACKNOWLEDGEMENTS

LES acknowledges the assistance of Diana Gomez, James van Rooyen and Alan Johnson of CTP for their assistance in developing this FEMP.

DOCUMENT DETAILS

Document Number:	ENV-MRN-PLN-0001-Final-Mereenie FEMP
Name of Document:	Mereenie Oil and Gas Field: Field Environment Management Plan
Authors:	Low Ecological Services P/L and Central Petroleum Limited
Client:	Central Petroleum Limited
Name of Project:	Mereenie Oil and Gas Field – OL4 and OL5

DOCUMENT CONTROL

Approvals	Name	Signature	Date
Originator:	Low Ecological Services		
Reviewer:	Central Petroleum Ltd.	×	
Administrator:	Central Petroleum Ltd	×	
Approver:	Dep't of Mines and Energy	×	
Custodian:	Central Petroleum Ltd	×	

REVISION DETAILS

Date	Revision	Details	Reviewer	Comments
	MASTER	Prepared by	Santos	Original document for Santos operations
03/05/2015	DRAFTv1	Prepared by	Diana Gomez & Alan Johnson – CTP	Updated original Santos document o reflect CTP ownership
25/11/2015	DRAFTv2	Revised by	Kye Mitchell – LES	Updated to meet new FEMP Government regulations
20/01/2016	DRAFTv2	Reviewed by	Bill Low – LES	Reviewed changes for compliance
18/05/2016	DRAFTv3	Revised by	Jeremy Snowdon-James - LES	Updated risk management section and Flora and Fauna.
26/05/2015	DRAFTv4	Revised by	Jeremy Snowdon-James - LES	Updated format and risk management section
30/05/2015	DRAFTv5	Revised by	Jeremy Snowdon-James - LES	Updated Risk Assessment and Appendices
19/08/2016	DRAFTtv6	Revised by	Jeremy Snowdon-James - LES	Update document to meet new DPIR guidelines
31/08/2016	DRAFTv7	Revised by	Jeremy Snowdon-James – LES	Updated road construction; and erosion and sediment control
25/10/2016	DRAFTv11	Revised by	Jeremy Snowdon-James – LES	Updated base on DME meeting
04/11/2016	DRAFTv12	Revised by	Diana Gomez - CTP	Reviewed changes and added final comments
08/12/2016	DRAFTv13	Revised by	Jeremy Snowdon-James- LES & Diana Gomez - CTP	Reviewed changes added and final converted to PDF format
28/06/2017	DRAFTv13.4	Revised by	Jeremy Snowdon-James- LES & Diana Gomez - CTP	Added information on water use, changes from DPIR.
25/09/2017	DRAFTv14.2	Revised by	Jeremy Snowdon-James- LES & Diana Gomez - CTP	Updated risk assessment and operations covered by this FEMP
	Final	Submitted by	Diana Gomez – CTP	Submitted to the DPIR

PREFACE

This preliminary document will remain a working document until it is finalised as an operational document and can be used as such by operators in the field.

The last version will incorporate any comments or recommendations resulting from any government approval processes and stakeholder consultation; it is not anticipated that any major changes to the document will be required.

All information on proposed operations contained in this document has been supplied by CTP.

GLOSSARY

AAPA	Aboriginal Areas Protection Authority
AGP	Amadeus Gas Pipeline
ALARP	As Low As Reasonably Practicable
APIA	Australian Pipeline Industry Association
APPEA	Australia Petroleum Production and Exploration Association
AS2885	Australian Standard Pipelines – Gas and Liquid Petroleum - Design and Construction
ASX	Australian Securities Exchange
BHP	Bottom hole pressure
BOP	Blow-out preventer
CTPL	Central Treatment Plant
CLC	Central Land Council
CTP	Central Petroleum Limited
CSM	Conceptual Site Model
DENR	Department of Environment and Natural Resource
DPIR	Department of Primary Industry and Resources (Northern Territory)
EAMR	Environmental Assessment and Management Report
EcSD	Ecological Sustainable Development
EIA	Environmental Impact and Flora and Fauna Survey
EIP	Environmental Improvement Programs
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act (*Commonwealth*)*
EMM	Environmental Management Manual
EMS	Environmental Management System
EPBC	Environmental Protection and Biodiversity Protection Act 1999 (Commonwealth)
ERMP	Environmental Review and Management Plan
ESD	Emergency Shut Down
ESS	Eastern Satellite Station
FEMP	Field Environmental Management Plan
FESA	Fire and Emergency Services Association
GIS	Geographic Information System
GOR	Gas to Oil Ratio
HP	Horse Power
HS&E	Health, Safety and Environment
HS&E MS	Health, Safety and Environmental Management System
HS&E IP	Health, Safety and Environment Improvement Plan
HSHS	Health and Safety Hazard Standards
IECA	International Erosion Control Association
IMS	Incident Management System
JHA	Job Hazard Analysis
kPa	Kilo Pascals
LES	Low Ecological Services
MAOP	Maximum Allowable Operating Pressure
MASP	Mereenie to Alice Springs Pipeline
MNES	Matters of National Environmental Significance
MRN	Mereenie Oil and Gas Field

MPa	Mega Pascals
SDS	Safety Data Sheet
NOI	Notice of Intent
NORM	Naturally occurring radioactive materials
NPI	National Pollutant Inventory
NT EPA	Northern Territory Environment Protection Authority
OL	Operating Licence
OPSMAN	Operations Manual
P&A	Plugged and Abandoned
PER	Public Environment Report
PFW	Produced formation water
PMSR	EPBC Protected Matters Search Report
PPM	Photo Point Monitoring
Psi	Pounds per square inch
PVC	Polyvinyl chloride
RCCA	Register and Closeout of Correcting Actions
SCADA	Supervisory Control and Data Acquisition
SHRR	Significant Hazard Risk Register
Significant Rainfall	Any rainfall event over 10mm in 24 hours
SMP	Stakeholder Management Plan
SSV	Surface Safety Valve
TEG	Tri-ethylene glycol
TPH	Total Petroleum Hydrocarbons
TPWC Act	*Territory Parks and Wildlife Conservation Act*

3 CORPORATE ENVIRONMENT POLICY

3.1 Central's Commitment to the Environment

CTP has a high standard of environmental responsibility implemented through operational quality and integrity measures above and beyond industry standards. CTP has a strong environmental commitment focus through all its facilities and operations, being at the forefront of policy and management strategy developments. CTP has compiled this FEMP and developed mitigation and preventative measures and standards to ensure the operation of the MRN within the OL area 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 remediated as soon as possible. The employees of CTP, both office and field, have been briefed on the company's beliefs, standards and green direction the company follows, and expectations.

CTP corporate environmental policy is provided in Figure 3-1 and the corporate Health, Safety and Environment (HS&E) policy is provided in Figure 3-2.

Central Petroleum Limited

CENTRAL PETROLEUM LTD
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.

Richard Cottee
Managing Director
1st March 2017

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Figure 3-1 CTP's corporate environmental policy

Central Petroleum Limited

CENTRAL PETROLEUM LTD
HSSE POLICY

Central Petroleum Limited believes that effective management of Health, Safety, Security and Environmental (HSSE) issues is essential for success in its business, by:

- Providing leadership and commitment to HSE 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 whilst involved in drilling, seismic or production activities (Operations) on site or when binding decisions relevant to Operations are required to be made;
- 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 HSE performance meets our and statutory 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 HSE objectives;
- Maintaining appropriate HSE documentation;
- Monitoring HSE 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; and
- Conducting audits and reviews to assess compliance with this policy.
- 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.

Richard Cottee
Managing Director
1st March 2017

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Figure 3-2 CTP's corporate HSSE policy

4 ENVIRONMENTAL LEGISLATION AND OTHER REQUIREMENTS

4.1 Legislation and Approvals

The legislation and associated project approvals relevant to environmental management of the MRN Operations are listed in Table 4-1. Currently the MASP is suspended and awaiting future use. The Brewer Estate is not currently utilised by MRN gas or oil produce.

Table 4-1 Legislation, consents and approvals

Legislation	Application[1]		
	MRN	MASP	Brewer Estate
Internal Policies			
Central Petroleum Environmental Protection Policy 2015	✓	✓	✓
Commonwealth			
Aboriginal Land Rights (Northern Territory) Act 1976	✓		
Australian Heritage Council Act 2003	✓	✓	✓
Environmental Protection and Biodiversity Conservation Act 1999	✓	✓	✓
Northern Territory			
Aboriginal Land Act 2013	✓	✓	
Northern Territory Aboriginal Sacred Sites Act 2013	✓	✓	✓
Bushfires Act 2014	✓	✓	✓
Control of Roads Act 2015	✓	limited	
Dangerous Goods (Road and Rail Transport) Act 2012	✓	limited	✓
Energy Pipelines Act 2015		✓	
Environmental Assessment Act 2013	✓	✓	✓
Environmental Offences and Penalties Act 2011	✓	✓	✓
Fire and Emergency Act 2015	✓	✓	✓
Heritage Act 2016	✓	✓	✓
NT Petroleum (Environmental) Regulations 2016	✓	✓	✓
Petroleum Act 2016	limited		
Petroleum (Prospecting and Mining) Regulations 2001	✓		
Public and Environmental Health Act 2016	✓	✓	✓
Public and Environmental Health Regulations 2014	✓	✓	✓
Schedule of Onshore Petroleum Exploration and Production Requirements 2016 (under the *Petroleum Act 2016)*	✓		
Soil Conservation and Land Utilisation Act 2016	✓	✓	✓

[1] Limited refers to the partial application of the Acts.

Legislation	Application[1]		
	MRN	MASP	Brewer Estate
Territory Parks and Wildlife Act 2014	✓	✓	✓
Waste Management and Pollution Control Act 2016		limited	✓
Water Act 2016	limited	✓	✓
Weeds Management Act 2013	✓	✓	✓
Operating Consents			
Oil Leases 4 and 5— both renewed in 2002	✓		
Pipeline Licence No. 2: Mereenie to Alice Springs Pipeline		✓	
Mereenie Agreement 2003 (Central Land Council)	✓		
Project Approvals			
Environmental Impact Statement, Mereenie Oil and Gas Field Appraisal Program (1981)	✓		
Supplement to Environmental Impact Statement, Field Development for Commercial Production (1983)	✓		
Preliminary Environmental Report, Alice Springs Crude Oil Line and Addendum (1985)		✓	
Preliminary Environmental Report, Crude Oil Processing Facility, Alice Springs (1985)			✓

4.2 Key legislation

In addition to the key legislation outlined in Section 5.1, other legislation which may apply to MRN includes, but is not limited to:

Land Use:

- *Planning Act* (Northern Territory);
- *Aboriginal Land Act* (Northern Territory);
- *Crown Lands Act* (Northern Territory);
- *Soil Conservation and Land Utilization Act* (Northern Territory);
- *Bushfires Act* (Northern Territory);
- *Pastoral Land Act* (Northern Territory);
- *Aboriginal Land Rights (Northern Territory) Act* (Commonwealth); and
- *Native Title Act 1993* (Commonwealth).

Cultural and Heritage:

- *Northern Territory Aboriginal Sacred Sites Act* (Northern Territory);
- *Heritage Act* (Northern Territory);
- *Aboriginal and Torres Strait Islander Heritage Protection Act* (Commonwealth); and

Water Quality and Biodiversity Conservation:

- *Water Act* (Northern Territory);
- *Biological Control Act* (Northern Territory);
- *Territory Parks and Wildlife Conservation Act* (Northern Territory);
- *Public and Environmental Health Act* (Northern Territory);

- *Weeds Management Act* (Northern Territory)*;* and

Air Quality, Noise and Waste Management:

- *Waste Management and Pollution Control Act* (Northern Territory)*;*
- *Public and Environmental Health Act* (Northern Territory)*;*
- *National Greenhouse and Energy Reporting Act* (Commonwealth)*;* and

Safety and Environmental Compliance:

- *Work Health and Safety (National Uniform Legislation) Act* (Northern Territory)*;*
- *Environmental Offences and Penalties Act* (Northern Territory)*.*
- *Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Act* (Northern Territory)*;*
- *Dangerous Goods Act* (Northern Territory)*;* and
- *Poisons and Dangerous Drugs Act* (Northern Territory*.*

4.3 Agreements

The Mereenie Agreement, signed 28th February 2003, is a legal agreement between oil and gas companies and associated service industries, with the Central Land Council (CLC) (the body corporate representing the Traditional Owners (TOs)). Approval from the TOs is required for any activities at the MRN involving ground disturbance, survey work, drilling, construction of petroleum gathering and processing facilities, access roads, drilling, completion and testings, pipelines and camp and ancillary facilities. This requirement is detailed under Clause 5.2 and Clause 5.3 of the Mereenie Agreement (CLC).

As part of this approval process, inspection by TOs and/or a professional archaeologist may be required to finalise locations for proposed activities involving ground disturbance. Once locations are finalised, and prior to any site activity, further field inspection reports are undertaken for each location, in accordance with CTP HS&E MS.

4.4 Industry Codes of Practise

The relevant industry Codes of Practice are:

- Australian Petroleum Production and Exploration Association (APPEA) Code of Environmental Practice (2008); and
- Australian Pipeline Industry Association (APIA) Code of Environmental Practice Onshore Pipelines (2009).

Operations at MRN are undertaken in accordance with these Codes of Practice.

5 DESCRIPTION OF ENVIRONMENT

5.1 Physical Environment

5.1.1 Climate

The climate of the project area 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.

The site experiences low and variable rainfall and high diurnal and seasonal temperature fluctuations. The mean annual rainfall for MRN is 300 mm, with most of rainfall in summer.

Temperatures vary from very hot in summer to below freezing in winter, and frosts occur regularly during the winter months. The mean annual evaporation rate at Alice Springs is 3066 mm. The dominant wind directions are southeast to northeast with not much seasonal variation.

Climatic conditions for Alice Springs and Hermannsburg, the two closest reliable weather stations, are shown in Figure 5-1.

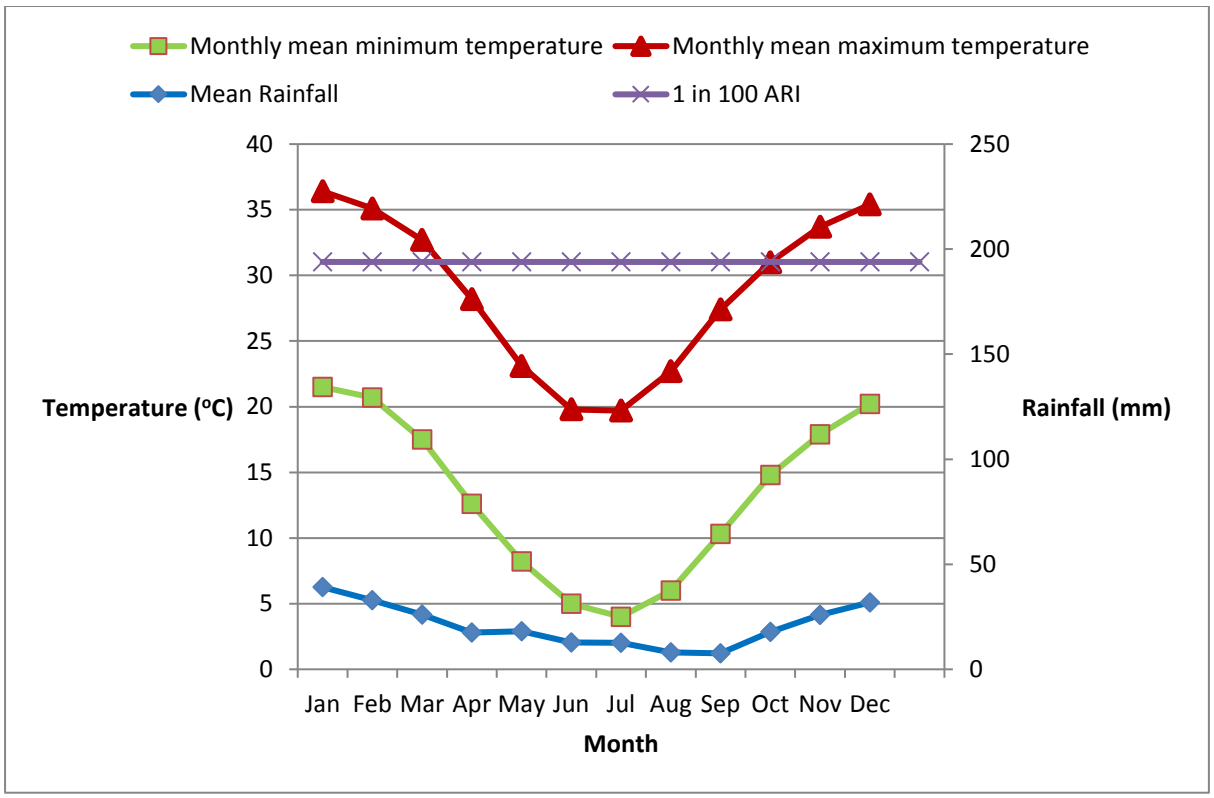

Figure 5-1 Alice Springs (1942-2015) weather data showing mean highest and lowest monthly temperatures and Hermannsburg (1888-2015) mean monthly rainfall; with 1 in 100-year rainfall event for freeboard calculations.

Table 5.1 shows the Annual Exceedance Probability (AEP) for various storm event durations at PVGF. The 1 in 100-year Average Recurrence Interval (ARI) storm event is the same as the 1% AEP, so for a 24-hour storm event the 1 in 100-year ARI is 193.9 mm. This value is used for freeboard engineering considerations on evaporation ponds and other open-air water structures.

Table 5-1 Annual Exceedance Probability (AEP) tables for storm durations at MRN

	Annual Exceedance Probability (AEP)						
Duration	**100%**	**50%**	**20%**	**10%**	**5%**	**2%**	**1%**
1 min	1.5	1.8	2.9	3.6	4.4	5.6	6.6
2 min	2.6	3.2	5	6.4	7.8	10	11.8
3 min	3.6	4.4	6.9	8.8	10.8	13.7	16.2
4 min	4.5	5.4	8.6	10.9	13.4	17	20
5 min	5.3	6.4	10	12.8	15.7	19.9	23.4
10 min	8.3	10	15.6	19.8	24.3	30.7	36.1
15 min	10.3	12.4	19.3	24.5	30.1	38	44.7
30 min	13.9	16.7	26.1	33.2	40.7	51.6	60.7
1 hour	17.5	21.1	33	42.1	51.7	65.6	77.3
2 hours	21.5	25.7	40.3	51.3	62.9	79.9	94.1
3 hours	24.1	28.8	45	57.2	70.1	88.8	104.5
6 hours	29.5	35.2	54.6	69.1	84.5	106.8	125.3
12 hours	36.5	43.5	67.3	85.1	103.9	130.9	153.4
24 hours	45.2	54.1	84.4	107	130.9	165.3	193.9
48 hours	54.9	66.3	105.3	134.8	166.2	212	250.5
72 hours	60.2	73.1	117.7	152	188.8	243.1	289.3
96 hours	63.2	77.1	125.4	163	203.7	264.5	316.7
120 hours	65	79.4	130.1	169.8	213.4	278.9	335.7
144 hours	66	80.6	132.7	173.8	219.2	288	348.2
168 hours	66.5	81.2	133.7	175.6	222.2	293.2	355.7

5.1.2 Bioregion

The OL area is in two Interim Biogeographical Regionalisation for Australia (IBRA), split by the OL 4 and OL 5 boundary. OL 5 is located entirely within the MacDonnell Ranges Bioregion, Figure 5-2 as classified by (Baker, et al., 2005) and described in Table 5-2. The bioregion covers 39,294 square kilometres of which 10-15% is protected within reserves. A proportion of OL 4 extends into the MacDonnell Ranges bioregion with the remainder located in the Great Sandy Desert IBRA as classified by (Baker, et al., 2005) and described in Table 5-2. Operations at the MRN will not impact on the environmental sensitivities and conservation importance of these two areas.

Table 5-2 Description of bioregion/s of the OL area adapted from (Baker, et al., 2005)

Extent in OL area	Bioregion	Topography	Geology	Soils	Vegetation
40%	MacDonnell Ranges	High relief ranges and foothills	Mostly sedimentary rocks in the Amadeus Basin	Generally skeletal or shallow sands on the rocky hills, with earthy sands and deep loamy alluvium on the lowlands	Dominant vegetation spinifex hummock grassland, sparse *Acacia* shrub lands and woodlands along watercourses
60%	Great Sandy Desert	Generally flat with several low ranges	Large expanse of horizontally bedded Mereenie Sandstone and associated Cambrian marine sediments – calcareous	Predominantly shallow soils influenced by the presence of saline lakes; where mostly saline loams occur	Dominate vegetation hummock grassland with areas of tall-shrubland or low open woodland,

Extent in OL area	Bioregion	Topography	Geology	Soils	Vegetation
			sandstones, siltstones and limestones		Mulga tall open-shrubland, and Samphire low open-shrubland fringing salt pans

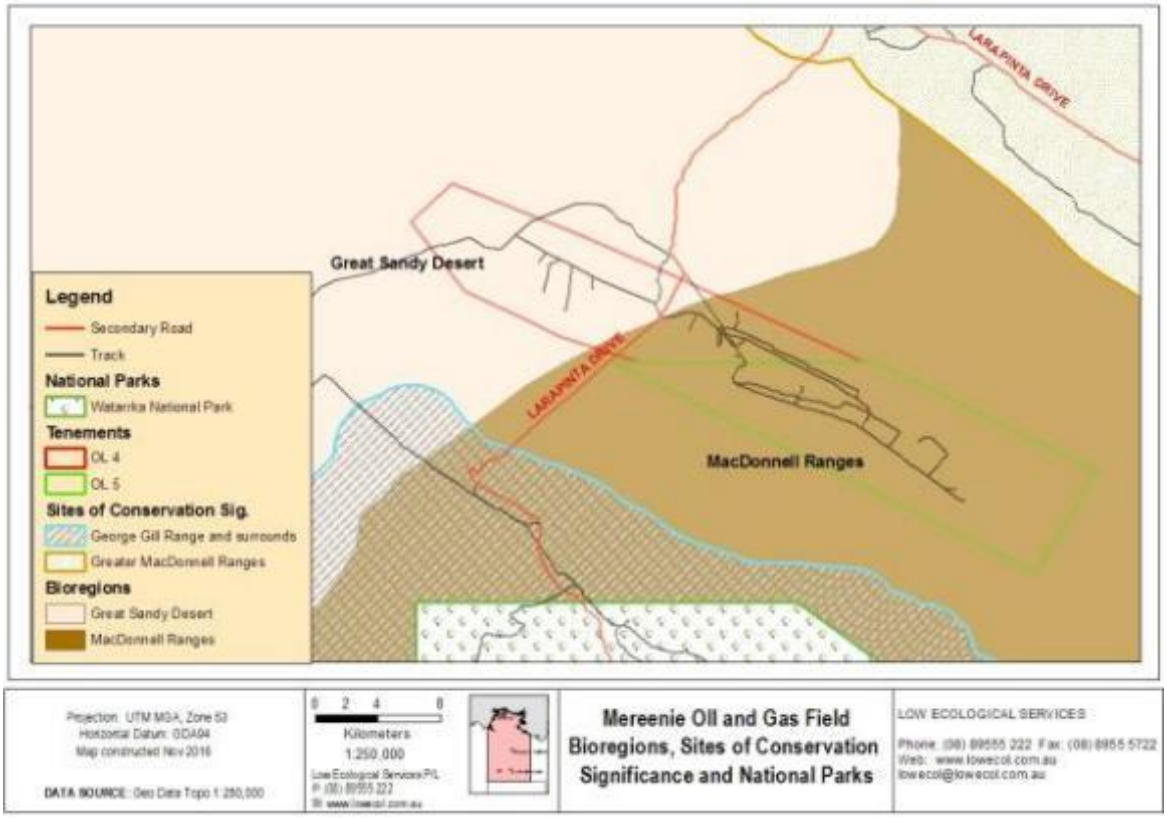

Figure 5-2 Bioregions, Sites of Conservation Significance and National Parks located around MRN

5.1.3 Sites of Conservation Significance

The OL area is not located within a Site of Conservation Significance, but the George Gill Range and surrounds is located approximately 6 km to the south and the Greater MacDonnell Ranges are approximately 14 km north at their closest points, see Figure 5-2. Operations at the MRN will not impact on the environmental sensitivities and conservation importance of these two areas.

5.1.4 National Parks

The closest National Park to the MRN is Watarrka National Park (Kings Canyon), comprising of approximately 105,700 ha of land encompassing the western end of the George Gill ranges. It is host to over 500 species of plants and many native animals and as such is an important conservation area. It is also of key importance as a tourist attraction and preservation of Indigenous culture (Parks ad Wildlife Services of the Northern Territory, 2009). Activities at MRN have currently had no impact on the integrity and significance of the Watarrka National Park, and future activities covered by this FEMP are unlikely to cause impact.

5.1.5 Land Systems

MRN

Three land systems have been recognised in the MRN area, see Figure 5-3 and described in detail in Table 5-3:

- **Simpson Land System:** Sand plains with dunes, occupying the northwest part of the OL area;
- **Krichauff Land System:** Sandstone plateaus, eroded and dissected, forming margins to the southeast part of the OL area; and
- **Gillen Land System:** Sandstone strike ridges and intervening valleys in the southern part of the OL area.

Soils range from lithosols developed on sandstones, and sands in dune areas to calcareous desert soils and red-brown earth developed on siltstones.

Table 5-3 Description of land systems mapped in the OL area (Perry, et al., 1962)

Extent in OL area	Land System	Geology	Topography	Soils	Erosion Hazard
10%	Krichauff	Flat lying sandstone, siltstone and conglomerate. Upper Proterozoic age, Amadeus trough (Heavitree quartzite)	Partially dissected erosional weathered land surface; relief up to 500 ft	Shallow stony or gravelly soils and some red sands or red clayey sands	Moderate erosion hazard
45%	Simpson	Extensive dune fields with hard spinifex pastures	Sand dunes of varying height and alignment, up to a maximum of 70ft in the Simpson Desert section	Red sands to red clayey sands and locally red earths	Low erosion hazard
45%	Gillen	Sandstone mountains with mulga or witchetty bush country	Partially dissected erosional weathered land surface; relief up to 500 ft	Shallow stony or gravelly soils and some red sands or red clayey sands	Moderate erosion hazard

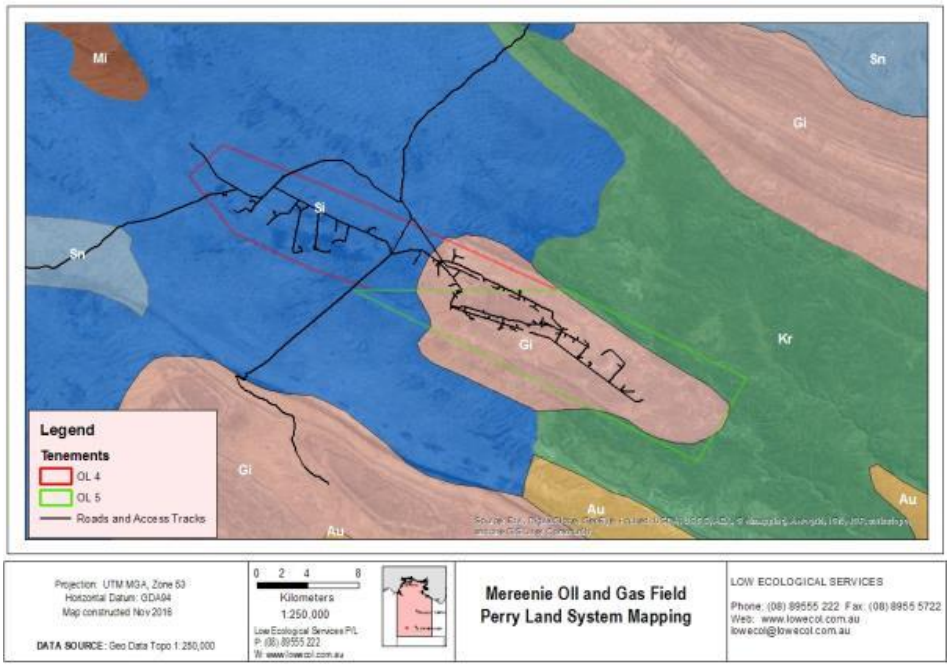

Figure 5-3 Land system mapping of the MRN area and surrounds. Other land systems not described in Table 5-3: AU – Amulda land system, SN – Singleton land system, Mi – Middleton land system.

MASP

The pipeline corridor from MRN to Hermannsburg crosses eight land systems. These systems are:

- Gillen;
- Simpson;
- Singleton;
- Stokes;
- Deering;
- Muller;
- Krichauff; and
- Finke.

At Alice Springs, the pipeline corridor crosses the Muller and Ewaninga land systems.

The level of grazing pressure and associated soil erosion issues inflicted upon the pipeline corridor is variable. Degradation of the soil is a constant threat, especially from recurring fire events and overgrazing by domesticated and feral stock. The principal erosion processes acting along the pipeline corridor now are sheet and wind erosion.

BREWER ESTATE

The site landforms comprise long slopes of low gradient with small sand dunes along the northern boundary. The soils at the site are red earths with deep sands on the dunes. The soils have moderate to very high erodibility ratings.

5.1.6 Geology

MRN

The OL area is in the Amadeus Basin, an east-west trending structural depression extending across the southern part of the Northern Territory and into Western Australia. This basin covers an area of approximately 207,000 km² and contains up to 9100 m of late Proterozoic and Palaeozoic sediments. It is bound in the north by the Arunta complex and in the south by the Musgrave-Mann complex, both containing granite, gneiss and schists, with amphibolite and quartzite.

Geologically, the MRN comprises a large anticlinal structure within the Amadeus Basin. Rocks within the OL area consist of sandstones which form resistant strike ridges and less resistant siltstones, commonly covered by superficial soils. Hydrocarbons occur in sandstones at depths ranging between 1200 and 1500 m.

MASP

The majority of the MASP has been constructed on quaternary undifferentiated sediments of aeolian sand and thin deposits of alluvium.

BREWER ESTATE

Brewer Estate is located within the Amadeus Basin and the geology at the site comprises a superficial cover of quaternary sediments overlying Pertnjara Group sediments which consist of conglomerates, siltstones and sandstones.

5.1.7 Soils

MRN

There are two main types of soils in the Simpson Land system. The soil on the dune flanks and crests is dominantly red earths whereas the soil in the dune swales is characterised as mainly red clayey sands, locally red earths, texture contrast soils, calcareous earths and shallow sandy soils (Perry, et al., 1962).

The Gillen Land system area is dominated by shallow, stony soils with red clayey soils around colluvial and alluvial fans (Perry, et al., 1962).

MASP

From MRN to Hermannsburg, the soils have been mapped through desktop research and verified with on-ground field surveys. Profiles of three principal soils along the Mereenie to Alice Springs pipeline are:

- Red earth;
- Siliceous sands; and
- Alluvial soil.

BREWER ESTATE

The area of the Brewer Estate is dominated by calcareous earths, with aeolian sands common.

5.1.8 Hydrology

MRN

Streams of the OL area are ephemeral and subject to short flow duration and high turbidity. No perennial surface water occurs in the OL area. There is a contrast between the majority of OL4 (southeast half of the OL area) where infiltration is slow and a dendritic drainage pattern is evident, and OL5 (northwest half of the OL area) where the lack of a drainage pattern indicates that runoff seldom, if ever, occurs (although some ponding may develop between dunes). Figure 5-4 shows a map of the hydrology of the OL area.

When surface run-off occurs it generally results in high intensity and turbid flows that can cause a large amount of disruption and disturbance to the environment, but are short lived in duration.

MASP

The MASP covers a range of varying hydrological features from sand dunes, streams, drainage depressions and major ephemeral river systems.

BREWER ESTATE

At Brewer Estate, there is almost a complete lack of defined surface drainage systems because of the irregular surface morphology and the presence of soils with high infiltration rates.

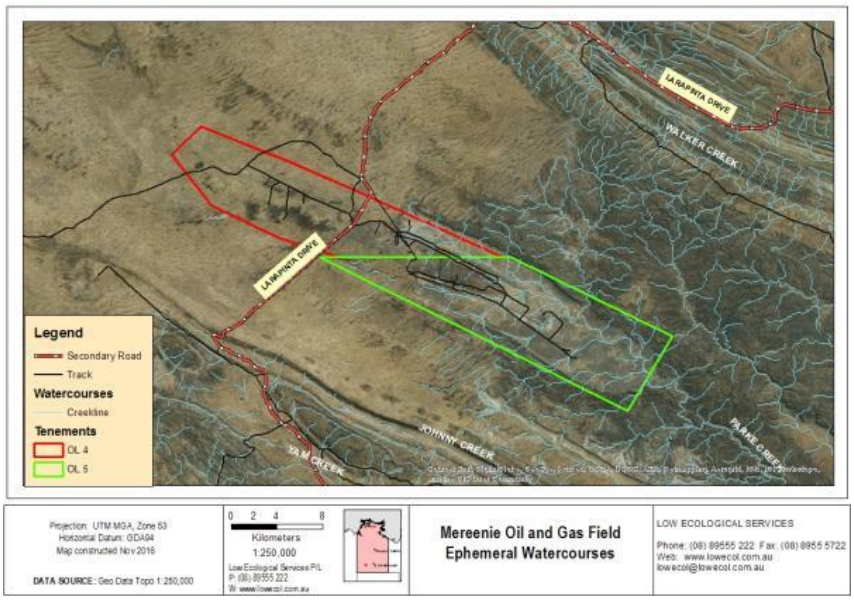

Figure 5-4 Hydrology of the MRN area, showing ephemeral creek and watercourse lines

5.1.9 Hydrogeology

Water Studies (2001a) presents the conceptual hydrogeology of significant units located at Brewer Estate Crude Oil Terminal, the MASP alignment and the OL area. These units include:

- Cainozoic (shallow) aquifer systems;
- Brewer Conglomerate (and the Undandita Member);
- Hermannsburg Sandstone;
- Parke Siltstone; and
- Mereenie Sandstone.

MRN

The MRN lies within Devonian, Silurian and Ordovician fold systems in the north of the Amadeus Basin and is sited on the Mereenie Anticline. The Mereenie Anticline is easterly plunging and slightly asymmetrical with a strike length of more than 40 km and an average width of 4 km (Havord, 1989).

The MRN produces oil and gas from the Pacoota Sandstone and the Stairway Sandstone. The Mereenie Sandstone overlies the Pacoota Sandstone and is the current source of potable water for the MRN Camp. The Parke Siltstone overlies the Mereenie Sandstone and outcrops along the margins of the anticline. The Hermannsburg Sandstone overlies Parke Siltstone to the north and south of the Mereenie Anticline, although the unit has been exposed and eroded along the structural hinge line. The historical development and geological setting of the MRN are further discussed in Havord (1989) and Lindsay & Korsch (1989). There is an impermeable layer (Stokes sandstone ~300 m thick) between the fresh aquifers (Mereenie sandstone etc.) and the target formation (Stairway through to Pacoota).

Figure 5-5 shows approximate depth to Mereenie sandstone with which the aquifer is located at locations within the MRN production license areas. Thickness can vary from 350m to 500m on the flanks, and water table sits at approximately 250m deep.

MASP

A description of the groundwater systems traversed by the MASP and the Brewer Estate Crude Oil Terminal is provided in the *Mereenie – MASP – Brewer Estate Hydrogeological Risk Evaluation and Site Appraisal (*Water Studies 2001a).

The MASP also crosses the major surface drainages of the Finke River, Ellery Creek and the Hugh River.

BREWER ESTATE

The majority of surface geology across the Brewer Estate Crude Oil Terminal site is comprised of a fine to medium, red brown, clay sand. The total depth to basement across the site is reported to average 8 m thickness of tertiary sand and silty sand. Basement at Brewer Estate Crude Oil Terminal is dominantly comprised of Brewer Conglomerate, which is characterised by very low permeability, and hence low potential for deep infiltration of fluids released from the site.

Further information on water studies conducted are available in the following reports:

- Rust PPK (1994) *Assessment of Groundwater Contamination. Mereenie Oilfield Phase II Investigation*. Report prepared for Santos Limited, reference 27F104B 94/560. September 1994.
- Water Studies (2001b). *Mereenie Oil and Gas Field - Northern Territory. Stage 1 Investigations. Mereenie – Alice Springs Pipeline Leak Assessment*. Consultant report WSDJ00220/1-A prepared for Santos Limited, 21 August 2001.
- Water Studies (2002). *Mereenie Oil and Gas Field – Northern Territory. Mereenie – MASP – Brewer Estate Hydrogeological Risk Evaluation and Site Appraisal*.

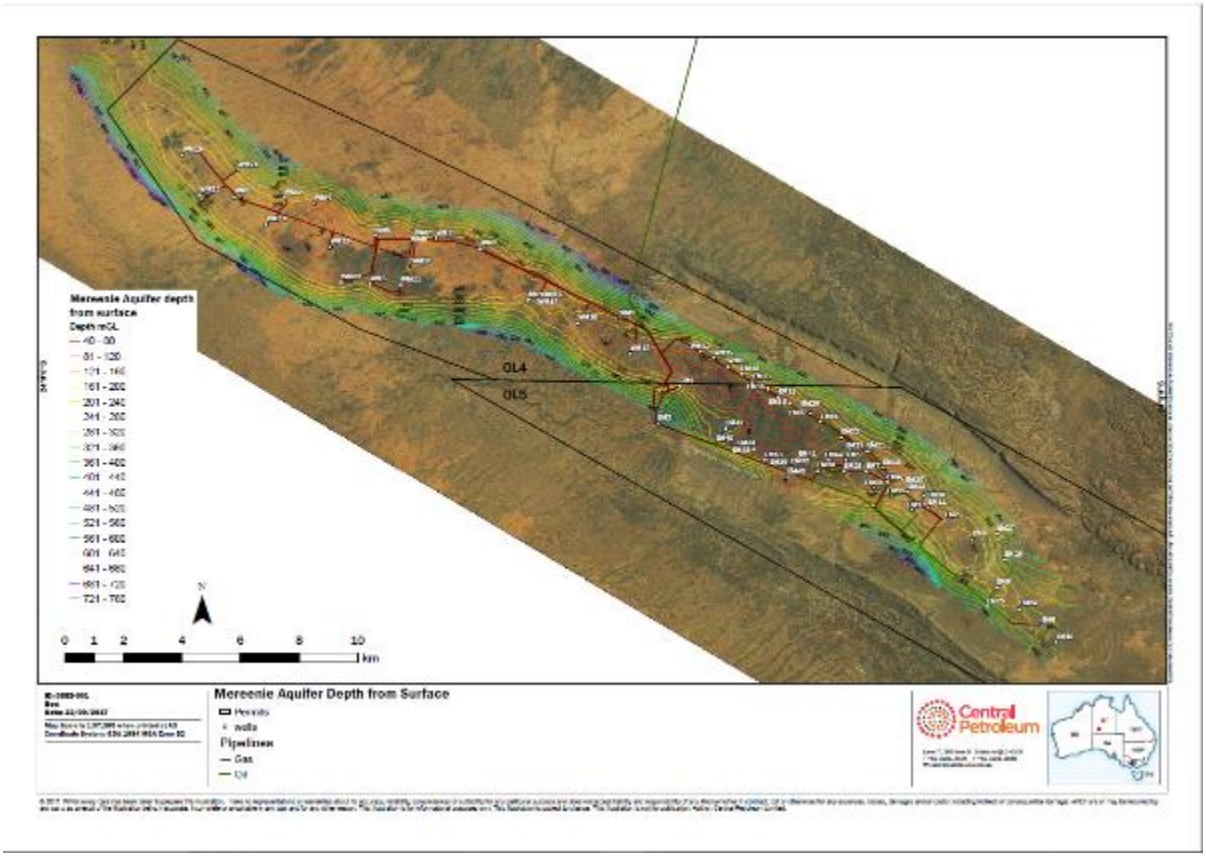

Figure 5-5 Hydrogeology of the MRN area showing approximate depth to groundwater

5.1.10 Vegetation Communities

MRN

The vegetation is closely related to the three land systems, each of which contains characteristic plant associations.

The Simpson land system supports distinctive associations characterised by desert oak trees, various myrtaceous and proteaceous shrubs, and grasses including spinifex. Thickets of mulga are common in this land system.

The Krichauff land system supports a variable assemblage of plants with relatively few species. Two species of mulga occur among the shrubs.

The Gillen land system supports a mosaic of short bunch grass savannah and spinifex steppe with few trees or shrubs; this system also contains extensive bare areas.

The following vegetation communities have been identified:

- *Eucalyptus camaldulensis* (river red gum) – *Eucalyptus microtheca* (coolabah) fringing woodland.
- *Eucalyptus intertexta* (gum coolibah) open woodland/tree savannah.
- *Allocasuarina decaisneana* (desert oak) open woodland/tree steppe/tree savannah.
- *Acacia estrophiolata* (ironwood) open woodland/tree savannah over various tussock grasses and short grasses.
- *Acacia aneura* (mulga) tall open shrubland with short grasses.
- *Acacia aneura – Acacia macdonelliensis* tall open shrub land.
- *Acacia kempeana* (witchetty bush) tall open shrub land.
- *Triodia clelandii* (weeping spinifex) hummock grassland.
- *Triodia basedowii* (hard spinifex) hummock grassland/shrub land.

- *Zygochloa paradoxa* (sandhill cane grass) hummock grassland/shrub land.
- *Eragrostis eriopoda* (woolly butt) tussock grassland.
- *Aristida holathera* (kerosene grass) tussock grassland.

None of these vegetation units or communities represents areas of conservation significance, and they are wide spread and undisturbed in the surrounding area. As such operations covered by this FEMP at MRN will not impact on the integrity of these vegetation communities at a regional scale.

Table 5-4 provides description of vegetation communities as mapped by Wilson et al (1991) and shown in Figure 5-6.

Table 5-4 Description of vegetation units mapped in the OL area (Wilson, et al., 1991)

Broad Vegetation Class	Fine Vegetation Class	Fine Vegetation Class Description	Structural Formation
Low open wood-lands	93	*Triodia basedowii* (hard spinifex) hummock grassland with *Allocasuarina decaisneana* (desert oak) open-woodland overstorey between dunes	L1H3 Mixed species low open wood lands
Sparse shrublands	73	*A. tetragonophylla* (dead finish), *A. kempeana* (witchetty bush) sparse-shrubland with herb/grassland understorey	Z1F3 Shrubs < 3m, 1-9%; Forbs 30-69%
Sparse shrublands	71	*A. aneura* (Mulga) tall sparse-shrubland with grassland understory	S1G3: Shrubs >2m tall less than 9% and tussock grass 30-69%
Tall shrubland	87	*Triodia (Spinifex)* open-hummock grassland with *A. aneura* tall sparse-shrubland over-story	S1H2: Shrubs >2m tall less than 9% and hummock grass 10-29%
Open woodlands	30	*E. gongylocarpa* (Marble Gum) open-woodland with open-hummock grassland understory	M1H2: Trees >10m tall <9% and hummock grass 10-29%

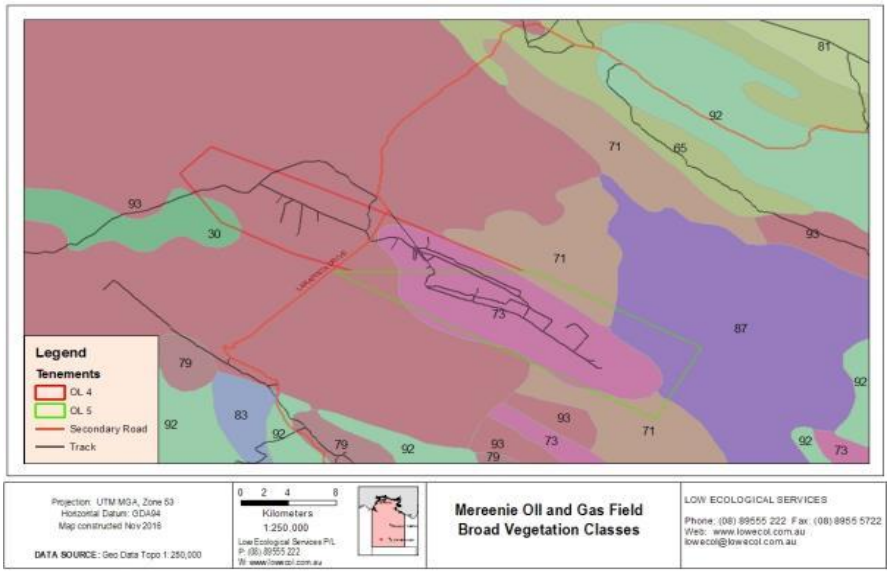

Figure 5-6 Vegetation communities in and around the MRN; broad vegetation descriptions not included in Table5-4: 92 – Mixed species low open woodland, 83 – Tall shrubland, 65- Tall open-shrubland, 81 – Tall shrubland, and 79 – Tall shrubland.

MASP

The total number of species listed by the NT Herbarium for the MRN to Hermannsburg section of the pipeline is 743. For the Alice Springs section, the total is 162 species.

Only one of the species is listed as being rare, the grass tree (*Xanthorrhoea thorntonii*) and was found during a site survey along the pipeline route. There are a few small, disjunct populations of this species in the western section of the pipeline corridor on either side of Deering Creek. A few plants of the *X. thorntonii* grow at the edge of a seismic line that is now the pipeline route.

Figure 5-7 Image of conservation significant Grass Tree (*Xanthorrhoea thorntonii) found along he MASP*

Many of the vegetation species occurring in the MASP area are used as sources of food and for other commodities by Aboriginal people; if not in the specifically targeted in the study area itself then in other parts of central Australia. In addition to their functional importance, plants are important to Aboriginal people as totems.

BREWER ESTATE

The vegetation of the site consists of ironwood (*A. estrophiolata)* open woodland and mulga tall open shrub land with a variety of other, smaller acacias, lower shrubs and grasses. The NT Herbarium provided a list of 162 species which have been collected in a larger area surrounding the site. On this list, one rare species, iron grass (*Lomandra patens*), was included; however, it was not sighted at the oil terminal, nor was it expected to be found as it prefers areas of skeletal soils.

5.1.11 Flora of Conservation Significance

A flora species is considered in this report to be of conservation significance if it is:

- Listed as Critically Endangered (Cr), Endangered (En), or Vulnerable (Vu) under the *TWPC* Act and has been recorded in the NT Flora Atlas within a 10 km or 25 km buffer of the OL area or has been recorded on field surveys of the area; or
- Listed as Cr, En, Vu or Conservation Dependent under the *EPBC* Act and is identified by a Protected Matters Search Report (PMSR) (Appendix 2) for the area or has been recorded in the NT Flora Atlas within a 25-km buffer of the OL area; or has been recorded on field surveys of the area.

A summary of flora species of conservation significance identified as potentially occurring within the OL area is provided in Table 5-5.

Table 5-5 Flora species of conservation significance for the OL area

Scientific Name	Common Name	NT Atlas[1]/TPWC Status[2]	PMST[3] / EPBC Status[4]
Corynotheca licrota	Club-fruit Lilly	YES / Nt	NO / -

Dodonaea microzyga var. microzyga	Brilliant Hopbush	YES / Nt	NO / -
Eremophila ovata		YES / Nt	NO / -
Euphorbia sarcostemmoides	Climbing Caustic	YES / Nt	NO / -
Glischrocaryon aureum var. angustifolium		YES / Nt	NO / -
Goodenia glandulosa		YES / Nt	NO / -
Grevillea pterosperma	Desert Grevillea	YES / Nt	NO / -
Laxmannia arida	Paper Lilly	YES / Nt	NO / -
Logania centralis		YES / Nt	NO / -
Macrozamia macdonnellii	MacDonnell Ranges Cycad	NO / Nt	YES / VU
Santalum acuminatum	Desert Quandong	YES / VU	NO / -
Spartothamnella puberula	Red-berried Stick-plant	YES / Nt	NO / -
Vittadinia pterochaeta	Rough Fuzzweed	YES / Nt	NO / -
Xanthorrhoea thorntonii	Desert Grass Tree	YES / Nt	NO / -

[1] Recorded in the NT Flora Atlas within a 10-km buffer of the OL area.
[2] TPWC Status: CR, Critical Endangered; EN, Endangered; VU, Vulnerable; Nt, Near Threatened; DD, Data Deficient; NE, Not Evaluated; LC, Least Concern as listed under the Territory Parks and Wildlife Conservation Act (TPWC).
[3] Listed on the EPBC PMSR report retrieved for the area with a 25-km buffer of the OL area (Appendix 2).
[4] EPBC Status: CR, Critical Endangered; EN, Endangered; VU, Vulnerable as listed under the Environmental Protection and Biodiversity Act (EPBC).

A flora and fauna assessment of the MRN was undertaken by Desert Wildlife Services in December 2000 (Desert Wildlife Services 2000a & b). The survey found that the flora of the MRN was particularly rich, containing many significant species and unique habitats. The survey increased the number of plant species known to occur at the MRN from 270 to 467. The number of rare and threatened plant species known to occur increased from 12 to 27 and seven of these were important at the national level.

Most of the significant plant species that were found fall into the poorly known category, but two nationally rare species were collected in the area:

- The false (or desert) caustic bush (*Euphorbia sarcostemmoides*) - Two populations of the fire-sensitive false caustic bush were found. These populations appear to be secure at this stage, but a pending threat is the intrusion of buffel grass into their habitat which would increase their vulnerability to fire; and
- Tar vine *(Commicarpus australis)* - Tar Vine has not been found inside the MRN, but as it was recorded within 6 km of the field's boundary, it may also occur within the OL area.

The brilliant hopbush (*Dodonea microzyga*) is a rare species in the Northern Territory. Two populations of brilliant hopbush were found in the MRN, but both have been disturbed by the presence of watering points for feral horses and borrow-pits.

Other important plant species to be protected during further development work, if possible are shown in Table 5-6.

Table 5-6 Other important species to be protected if future works are proposed

Species	Image
Nationally rare species: The false (or desert) caustic bush (*Euphorbia sarcostemmoides*)	
Nationally rare species: Tar vine *(Commicarpus australis)*	
Dwarf tea-tree (*Leptospermum sp*.)	
Desert kurrajong (*Brachychiton gregorii)*	

Species	Image
Quandong (*Santalum acuminatum*).	

5.1.12 Introduced Flora and Weed Species

Thirty-Two Weeds of National Significance (WoNS) have been brought under national management for restricting spread and/or eradicating these weeds from parts of Australia.

CTP and TOs are ultimately responsible for managing WoNS in the OL area, and the state/territory government is responsible for overall legislation and administration.

All occurrences of WoNS should be reported to the DENR and a management strategy developed for control of the infestation.

A declared weed in the NT is a plant or species of plant which has been identified for control, eradication, or prevention of entry in all or part of the Northern Territory under the *Northern Territory Weeds Management Act* 2001.

There are three classes of declared weeds:

- Class A – To be eradicated
- Class B – Growth and spread to be controlled
- Class C – Not to be introduced to the Northern Territory

All Class A and Class B weeds are also considered to be Class C weeds.

An introduced flora species is considered in this report to be of management concern if it is:

- Listed as declared weed under the *NT Weeds Management Act* and is identified by a PMSR (Appendix 2) or has been recorded in the NT Flora Atlas within a 25-km buffer of the OL area or has been recorded on field surveys of the area; or
- Listed as a WoNS and is identified by a PMSR (Appendix 2) for the area or has been recorded in the NT Flora Atlas within a 25-km buffer of the OL area; or has been recorded on field surveys of the area.

There are no declared weeds or WoNS identified within 25 km of the OL area in the NT Flora Atlas. The weeds in

Table 5-7 are listed as introduced and invasive species. Effort will be made to control the spread and development of these weeds in the OL area.

Table 5-7 Introduced flora and weed species of management concern identified in a NT Flora Atlas search of 25 km of the OL Area

Scientific Name	Common Name	Status [1]	Image
Acetosa vesicaria	Ruby Dock	-	
Brassica tournefortii		-	
Cenchrus ciliaris	Buffel Grass	-	
Cenchrus echinatus		-	

Scientific Name	Common Name	Status [1]	Image
Citrullus colocynthis (slightly larger fruit than *Citrullus lanatus*)	Desert gourd	-	
Citrullus lanatus	Paddy Melon	-	
Conyza bonariensis	Fleabane	-	
Eragrostis barrelieri	Pitted lovegrass	-	

Scientific Name	Common Name	Status [1]	Image
Lactuca serriola	Prickly lettuce	-	
Malvastrum americanum	Spiked Malvastrum	-	
Sonchus oleraceus	Common sow-thistle	-	

[1] Declared weed class as identified under the *Northern Territory Weeds Management Act 2001;* or WoNS

5.1.13 Native Fauna of Conservation Significance

A fauna species is considered in this report to be of conservation significance if it is:

- Listed as Cr, En, or Vu under the *TWPC* Act and has been recorded in the NT Fauna Atlas within a 25-km buffer of the OL area or has been recorded on field surveys of the area; or
- Listed as Cr, En, Vu, Conservation Dependent, Listed Migratory Species or Listed Marine Species under the *EPBC* Act and is identified by a PMSR (Appendix 2) for the OL area or has been recorded in the NT Flora Atlas within a 25-km buffer of the OL area; or has been recorded on field surveys of the area.

Table 5-8 provides a summary of fauna species of conservation significance for the OL area.

Table 5-8 Fauna species of conservation significance within a 25-km radius of the OL area

Type	Scientific Name	Common Name	Recorded[1] / TPWC Status[2]	Listed[3] / EPBC Status[4]
10 Km				
Mammal	*Lagorchestes hirsutus*	Mala	YES / EW	YES / EN
Bird	*Ardeotis australis*	Australian Bustard	YES / Nt	NO / -
Reptile	*Pseudechis australis*	King Brown Snake	YES / Nt	NO / -
25 Km				
Mammal	*Lagorchestes conspicillatus*	Spectacled Hare-wallaby	YES / Nt	NO / -
Mammal	*Leporillus apicalis*	Lesser Stick-nest Rat	YES / EX	NO / EX
Mammal	*Trichosurus vulpecula vulpecula*	Common Brushtail Possum (Southern N.T.)	YES / EN	NO / -
Mammal	*Petrogale lateralis*	Black-footed Rock-wallaby	YES / Nt	YES / VU
Mammal	*Macrotis lagotis*	Bilby	YES / VU	YES / VU
Mammal	*Zyzomys pedunculatus*	Central Rock-rat	NO / EN	YES / EN
Reptile	*Croitana aestiva*	Desert Sand-skipper		
Reptile	*Liopholis kintorei*	Great Desert Skink	NO / VU	YES / VU
Reptile	*Liopholis slateri slateri*	Slater's Skink	NO / EN	YES / EN
Bird	*Ardea alba*	Great Egret	MIG	
Bird	*Ardea ibis*	Cattle Egret	MIG	
Bird	*Apus pacificus*	Fork-tailed Swift	MIG	
Bird	*Calyptorhynchus banksii samueli*	Red-tailed Black-cockatoo (Central Australia)	YES / Nt	NO / -
Bird	*Charadrius veredus*	Oriental Plover	MIG	
Bird	*Glareola maldivarum*	Oriental Pratincole	MIG	
Bird	*Merops ornatus*	Rainbow Bee-eater	MIG	
Bird	*Motacilla cinerea*	Grey Wagtail	MIG	
Bird	*Motacilla flava*	Yellow Wagtail	MIG	
Bird	*Pyrrholaemus brunneus*	Redthroat	YES / Nt	NO / -
Bird	*Amytornis striatus*	Striated Grasswren	YES / Nt	NO / -
Bird	*Dromaius novaehollandiae*	Emu	YES / Nt	NO / -
Bird	*Falco hypoleucos*	Grey Falcon	YES / VU	NO / -
Bird	*Calidris tenuirostris*	Great knot	YES / VU	NO / -
Bird	*Polytelis alexandrae*	Princess Parrot	YES / VU	YES / VU
Bird	*Erythrotriorchis radiatus*	Red Goshawk	NO / VU	YES / VU
Bird	*Pezoporus occidentalis*	Night Parrot	NO / CR	YES / EN
Bird	*Rostratula australis*	Australian Painted Snipe	NO / VU	YES / EN

[1] Recorded in the NT Fauna Atlas within a 25-km buffer of the OL area.

[2] TPWC Status: CR, Critical Endangered; EN, Endangered; EW, Extinct in the Wild: EX, Extinct; VU, Vulnerable; Nt, Near Threatened; DD, Data Deficient; NE, Not Evaluated; LC, Least Concern as listed under the Territory Parks and Wildlife Conservation Act (TPWC).
[3] Listed on the EPBC PMSR report retrieved for the area with a 25-km buffer of the OL area (Appendix 2).
[4] EPBC Status: CR, Critical Endangered; EN, Endangered; VU, Vulnerable; MIG, Migratory; MAR, Marine; WET, Wetland; TER, Terrestrial; (L)MAR, Listed Marine Species as listed under the Environmental Protection and Biodiversity Act (EPBC).

A fauna survey of the site, undertaken in 2000 (Desert Wildlife Services 2000a & b), increased the number of vertebrate species recorded from the MRN from 128 to 174. Both native and introduced rodents were found to be abundant - this was attributed to the exceptional seasonal conditions that prevailed in central Australia in the 12 months prior to the survey. Six frogs, 32 reptiles, 67 birds and eight small mammal species were recorded during the survey.

An EPBC PMSR generated for a 25-km radius of the OL area identified five endangered, six vulnerable and eight migratory marine and migratory wetland species which could occur in habitats in the area

A search of the NT Parks and Wildlife Fauna Atlas for the area within a 25-km radius of the OL area identified 3660 records of 228 species. Eight of these species are listed as near threatened, four as vulnerable, one as extinct, one as extinct in the wild, and one as endangered under the TPWC Act. Key conservation advice and likelihood for conservation significant species potentially occurring within the OL area is provided below. Species that are extinct or regionally extinct are not discussed.

5.1.14 Introduced Fauna and Pest Species

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

- Listed in the NT Fauna Atlas as “Introduced” and has been recorded within a 25-km buffer of the OL area; or
- Identified as an invasive species by a PMSR report for the area within a 25-km buffer of the OL area (Appendix 2); or
- Has been recorded on field surveys of the area.

Table 5-9 provides a summary of introduced fauna species of management concern existing or potentially existing within the OL area.

Table 5-9 Introduced fauna and pest species of management concern for the OL area

Type	Scientific Name	Common Name	NT Atlas[1]	PMST Report[2]
Mammal	*Bos Taurus*	Domestic Cattle	No	Yes
Mammal	*Camelus dromedarius*	Camel	Yes	Yes
Mammal	*Canis lupus familiaris*	Domestic Dog	No	Yes
Mammal	*Equus caballus*	Horse	Yes	Yes
Mammal	*Felis catus*	Domestic Cat	Yes	Yes
Mammal	*Mus musculus*	House Mouse	Yes	Yes
Mammal	*Oryctolagus cuniculus*	European Rabbit	Yes	Yes
Mammal	*Vulpes vulpes*	European Fox	Yes	Yes

[1] Recorded in the NT Fauna Atlas within a 25-km buffer of the OL area.
[2] Listed on the EPBC PMSR retrieved for the area with a 25-km buffer of the OL area (Appendix 2).

MASP

It is expected that 56 species of mammals (including 7 placental mammals as established aliens), 172 species of birds, 81 species of lizards, 23 species of snakes, and 10 species of frogs would occur along

the pipeline corridor. Of the above species, 21 species of mammals, 7 species of birds and 4 species of reptiles are uncommon or rare.

Because the fauna habitats occurring along the MASP area are common over a wide geographical range, there is unlikely to be any appreciable impact on any species that are rare or geographically restricted.

BREWER ESTATE

It is anticipated that 28 species of mammals, 45 species of birds, 4 species of frogs, 51 species of lizards, and 20 species of snakes could occur at the site. None of the species are rare or geographically restricted.

5.1.15 Fire History and Regime

Northern Australian Fire Information (NAFI) records show that the majority of OL 4 has been burnt extensively in 2002 and 2011, see Figure 5-8. Both these fire seasons followed several years of above average rainfall in central Australia. There has been no recorded fire in OL 5 since 2001. The most recent fire in OL 4 was October 2014 (NAAFI, 2016).

Within the OL area, much of the vegetation which does pose a fire risk is poisoned or manually removed (predominantly buffel grass and other fast growing high fuel grasses). Because of this and due to the fluctuating growth density of the surrounding vegetation, any fire management plans will be conducted after advisement from LES or other professional services capable of ensuring a successful fire treatment while ensuring minimal risk to human and animal inhabitants.

Fire management plans along the MASP will also be conducted after advisement, however the necessity in this area of operation rarely requires fire treatment as the pipeline itself has adequate vegetation clearance and regular clearing patrols to ensure the limitation of wildfire impacts and allowing access for maintenance.

The Brewer Estate is managed under a separate Environmental Management Plan. If Produce form the MRN is to utilise the Brewer Estate facility, it will comply with regulations and guidelines as set out in this plan.

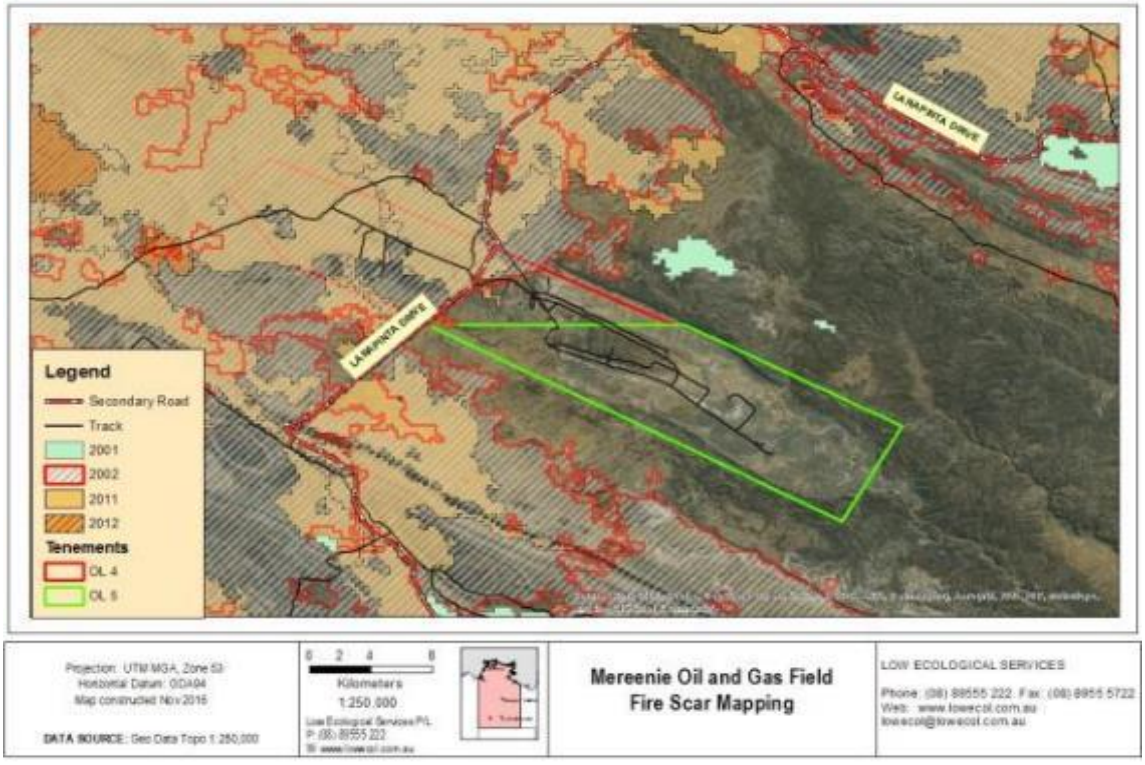

Figure 5-8 Fire scar mapping for the MRN area and surrounds

5.2 Socio-economic Environment

5.2.1 Surrounding Land Tenure

Land tenure of the OL area is Aboriginal land belonging to the Haasts Bluff Aboriginal Land Trust.

The MASP route passes through the Haasts Bluff Aboriginal Land Trust, the Hermannsburg Special Purpose Lease (which has been divided into five Land Trusts), through the Owen Springs Reserve, and into Brewer Estate Crude Oil Terminal. The pastoral grazing activities (cattle and horses) on the MASP are managed by Aboriginal interests and undertaken by outstation communities.

The industrial subdivision in which the Brewer Estate Crude Oil Terminal is located was acquired by the NT government from the owners of the previous Owen Springs Pastoral Lease for locating industries away from Alice Springs residential areas. The industrial areas encompass 500 ha, of which 100 ha was allocated to the Mereenie Joint Venture for the Crude Oil terminal.

5.2.2 Historic and Current Land Use

The OL area prior to the discovery of the oil and gas field had been used by Aboriginal people. Undertakings have been given in the 2003 Mereenie Agreement to maintain the right of the TOs to move freely throughout the OL area.

The land use of those areas adjacent to the MASP was, for the most part, discussed in the Palm Valley Pipeline Project Environmental Assessment and Management Report (Dames & Moore 1983) and the Preliminary Environment Report, Alice Springs Oil Line (Dames & Moore, 1985). In summary, the predominant land use was described as pastoral.

However, since the time of these approvals, land use for conservation has increased significantly in the Alice Springs / central Australia Region. The only part of the MRN operations affected by this is the eastern end of the MASP, which passes through the Owen Springs Reserve. The Reserve (previously the Owen Springs Pastoral Lease) was acquired by the NT government in 2000 and opened to the public in 2003.

The main National Parks and Reserves in the Alice Springs / central Australia Region are:

- Finke Gorge National Park;
- Owen Springs Reserve;
- Watarrka National Park; and
- West MacDonnell National Park.

Tourism has become a notable land use in this area; however, the operations do not encroach on the frequented tourist recreational areas in any way and operations within the OL area, MASP and Brewer Estate will not impact on the amenity or conservation significance of these parks.

5.2.3 Surrounding Populated Places

The OL area is located within one of the most remote and sparsely populated regions of Australia. Seven Aboriginal communities are near the OL area. These are:

- Kulpidjara;
- Areyonga;
- Underana;
- Undandita;
- Haasts Bluff;
- Papunya; and
- Ipolera.

There is also a community of 600-800 people at Hermannsburg, located 110 km east of the OL area. The nearest major centre is Alice Springs, with a population of approximately 26,000, located 250 km by road from the MRN.

Although Haasts Bluff and Papunya are a considerable distance from the OL area and are not affected, it is recognised that people from those communities, particularly those of the Luritja background, have strong traditional ties with country surrounding the OL area. There are also communities based at Kings Canyon and Kings Creek; approximately 40 – 50 km away by road.

The OL area lies within the territory of the Kukatja people who, along with Mantutara people, are now more commonly known as Luritja. It is bounded to the east by Western Arunta territory, to the south by Mantutara territory; to the west by Pintupi territory and to the north by Ngalia territory.

Kukatja people with TOs ties with the OL area live permanently at Hermannsburg Mission Station. These people, in addition to small family groups at outstations at Undandita, Underana, Kulperjara and Camel's Hump, are recognised by all Aboriginals in the surrounding communities as the prime Mereenie TOs.

Since the establishment of mission stations such as Haasts Bluff, Hermannsburg and Areyonga by the Lutheran Church almost 100 years ago, Aboriginals from the Kukatja, Mantutara and Western Arunta territories relocated themselves to those missions. While hunting and gathering is still carried out, its importance for subsistence has declined. There has been no occupation by Aboriginals, either on a semi-permanent or permanent basis, within the OL area for the past 80 years.

5.2.4 Heritage Areas identified EPBC PMSR

An EPBC PMSR retrieved for the OL area identified no National Heritage Places.

5.2.5 Archaeological Surveys

As the area is on Aboriginal Land Trust, a CLC clearance is required before any new works are commenced. In the event of new construction works a qualified archaeologist will be on-site during clearing and construction.

5.2.6 CLC Sacred Sites Clearance Certificate

CTP has a current CLC Sacred Site Clearance Certificate for the MRN existing operations on OL4 and OL5 (Appendicies

Appendix 1). CTP will seek the necessary approvals and CLC Sacred Site Clearance for any new proposed disturbances within the OL area.

5.2.7 Mereenie to Alice Springs Pipeline (MASP)

The MASP corridor location was selected by field investigations following approval of the preliminary route by the CLC. The final route was approved after the CLC had discussed the location of Aboriginal sites of significance with TOs, and the route does not encroach on these sites.

The pipeline corridor does not encroach closer than 1 km to two recognised European historic sites: the old Owen Springs homestead ruins, and the Hermannsburg Mission. No other European historic sites were identified by the Conservation Commission of the Northern Territory during the environmental assessment approval process.

5.2.8 Brewer Estate Crude Oil Terminal

The terminal lease covers an area of 100 ha adjacent to the Tarcoola-Alice Springs railway line, approximately 20 km south of Alice Springs.

An anthropological survey did not identify any sites of significance to Aboriginal people at the site. There were also no known sites of European historic interest at Brewer Estate.

6 DESCRIPTION OF ACTIVITY

6.1 Background

A detailed description of operations is provided in Mereenie Eastern Satellite Station (ESS) and Central Treatment Plant (CTPL) Operations Manual.

Gas production was principally from the P1 sands and from gas produced in solution with the oil. Since the gas sale contract ended in 2009, gas from the CTPL and ESS has been reinjected into the main oil reservoir to maintain reservoir pressure.

Many flank wells deviate naturally (up to 45%) through the hard-abrasive rock to intersect the narrow oil rim which surrounds the gas cap. Reserves have also been identified in the Pacoota P4 unit and in the Stairway Sandstone.

Crude oil and condensate from the CTPL and crude oil from the ESS is transported via road tanker tru cks to Port Bonython, near Whyalla in South Australia, for sale to customers. The 267 km Mereenie to Alice Springs oil pipeline (MASP) to the Brewer Estate Crude Oil Terminal facility at Alice Springs is presently mothballed. It happened in 2010 due to integrity issues (first 70 km from Mereenie).

Sales gas is delivered to customers through the 1500 km Amadeus Basin – Darwin gas pipeline.

As at September 2016, the field comprises of 70 wells, of which it produces from 8 Gas wells and 28 oil wells; with 13 wells utilised as gas injectors. The remaining of wells are either suspended or Plugged and Abandoned (P&A). This is also and approximately 178 km of pipelines and flow lines connecting the field and the processing facilities. Since loss of contract the gas is injected to dedicated wells.

6.2 Plan

Any proposed future work program comprises a continuation of business involving conventional oil and gas exploration, development and production within existing leases. CTP may at some point propose to increase development, fracture stimulation and raise production operations in these leases.

6.3 Production

CTP has a Gas Supply and Purchase Agreement with Santos Ltd, shared owner of the Mereenie oil and gas field, dated 14th September 2011 (PVGSPA) for the supply of gas from the PVGF for a term of 17 years. That agreement became effective on 29th May 2012. PVGF gas is on-sold by Santos together with a proportion of Mereenie gas to meet its NT customers' demand.

CTP also has a Gas Transportation Agreement - Amadeus Gas Pipeline - Parking Service with the APA Group to allow flexibility with production to meet the current low daily nominated supply obligations under the PVGSPA. This allows control of production from the PVGF so that the well(s) and gas plant can be flowed / operated at the optimum minimum daily rate while meeting contracted supplies utilizing the parking service.

All crude produced from the field is transported by road to Port Bonython South Australia.

6.3.1 Field History and Overview

The MRN is located on a north-west/south-east trending anticline, situated on the upper plate of the Mereenie thrust fault. The overall field is 35 km long and up to 4 km wide. The field is contained within NT Petroleum Leases OL4 (West Mereenie) and OL5 (East Mereenie) - refer to Figure 6-2 and Figure 6-3 respectively.

The principal oil and gas reservoirs are the P1 and P3 units of the Ordovician Pacoota Sandstone at a depth of approximately 1,500 m. The overlaying Horn Valley Siltstone is both the source and seal. Most of oil production has come from the quartzose P3, in which porosities average 8% and permeability's average 10 md.

Gas production was principally from the P1 sands and from gas produced in solution with the oil. Since the gas sale contract ended in 2009, gas from the CTPL and ESS has been reinjected into the main oil

reservoir to maintain reservoir pressure. Many flank wells deviate naturally (up to 45%) through the hard-abrasive rock to intersect the narrow oil rim which surrounds the gas cap. Reserves have also been identified in the Pacoota P4 unit and in the Stairway Sandstone.

As at September 2016, the field comprises of 70 wells, of which it produces from 8 Gas wells and 28 oil wells; with 13 wells utilised as gas injectors. The remaining wells are either suspended or P&A. This is also and approximately 178 km of pipelines and flow lines connecting the field and the processing facilities. Since loss of contract the gas is injected to dedicated wells.

Crude oil and condensate from the CTPL and crude oil from the ESS is transported via triple road tanker trucks to Port Bonython, near Whyalla in South Australia, for sale to customers. The 267 km MASP terminates at the Brewer Estate Crude Oil Terminal facility at Alice Springs (presently mothballed).

Produced Formation Water (PFW) is a by-product of the oil and gas extraction. PFW is delivered (with the hydrocarbons) by a pipeline network to the CTPL and ESS where the total produced fluids are separated into gas, water, oil and sediment. Oil and water are separated in American Petroleum Institute (API) standard separators, with the remaining water managed in evaporation ponds at the CTPL and ESS. Ongoing exploration, development and well workover (maintenance) programs occur periodically in the MRN.

Figure 6-4 shows the location of all borrow pits, groundwater extraction bores, sewerage treatment facilities and any areas of waste discharge.

6.3.2 Conceptual Site Models

Figure 6- and Figure 6-1 are conceptual site models (CSM) for the CTPL and ESS facilities respectively. Table 6-1 provides the details of each component of the CTPL facility.

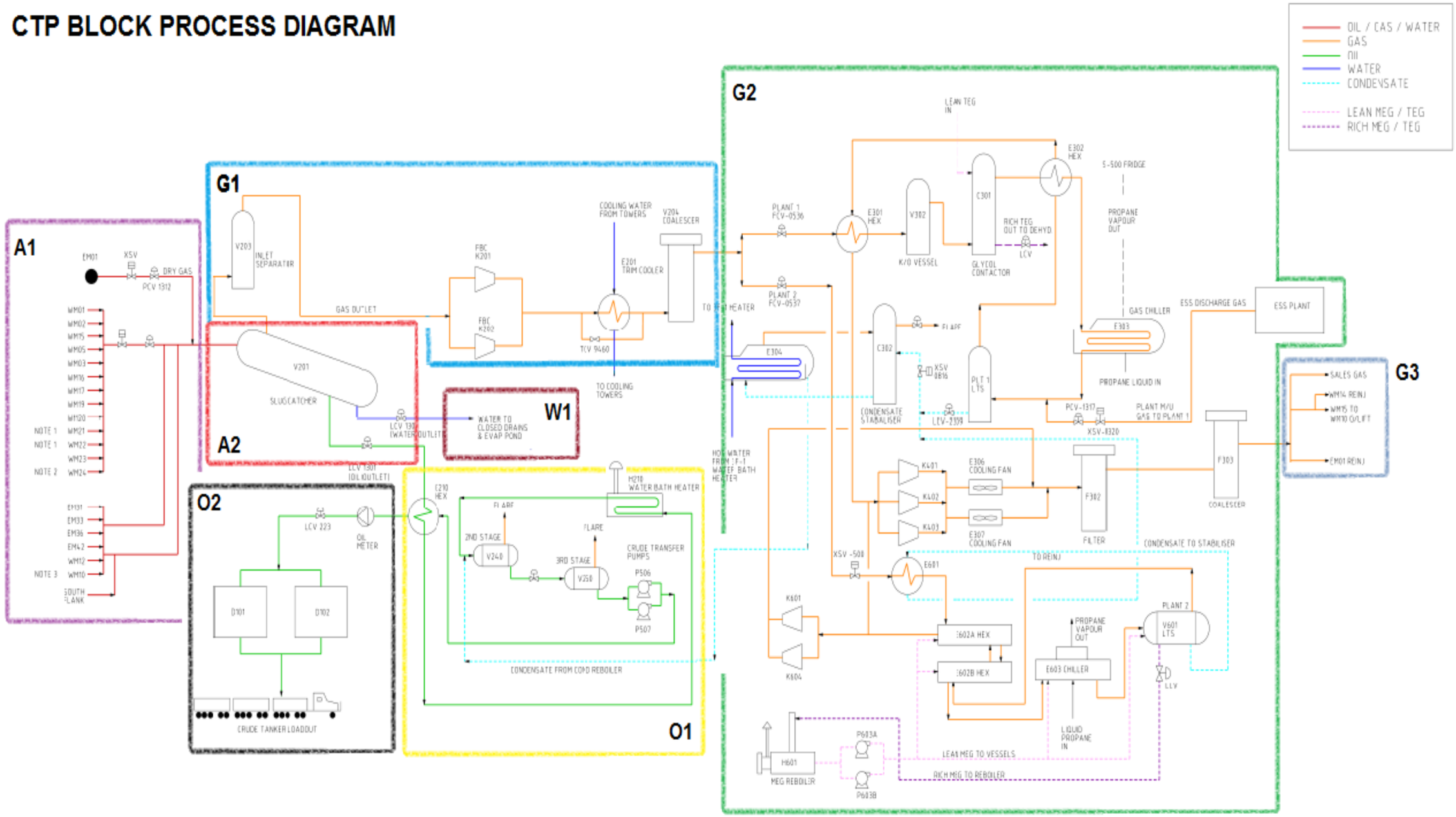

Figure 6-2 Conceptual site model for the CTPL facility

Table 6-1 CTPL conceptual site model description of each component

AREA	FACILITY	PURPOSE
A1/ Inlet (Oil, gas and water)	Wells, gathering system	Collect raw oil and gas from target formation to the CTP
A2	Slug catcher separator	Separate oil, water and gas into their own streams (G, W, O)
G1/ Gas inlet from A2	Inlet separator Compressors Filter Coalescer	Treat gas for sales
G2 (Plant 1 and Plant 2)	Knock out vessel Glycol contact Heat exchanger Condensate stabilizer Low temperature separator Compressor Filter coalescer	Remove condensate
G3 / Output	Gas sales Reinjection	Output of gas for sales or reinjection to maintain reservoir pressure
W1 / Water Output from A2	Closed drains and Evaporation Pond	Process waste water
O1/ Oil inlet from A2	Heat exchangers Train separators	
O2 / Outlet	Sales Oil	Oil for sales currently transported by semi-trailer truck

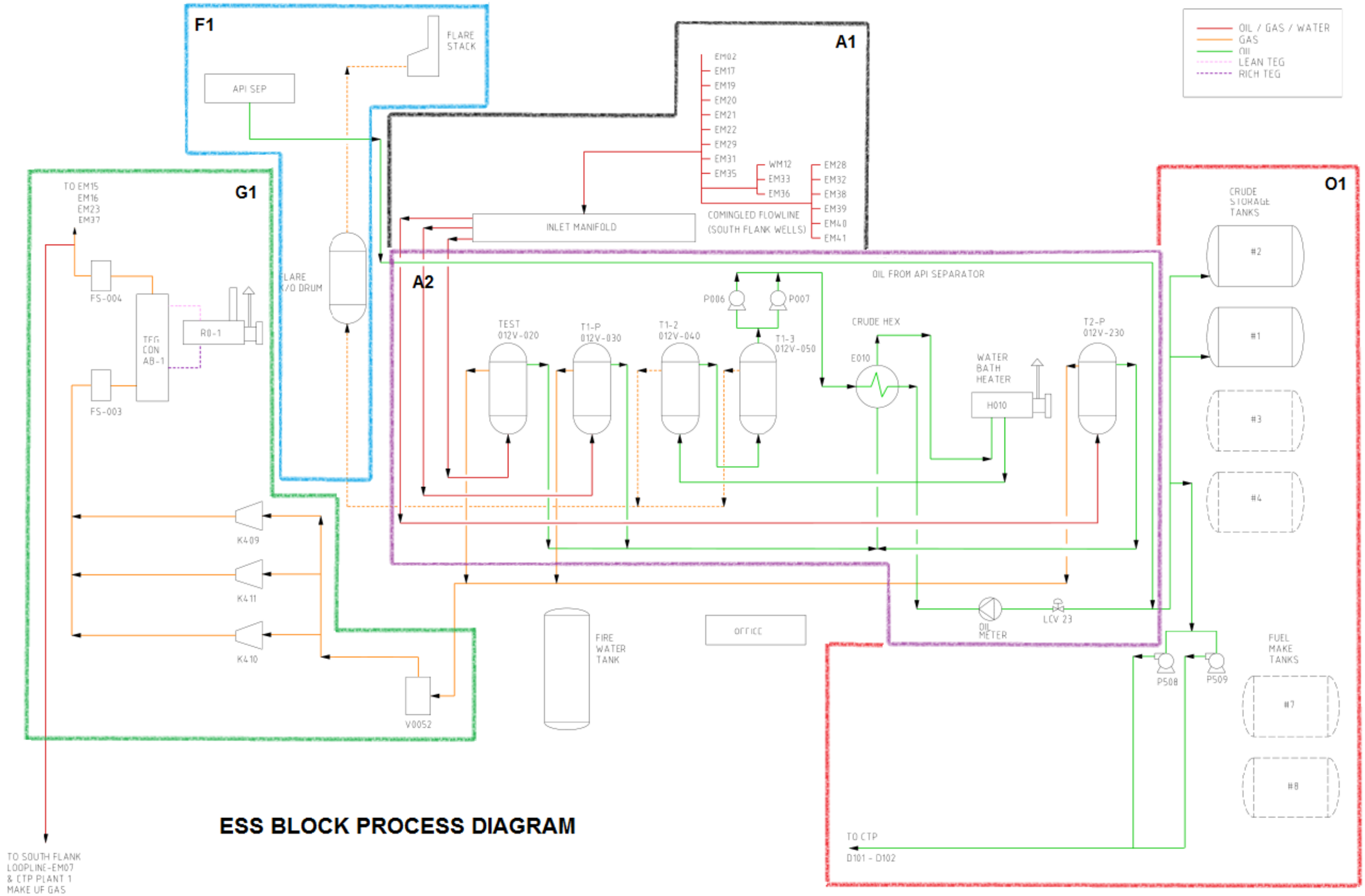

Figure 6-1 Conceptual site model for the ESS facility

Table 6-2 ESS conceptual site model description of each component

AREA	FACILITY	PURPOSE
A1/Inlet	Wells, gathering system	Collect raw oil and gas from target formation to the ESS
A2	Train Separator	Separate oil, gas and water into their own streams
F1/Outlet	Flare stack Evaporation pond	Residual Gas from A2 that has lower pressure than compressors is flared Water goes into evaporation pond
G1/Outlet	Compressors TEG contact	Gas from A2 reinjected or sent to CTP plant (depending on gas needed)
O1	Oil tanks Gathering system to CTP	Oil stored and shipped to CTP

6.4 Existing Infrastructure Covered by this FEMP

Existing site infrastructure relevant to the project includes:

- Existing public access roads;
- Existing restricted access roads constructed by various operators;
- Seventy wells have been drilled in the MRN, with the following currently in production;
    - Eight producing gas wells;
    - Twenty-eight oil wells
    - Thirteen used for gas injection; and
    - The remaining twenty-one either suspended or P&A.
- In-field gathering system (approx. 178 km);
- Mereenie to Alice Springs Oil Pipeline (MASP) Managed under Pipeline Licence 2;
- Central Treatment Plant (CTPL);
- Eastern Satellite Station (ESS);
- Groundwater bores;
- Evaporation ponds;
- Waste Management and lay down areas;
- Camps and offices;
- Airstrip;
- Bio-remediation pits; and
- Workshop.

6.5 Operations Covered by this FEMP

Table 6-3. lists the operations covered by this FEMP and those operations which will require separate Environmental Management Plans developed.

Table 6-3 Operations covered by this FEMP and those requiring separate Environmental Management Plans

MEREENIE OIL AND GAS FIELD OPERATIONS	
COVERED BY FEMP	**SECTION**
• Road and access track maintenance	• 6.5.1 and Appendix 7
• Weed management and control	• 8.2.1
• Wells operations and monitoring - Workover	• 6.5.5
• Wells operations and monitoring- Reinjection	• 6.5.6
• Wells operations and monitoring - Suspension	• 6.5.7
• Pipelines and flow-line operations	• 6.5.8
• Production/processing facility (Including flaring, CTPL and ESS)	• 6.5.9 and 6.5.10
• Travel, transport, vehicles	• 9.2
• Equipment failure	• 6.5.5, 6.5.8, 6.5.9 and 6.5.10
• Chemical and fuel storage and handling	• 8.2
• Waste management	• 6.5.12
• Bioremediation-pits	• 6.5.12
• Borrow pits	• 6.5.1 and Appendix 7
• Overflow and flooding of evaporation pits and interceptor pit	• 6.5.9 and 6.5.10
• Water supply and use (ground and surface water)	• 6.5.2
NOT COVERED BY FEMP	
• Drilling of new oil or gas well	• Separate EMP approval required
• Hydraulic fracture and stimulation	• Separate EMP approval required
• Clearing of new access roads or tracks	• Separate EMP approval required
• Disposal of a listed waste on site	• Separate EMP approval required
• Disposal of any waste on site not covered in this FEMP	• Separate EMP approval required
• Clearing of undisturbed vegetation	• Separate EMP approval required
• Development of new groundwater wells	• Separate EMP approval required

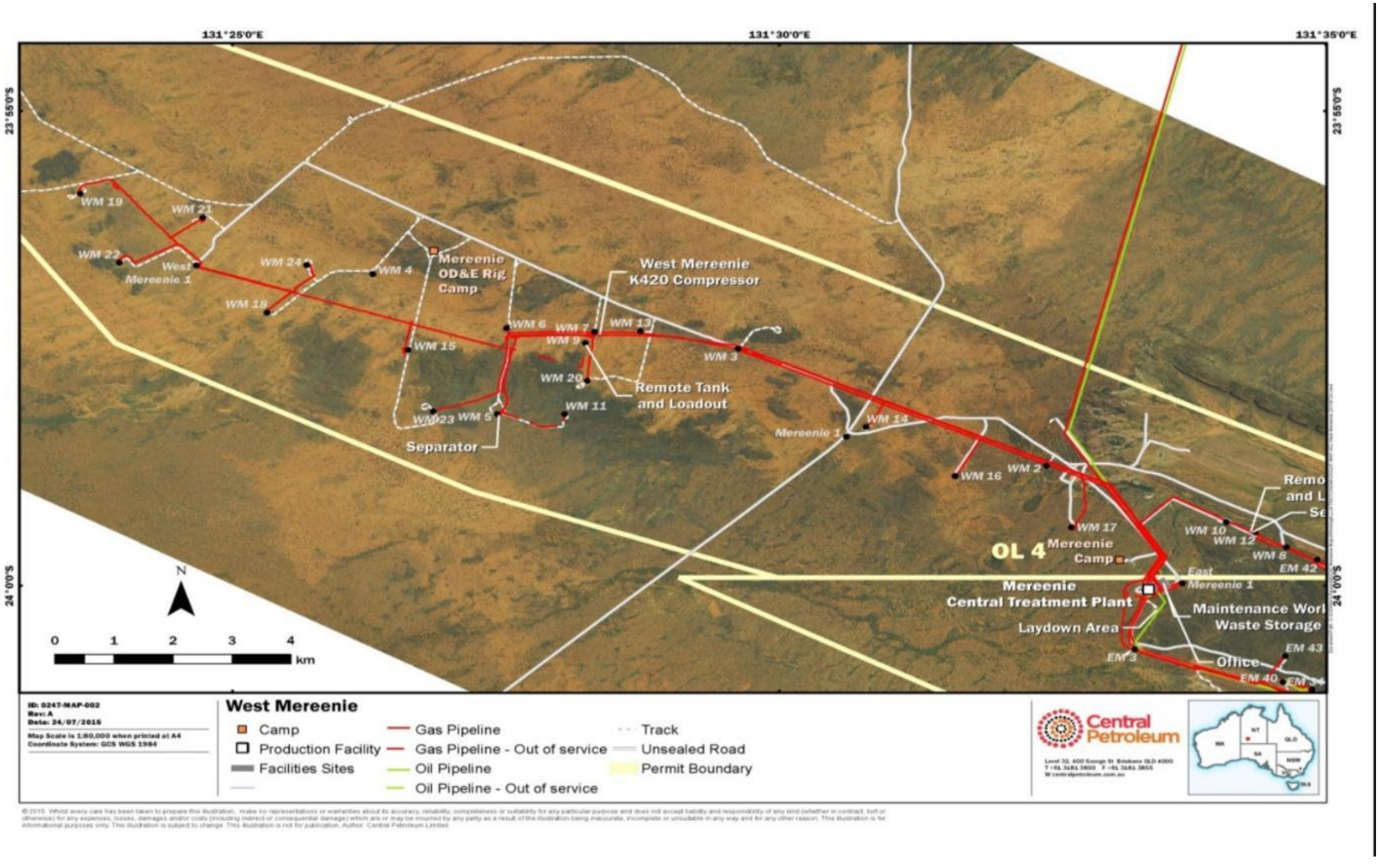

Figure 6-2: Well layout and area map showing infield oil and gas pipelines and gathering network in the OL4 area

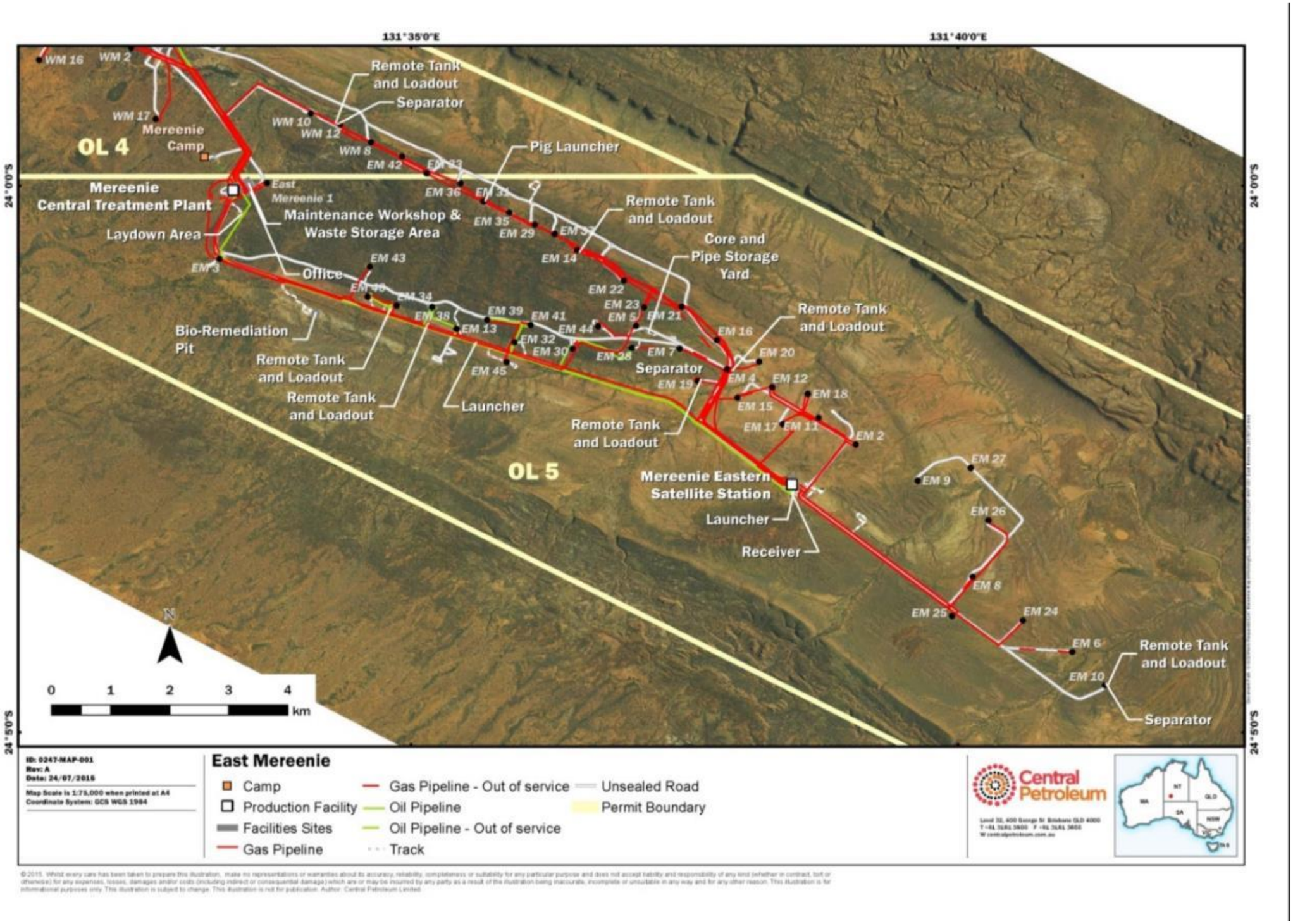

Figure 6-3 Well layout and area map showing infield oil and gas pipelines and gathering network in the OL5 area

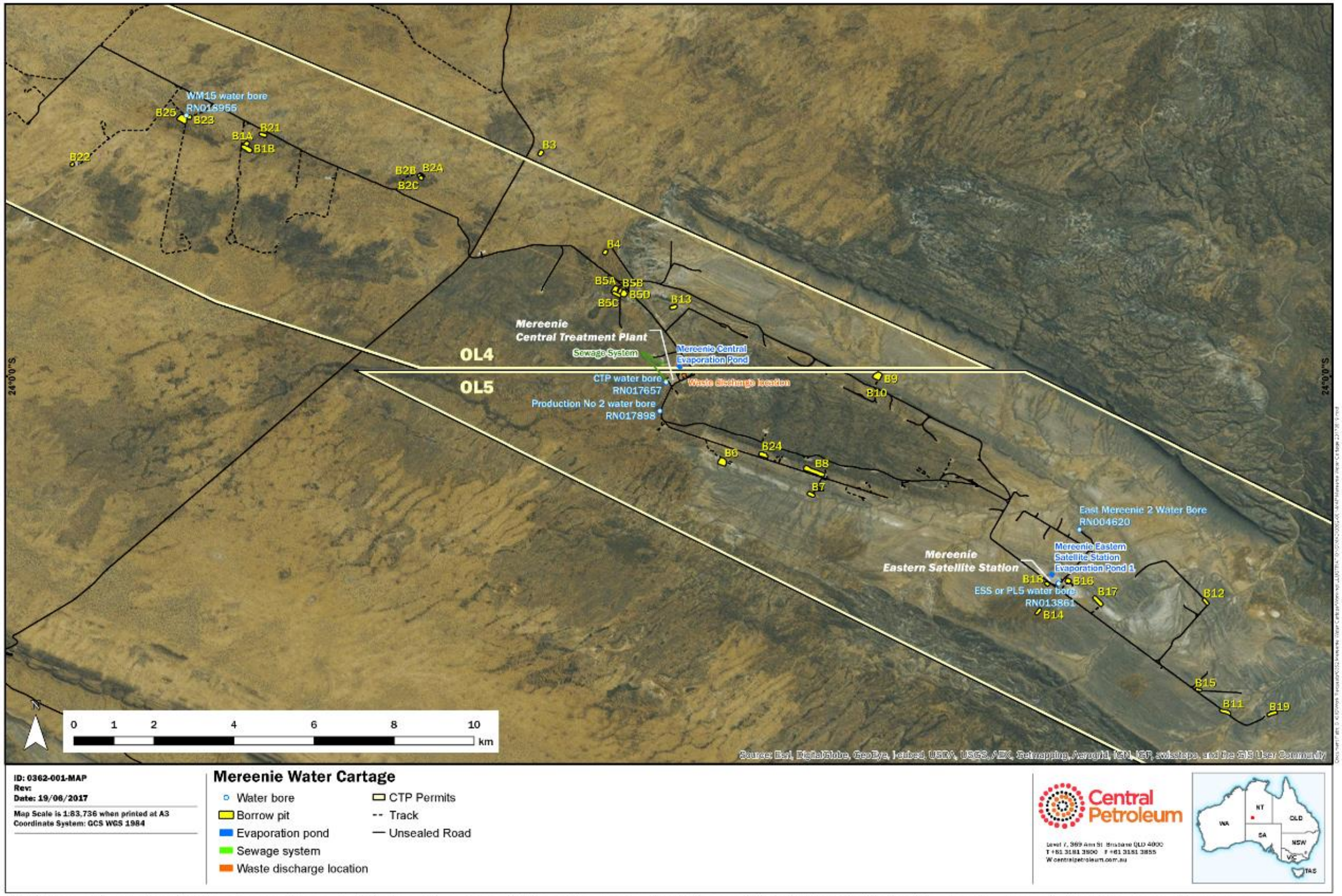

Figure 6-4 Location of borrow pits, groundwater bores, sewerage systems and waste discharge locations in the OL area.

Figure 6-5: Aerial image of Mereenie Central Treatment Plant

Figure 6-6: Aerial image of Mereenie Eastern Satellite Station

6.5.1 A1 - Roads, Tracks and Other Access

Approximately 150 km of CTP operated roads have been constructed at MRN including many primary arterial roads that service the oil and gas field, offices, workshops and the CTPL and ESS facilities. These roads require maintenance to provide continued access to facilities and infrastructure.

Triple road tanker trucks operate every day to transport oil from MRN to Port Bonython in South Australia.

Ongoing exploration and production may require the construction of additional access tracks and maintenance of these tracks to provide access for drilling, well site and production operations. Any new clearing or road development will be covered by a separate EMP.

Appendix 7 provides information on the standard best practise techniques for road construction and maintenance employed by CTP at MRN at a minimum to ensure that all roads are trafficable and they have minimal impact on the environment.

6.5.2 A1 - Water Supply and Use

Water for operations at MRN are provided by five bores located in the OL area as shown in Table 6-4.

Table 6-4 Bores used for water extraction at MRN.

Bore	Description
Production Bore No. 2 (ESP near EM3)	Camp Water
CTP (ESP near Admin)	CTPL Drinking Water
EM2	Raw Water for Plant (Drinking, Safety Shower, Bulk Coolant System)
ESS (PL5 – RN13861)	Turkey Nest, Bottom Dam (Stock), Fire
WM15	Stock Bore
RN4619	Drilling Water (Unmetered)

Water treated by a membrane treatment plant, with electricity provided by on-site generation. The current MRN camp water supply is from bore No. 2 that draws water from the Mereenie Sandstone aquifer, which is located south west of the MRN offices and adjacent to the CTPL flare pit.

Water for drilling is supplied from Bore RN4619 (West Mereenie 1), located at the westernmost edge of the MRN. The facility is equipped with a pump and fuel storage, and is fenced. Water from the bore is pumped to two tanks approximately 6 km to the east.

The water supply for the ESS is from Bore RN13861, which is located to the east of the ESS. There is a turkey's nest dam approximately 150 m to the south east of the bore. Bore RN4620 is located approximately 1.4 km to the north of the ESS bore and has been used as a backup supply for the ESS.

Water extraction is recorded quarterly from the five main bores in Table 6-4.

Water quality testing is undertaken daily at the tap kitchen from water supplied from Bore No. 2 for coliforms and E. Coli; all other water is tested weekly.

Waste water is treated by a Biocycle unit at the top camp and an OzziKleen at the bottom camp. Central maintain these OCIS (camp operations contractor) carry out weekly checks. External contractor conducts inspection of the units every six months.

Baseline, or more benchmark, groundwater quality assessments have been carried out in 2013, 2014 and 2015 by Golder Associates. The series of groundwater assessment reports were to document if there were any impacts on the groundwater source due to fracture stimulation operations at MRN. The

reports indicated no impacts to groundwater resources at MRN due to fracture and stimulation operations carried out.

6.5.3 A1 - Mobile plant

The mobile plant items permanently on site include:

- Site tanker for moving crude oil from remote tanks to the CTPL;
- Grader;
- Backhoe;
- Bulldozer;
- Bobcat;
- Forklifts;
- Flat-top truck with crane; and
- 4WD vehicles.

Drill rigs and seismic equipment are brought to site as and when required, any drilling or seismic operations will be covered by a separate job specific EMP.

6.5.4 A1 - Air Strip

The MRN airstrip is currently retained for emergency use, but may be used to transport the workforce to and from site during future development activities.

The airstrip perimeter is fenced and vegetation growth is restricted. The airstrip does not have permanent refuelling facilities.

6.5.5 A1 - Gas and Oil Wells

As at July 2016, the field comprises of 70 Wells and produces from 8 gas wells, 28 oil wells; with 13 wells utilised as gas injectors (Table 6-5). The remaining wells are either suspended or P&A.

Table 6-5 Status of OL area wells (as at July 2015)

Status (July 2015)	Well
Oil producer	EM02, EM14, EM17, EM19, EM20, EM21, EM22, EM28, EM29, EM30, EM32, EM33, EM34, EM35, EM36, EM38, EM39, EM40, EM41, EM42, WM03, WM05, WM06, WM09, WM12, WM20, WM23, WM24
Gas producer	EM01, EM02 (SSD closed), EM12, WM01, WM15, WM16, WM17, WM18
Gas injection	EM01, EM07, EM13, EM15, EM16, EM23, EM30, EM34, EM37, EM43, WM14
Potential Observation Wells – Currently suspended	EM24, EM25, EM26, EM27, EM31 (offline), WM02, WM04, WM10
Suspended	EM18, WM07, WM08, WM09, WM21, WM22, WM44, WM45
Plugged and abandoned	Mereenie 01, EM03, EM04, EM05, EM06, EM08, EM09, EM10, EM11, WM11, WM13

6.5.5.1 A1 - Workover Operations

Workover is a maintenance activity used to restore well bore integrity and/or increase production rates, although the term workover is also used to describe 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.

Major 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.

Some MRN wells have suffered from varying degrees of casing corrosion; therefore, workover activities at MRN commonly include casing inspection and repair activities. Some of the early wells drilled at MRN encountered difficulty with the primary cementing work, and so remedial cementing activities have been conducted.

Deterioration in wellbore condition is monitored through an established surveillance program that includes 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 MRN.

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. A separate EMP will be developed for any major workover operation that is likely to have an environmental impact outside the scope of this FEMP.

6.5.5.2 A1 - Wellsite Operations

Most oil and gas wells in the MRN flow free to surface through natural reservoir drive mechanisms. Pressure depletion in the P3 oil reservoir in the eastern nose and along the north flank of the reservoir is offset to a small extent by the reinjection of associated gas processed at the ESS.

Operations personnel visit producing wells frequently to record flow rates and pressures. The flow rate from oil wells is adjusted from time to time according to instructions from office-based reservoir engineers. All wells (producing and shut-in) are visited every month to record pressures on all casing annuli. This information is recorded and forwarded to the management team in Brisbane.

Flaring of gas from the surface casing at some well sites is undertaken to relieve pressure on the surface casing shoe to reduce the risk of a subsurface blowout. Flaring of associated gas as part of oil production operations has been reduced significantly over the recent past with all wells flowing into the gathering system.

6.5.6 Water Injection (Water flood)

Water injection (water flood) is a means of improving oil recovery by maintaining the pressure in the formation and improving the sweep efficiency (i.e. displacement of oil from the reservoir). The pressure is maintained by injecting PFW back into the formation from which it was produced or injecting water from other produced wells that have compatible water quality into the target formation.

6.5.6.1 Water Injection Operations

Water flood comprises the following activities:

- PFW compatibility assessment.
- Treatment and testing of PFW prior to use.
- Reinjection of PFW into the target formation.

Prior to injection, the PFW is tested to ensure it meets requirements to prevent corrosion or damage to injection equipment. It must be clear, stable and of similar quality to the water in the target formation, and must not be severely corrosive. It may need to be filtered, chemically treated and/or stabilized. Chemical treatment includes: biocide to kill any bacteria residing in the injection water, scale inhibitor to inhibit formation of scale from forming downhole and oxygen scavenger to prevent oxygen from proceeding downhole. Safety Data Sheet (SDS) for chemical are contained on site in appropriate locations and in the site office.

The process is designed to minimise / avoid contact between the PFW and air, therefore eliminating oxygen content or other components in the water that may cause corrosion of tubulars or incompatibility of the water injected formations.

The water is reinjected at pressures high enough to enter the target injection formation after friction losses through the tubulars.

An injection well may be a previous production well converted to a water injection well, or a well purpose-drilled for water injection. Different injection wells may be used over of the life of the field to maximise efficiency of oil recovery from the reservoir.

6.5.6.2 Use of Tracer Material

Chemical tracers are used to enhance reservoir characterisation and increase oil recovery. To determine if a water flood is sweeping the reservoir effectively and radially from any injection well, a chemical tracer can be added to the injected water and monitored at the producing wells. Radioactive tracers are not proposed to be used at MRN.

The use of a tracer in some, or all, of the individual water injection wells assists in:

- Establishing injector to producer flow relationships.
- Accurately measuring injection tracer breakthrough to calibrate computer flow models.
- Quantifying the amount of water flowing from an injector to a specific producer.
- Assessing volumetric sweep efficiency of the flood.
- Detecting and quantifying fault block communication.
- Determining zonal water flow communication.
- Establishing the presence of high flow permeable channels.
- Measuring flood wide reservoir preferential flow trends.

6.5.7 A1 - Suspension and Abandonment

When a well has finished its productive life, a decision is made to abandon the cased well bore or leave it in a suspended state until it can be abandoned or recompleted. Each well is evaluated individually so that an abandonment design can be developed that is specific to the casing and hydrocarbon zones present in the well.

6.5.7.1 A1 - Suspension

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

For example, suspension of a well with good mechanical integrity can simply involve closing the wellhead in at the surface.

6.5.7.2 A1 - Abandonment

The decision to abandon a wellbore is made after assessing the potential value of unproduced hydrocarbons compared to the cost of remedial activities required for production of the remaining reserves.

During an abandonment program, it is ensured that different perforated hydrocarbon zones are isolated from each other by cement plugs and/or bridge plugs. Bond logs are evaluated to ensure that the cement behind the production casing is adequate to avoid crossflow of aquifers with other aquifers or hydrocarbon producing zones.

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. Careful abandonment design incorporating remedial cementing work is required for some MRN wells since some of the original primary cementing work did not achieve cement tops that were high enough on the outside of the casing to provide adequate isolation (of either of the gas-bearing Stairway formation or the Mereenie aquifer).

The well head is cut off below ground level, a cement cap placed over the casing stubs and the well cellar backfilled. The area around the well, the lease and roads into the lease are then rehabilitated in accordance with the Decommissioning and Closure Plan (see Appendix 4, 5 and 6 for layout plans).

6.5.8 A1 - Gathering Systems (Field Flow lines)

There are approximately 178 km of pipelines and flow lines in place in the MRN to 'gather' gas, oil and water from the production wells and redistribute gas to the injection wells and production wells equipped with gas lift.

Wells from the western area of the MRN are connected to two spine lines terminating at the CTP. The eastern part of the MRN is subdivided into three areas:

- North flank wells are connected into one of two spine lines, with some wells capable of being switched to either the ESS or the CTPL depending on operational requirements.
- South flank wells are connected into a spine line terminating at the ESS.
- Eastern nose wells are gathered into a test header at the ESS with some of the wells equipped with a dedicated flow line and the remaining wells sharing a flow line to the ESS.

Oil, gas and water are separated at the ESS. Oil is pumped to the CTPL in a dedicated oil pipeline that is treated with biocide and pigged regularly. High pressure pipelines transport dehydrated gas to the injection wells in the eastern nose and the north flank as well as to the CTPL.

External corrosion of buried pipelines is controlled by cathodic protection systems which are regularly monitored and maintained. Spine line and flow line rights of way are inspected every 6 months for identification of access and erosion issues. All spine lines are equipped with biocide injection facilities and are pigged regularly to eliminate stagnate water pooling in low sections of the lines.

6.5.9 A2, G1, G2 and G3 - Central Treatment Plant

A simplified flowsheet of the CTPL is presented in Figure 6-7. The CTPL comprises:

- Oil processing: crude/water separation, condensate stabilisation, crude/condensate storage and crude pumping facilities.
- Gas processing: field compression, inlet slug catchers, gas dehydration and separation, hydrocarbon dew point control and pipeline compression.

The CTPL main functions are as follows:

- Remove gas from various crude oil and condensate streams to produce a stabilised crude oil.
- Separate free water and liquid hydrocarbons from the raw gas stream. Water that is saturated in the gas is removed by a column using glycol dehydration (MEG and TEG). Hydrocarbon dew-point control is achieved by a refrigeration and low temperature separation process using a series of heat exchangers, a propane refrigeration circuit and a low temperature separator.
- Blend condensed hydrocarbon liquids from the gas stream with the crude oil for sale.[2]
- Compress the sales quality gas from plant pressure of 3,300 kPa (475 psi) to the pipeline pressure of 10,300 kPa (1,500 psi). Excess or out of specification gas from the CTPL is reinjected into the main oil reservoir to maintain reservoir pressure.[3]

[2] Prior to the end of the gas sale contract in 2009, the C5+ content within the remaining gas stream was reduced to meet the required sales gas specification of <80 milligrams of water per cubic metre of gas and <0.5% C5+.
[3] Until the Darwin gas contract ended in 2009, gas from the CTPL was compressed and sent to Darwin via the 1,628 km Amadeus Basin to Darwin pipeline. Since the gas sale contract ended, gas from the CTPL has been reinjected into the main oil reservoir to maintain reservoir pressure.

The CTPL evaporation ponds receive discharge from the wash down bay, the CTPL and from water / crude oil mixes collected from the remote well facilities. The system comprises four ponds: an interceptor pond, two holding ponds and an evaporation pond. The ponds have been progressively upgraded and relined since 2009.

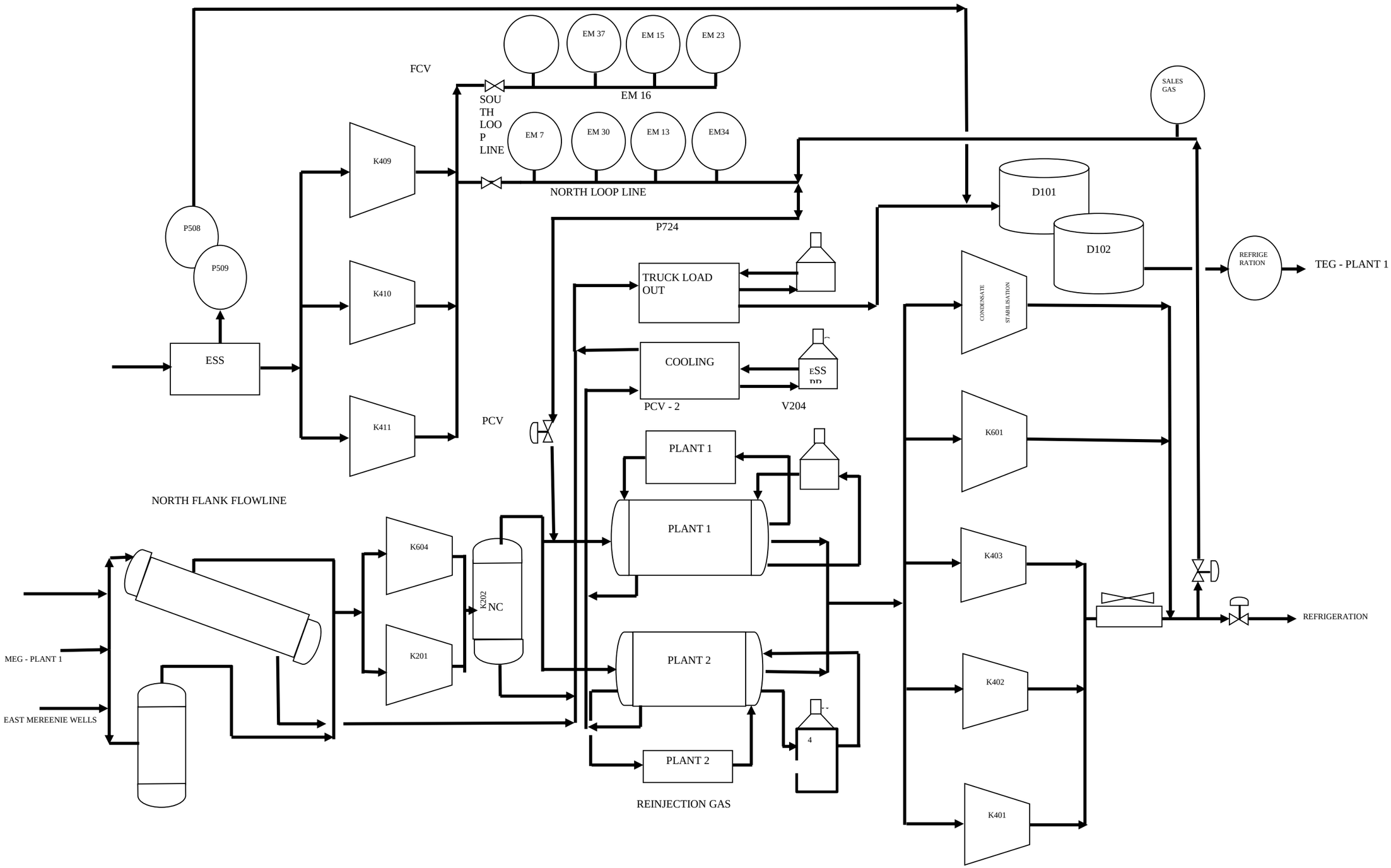

Figure 6-7 Simplified diagram of the CTPL

6.5.10 A2, F1 and G1 - Eastern Satellite Station

The ESS, with a capacity of 5,000 barrels of petroleum liquid per day, contains three stages of separation and 4500 HP of gas compression. It processes most of the crude oil production from the eastern part of the field. The separated crude oil and some of the compressed gas, together with unprocessed oil and gas gathered from the central part of the field, is transferred to CTPL. Associated gas from oil produced at the ESS is compressed and reinjected into the main oil reservoir to maintain reservoir pressure.

The ESS evaporation ponds receive water from the ESS process area. The system comprises a primary interceptor pond and an evaporation pond, with both ponds lined.

6.5.11 Campsite and Offices

There is one permanent camp which houses employees and contractors working at MRN. The permanent camp has a capacity of 64 beds, and potential to extend to 80 beds if required. The location is shown in Figure 6-3, and an aerial photograph of the camp is shown in Figure 6-8. There are also various sites within the MRN that have been used for temporary campsites and offices associated with past seismic and drilling operations.

Camp operations include:

- Delivery and preparation of food;
- Daily testing of water for drinking quality and weekly testing of all other bores;
- Weekly testing of wastewater treatment systems;
- Provision of shower and toilet facilities;
- Segregation of waste streams and transport to main waste management area.

A variety of general offices are located at the CTPL, Workshop and ESS.

6.5.11.1 Temporary Campsites

Due to the extended and often remote nature of drilling and well operations, a temporary campsite is usually required to provide accommodation for operations personnel, particularly for drilling and workover operations.

Existing campsites are utilised where possible. Where new campsites are required, site preparation methods are like those for well sites with the following exceptions:

- There is more flexibility for locating campsites away from sensitive environmental receptors; and
- The degree of compaction required is not as great as that required for well sites.

Temporary campsites are constructed in areas where disturbance can be minimised. Campsites require a flat and stable surface and generally require grading only, avoiding the need to import borrow material for stabilisation. Sewage from these temporary camps is treated with certified portable septic systems.

Figure 6-8 Mereenie oil and gas field camp aerial photograph

6.5.12 Waste Management

The MRN waste management facilities and procedures aim to maximise segregation and recycling, and are located adjacent the Maintenance Workshop near the CTPL. Two small compaction units available for soft plastics, paper and cardboard. Steel, tyres, drums, waste oils, other hazardous wastes, and kitchen-type wastes are collected separately for periodical removal off site. Pallets, weeds, other green waste, paper and cardboard which are occasionally burned on site in a dedicated burn pit. The burn pit is located within a cleared and fenced enclosure.

6.5.12.1 Waste Disposal and Transport

All waste is transported off site by TOLL. All waste is placed in sealed containers for transport to the locations indicated in Table 6-6. All freight is collated for transport off site every Wednesday; this includes wastes. Waste is separated into listed and non-listed wastes as per Table 6-6 and disposed of by appropriately licensed third-party contractors (current contractors, 2017).

Table 6-6 Waste disposal locations and facilities currently used for disposal of listed and non-listed wastes

Type of Waste	Disposal Location
General and food	JJ Richards, Alice Springs NT
Empty ICBs	JJ Richards, Alice Springs NT
Metal and plastic drums	JJ Richards, Alice Springs NT
Waste metal	Alice Metal Recyclers, Alice Springs NT
Batteries and Tyres	Cleanaway 6, Alice Springs NT
Listed Waste	Any waste prescribed wastes under the *Waste Management and Pollution Control Act* as specified as a listed waste by the NT EPA as found at https://ntepa.nt.gov.au/waste-pollution/approvals-licences/listed-waste, will be disposed of in accordance with the regulations

	and by a company licensed to handle and dispose of this waste.

6.5.12.2 Bio-remediation Pits

Approximately 2.6 km south east of the MRN CTPL facility are the bio-remediation pits ('bio-pits'). This facility comprises 3 cells of approximate dimensions 60 m x 6 m, with a depth of 1 to 2 m. The location is shown in Figure 6-2. The bio-pits are used for the rotation of all 'dirty' soil (including those which are contaminated with hydrocarbons from spills) and some liquid wastes such as water, cooking fats, etc. Cell contents are periodically worked. Where appropriate, nutrients (fertilizer) are mixed into the soils to assist in the bio-remediation process.

6.5.12.3 Wastewater

Waste production water is treated through a series of evaporation ponds at the CTPL and ESS. First the hydrocarbons are separated, treated and removed; then the remaining liquid is transferred to the larger evaporation pond to evaporate.

Grey and black water from the top camp is treated by a Biocycle unit and the bottom camp by an OzziKleen unit. This water is then transferred to a dam for evaporation, or if required excess wastewater is transported for off-site disposal by an approved waste contractor.

Grey and black water from the CTPL and ESS offices are treated by individual septic systems, with excess water released through underground rock drainage.

Central maintain the wastewater treatment units every three months and OCIS (camp contractors) test the system weekly.

6.5.13 Brewer Estate Crude Oil Terminal

The Brewer Estate Crude Oil Terminal is located at the southern end of Brewer Road, approximately 19 km south of Alice Springs and 10 km southwest of Alice Springs airport. This facility is currently suspended awaiting probable future use.[4]

The office facilities and warehousing at Brewer Estate is being used by CTP for MRN support.

The facility area is 50 ha, of which 19 ha is fenced. The fenced section is subdivided into three areas:

- South and southwest: Central oil storage and oil transfer facility, including oil storage tanks, oil transfer pumps, road and rail loading gantries, pigging facilities, oil-water interceptor, maintenance workshop, storage and administration buildings. The MASP enters this area from the west. The site is not currently operating and is unmanned apart from occasional visits to check site security or to conduct maintenance (such as grass cutting), decommissioning (including cleaning of tanks), and site assessment and remediation activities.
- Northwest corner: area previously leased to and occupied by Central Oil Refineries Pty Ltd (COR), which received crude oil by pipeline from the Central site and processed it to produce diesel which was exported by truck. The COR site stopped operating and went into administration at the end of 2002. The site has largely been cleared.
- East and northeast: undeveloped zone, occupied only by a small area of scrap storage, an anode bed for cathodic protection, and a buried wastewater pipeline. Outside the fenced area, but still within the property boundary: two evaporation ponds for captured site drainage and previously for tank dewatering, and a land farm.

[4] The facility was developed in the mid-1980s on previously undeveloped land, and was operational up to mid-2009 when it was closed following the mothballing of the MASP. During most of its operational period, Brewer Estate received crude oil from MRN via the MASP and exported the majority of it by rail to the Mobil Port Stanvac refinery in SA. After the closure of Port Stanvac in 2003, export of the crude oil was by road tanker to the Santos Port Bonython fractionation plant near Whyalla, South Australia.

There are no on-site waste management facilities at Brewer Estate – all waste will be collected by a local contractor if required.

6.5.14 Mereenie to Alice Springs Pipeline (MASP)

The MASP, which was used to transfer the produced crude oil from MRN to the Brewer Estate Crude Oil Terminal at Alice Springs for on-shipment by road or rail to refiners, is currently mothballed.[5]

The MASP is a 267 km 8" NB steel pipe coated with a protective tape wrap. The MASP facilities consisted of a pumping station at the MRN CTP facility, a scraper station midway along the pipe, automatic isolation valves at river crossings, and a back-pressure control system at the pipeline terminal at Brewer Estate Crude Oil Terminal. The pipe has cathodic protection, powered by three solar impressed current units located along the length of the pipeline.

The MASP has been flushed of oil and is now filled with water (from a MRN groundwater bore), dosed with the following:

- Biocide (AUK-550) at a concentration of 1 part per 4000; and
- Corrosion inhibiter (IRU 163) at a concentration of 1 part per 2000.

Maintenance of the MASP includes, but is not limited to,

- Periodic pigging and reinstatement of biocide; and
- Corrosion inhibitors.

6.5.15 Decommissioning and Closure Plan

The initial MRN Decommissioning and Closure Plan was developed by Santos to proactively prepare for the eventual closure of the MRN. It includes information on:

- Legislative and other requirements,
- Closure objectives, status of decommissioning and rehabilitation, and
- Monitoring of rehabilitation success.

CTP has no current intentions to decommission and close the plant. However, if circumstances dictate then the closure plan will be periodically reviewed and updated as appropriate in accordance with legislative and other requirements. The current closure plan was updated by Santos in July 2007, and should be consulted for information on rehabilitation.

The objective for the closure of the MRN, its associated sites and infrastructure will be:

- *To enable the effective transfer of operating areas to land owners in a way that is compatible with post-closure land-use.*

The rehabilitation objective for each site at relinquishment is to be to the satisfaction of the landowner(s), where applicable, and the regulatory authorities.

The objective of rehabilitation is to return disturbances to a stable condition such that the land will return to a condition as close as practicable to the surrounding area within an acceptable timeframe or to an endpoint consistent with stakeholder requirements and expectations. The rehabilitation endpoint criteria that will be applied for the decommissioning and closure are described in the closure plan.

Final site rehabilitation will involve three main activities:

- Surface preparation and site contouring;
- Installation of drainage and erosion control structures (if required); and
- Revegetation.

[5] The pipeline construction began in 1985, and it operated from commissioning in 1986 until it was mothballed in mid-2009. Its design operating pressure was 11.25 MPa and it was originally operated at a maximum of 9.6 MPa. Following an integrity review in 2006 this was reduced to 5.0 MPa, then to 3.7 MPa and then 2.0 MPa.

7 ENVIRONMENTAL IMPACT AND RISK ASSESSMENT

7.1 Scope

The scope of the environmental risk assessment covers all aspects of the MRN operations within the OL area. The management and mitigation measures are in accordance with CTP Health, Safety and Environmental Management System (HS&E MS).

7.2 Environmental Hazard Identification, Risk Assessment and Management Measures

Activities (or elements of activities) that have the potential for environment impact[6] have been identified and assessed for the MRN operations in accordance with *MSTD09-01 v1 – Hazard Identification, Risk Management and Control*. The risk assessment process defined under MSTD09 includes:

- Identification of all environmental hazards associated with MRN operations;
- Consideration of the pathway of impact upon environment receptors for each hazard and the potential maximum consequence if no control measures are implemented;
- Consideration of controls that are appropriate and implemented to manage each hazard;
- Consideration of the likelihood (probability) of the consequence occurring with these controls in place;
- Re-consideration of the final maximum consequence that is credible once controls are implemented;
- Calculation of the environmental risk; and
- Assessment to determine if the risk is as-low-as-reasonably–practicable (ALARP). If it is not, then consideration of further risk control measures will be implemented to reduce the risk to ALARP, or to an otherwise acceptable risk level.

Significant MRN operations-specific hazards and risks are summarised in a Significant Hazard Risk Register (SHRR), which is prepared and risk management measures implemented in accordance with *MSTD09*; the SHRR is reviewed periodically.

This section summarises the environmental hazards and management measures relevant to MRN operations on an activity basis. The following activities are addressed:

- Road, track and lease construction, maintenance and access;
- Water injection (water flood) operations (a potential future activity);
- Well bore management;
- Pipeline and flow line operations;
- Processing facilities;
- Fuel and chemical storage, handling and transportation; and
- Waste management.

CTP's *Field Operations Emergency Response Plan MSTD13-PL002 (v1)* is applicable for any incident that occurs outside of mitigation as proposed by Mereenie following industry best practise.

7.3 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 MRN and the relative impact of mitigation and preventative measures proposed. The following is an acknowledgement of all individuals and groups involved in the risk assessment process:

- Dr William Low – Director and Principal Environmental Consultant. Low Ecological Services

[6] An environmental impact is any change to the environment, whether adverse or beneficial, resulting from an activity.

- Lauren Young – Senior Environmental Consultant. Low Ecological Services
- Jeremy Snowdon-James – Senior Environmental Consultant. Low Ecological Services
- Charles Dack – Environmental Engineer, Department of Primary Industry and Resources, N.T Energy Division
- Gibson Porkime – Senior Petroleum Engineer, Department of Primary Industry and Resources, N.T Energy Division
- Jop van Hattum – Senior Director Petroleum Technology and Operations; Department of Primary Industry and Resources, N.T Energy Division
- Emergency Contact Information for Department of Primary Industry and Resources – 1300 935 250
- James van Rooyen – Acting as a General Operations Manager, CTP
- Diana Gomez – Environmental Manager, CTP
- Alan Johnson – Health and Safety Manager, CTP

Acknowledgment to various field staff for the active involvement of the preparation of the risk matrix.

7.4 Key Definitions

Key definitions relating to risk management are provided in Table 7-1.

Table 7-1 Key definitions relating to risk management

Key Definitions	
Incident Event	An event capable of causing critical, major, moderate, minor damage to the environment or negligible damage with no significant environmental effect.
Hazard	A physical situation with the potential for damage to the environment, human injury, damage to property or some combination of these.
Risk	The likelihood of a specified undesired event occurring within a specified period or in specified circumstances. It may be either a frequency (the number of specified events occurring in a time unit) or a probability (the probability of specified event following a prior event), depending upon circumstances.

7.4.1 Risk Assessment Methodology

This section describes the environmental risk assessment for potential events that may impact the environment during operational activities.

The purpose of this risk assessment is to identify hazards and develop risk-reducing measures to prevent and mitigate impacts from operational activities. This assessment also outlines recommended management actions that help to reduce the risk to ALARP.

Environmental risk assessment consists of five basic steps:

1. Hazard identification;
2. Risk analysis;
3. Risk evaluation;
4. Risk management; and
5. Residual Risk Analysis.

7.4.1.1 Hazard Identification

Hazard identification involves identifying the sources of risk i.e. those activities or incidents that could result in an environmental impact. Hazards are categorised into those arising from routine operations, and those arising from incidents.

7.4.1.2 Risk Analysis

Risk analysis determines the likelihood of an activity or event occurring, and the consequences of that activity or event on the environment. The risk ranking matrix, (Table 7-3) was used to assess the consequence and likelihood of all identified events. The matrix is based on six classifications of severity and six for the likelihood of a hazard.

7.4.1.3 Risk Rating

Risk evaluation prioritises the risks i.e. determining if the risk of an activity or incident is acceptably low, or if management actions are required to reduce the risk to ALARP. The risk evaluation presented in Table 7-4 takes existing safeguards/management measures into consideration i.e. represents the residual risk with existing or planned safeguards in place. A further column is added to the final risk rating to determine if there are any uncertainties in the risk rating due to unpredictable impacts, knowledge gaps, lack of information or other unknown factors influencing the risk rating. If there are any uncertainties in the risk rating then a safety factor has been applied to the score, increasing the risk rating.

7.4.1.4 Risk Management

Table 7-4 presents the detailed assessment of risks, impacts and their management for the MRN. Sections 10 focus on the management and implementation measures CTP will employ to minimise the environmental risks identified to ALARP.

7.4.1.5 Residual Risk Analysis

Residual Risk is the risk rating once additional management measures have been implemented. This rating will be ALARP.

7.5 Cumulative Impacts

Cumulative impacts of MRN are low due to lack of surrounding developments. The surrounding communities have small population and limited infrastructure, with most of services provided in Alice Springs. The cumulative impacts of MRN will be re-assessed if there are any major future developments in the area. The other major development in the area is related to TOs mustering of feral animals in which the MRN has played a significant role in developing and supporting.

7.6 Environmental Risk Assessment Matrix

Table 7-2 provides an overview of activity considered in the risk assessment likely to have impact on the environment and their location in the ESS and CTPL CSM's. These activities have been assessed for their environmental risk in Table 7-4.

Table 7-2 Activity ID and relation to the CSM for CTP and ESS used in risk assessment matrix

ID	Activity	CSM Component
1	Roads (including tracks, lease maintenance and borrow pits)	A1 (CTPL and ESS)
2	Wells Operations and Monitoring (Including completions, workover and reinjection)	A1 (CTPL and ESS)
3	Pipelines and Flow-line Operations	A1 (CTPL and ESS)
4	Production/Processing Facility (Including flaring)	A2 (CTPL and ESS), G1 and G2 (CTPL), O1 and O2 (CTPL and ESS), F1 (ESS)
5	Commissioning (Including wells and plant testing)	A1 (CTPL and ESS)
6	Fuel and chemical management	CTPL and ESS
7	Travel, Transport, Vehicles	CTPL and ESS
8	Equipment Failure	CTPL and ESS
9	Chemical and Fuel storage and handling	CTPL and ESS
10	Waste Management	W1 (CTPL) and F1 (ESS), CTPL and ESS
11	Bio-pits	CTPL and ESS
12	Overflow and Flooding	CTPL and ESS
13	Water Supply and Use	A1 (CTPL and ESS)

Table 7-3 Risk assessment matrix

		Low Risk / Moderate Risk / High Risk	LIKELIHOOD – Probability of Harm / Loss					
			1	2	3	4	5	6
		Environmental Impact	Unlikely / Unknown Not expected to occur	Remote Potential May occur only on exceptional circumstances	Possible Could occur at some time	Probable Expected to occur at some time	Frequent Likely to occur regularly	Highly Likely Ever present; occurs in most circumstances
CONSEQUENCES – Severity of Harm / Loss	1	Alteration/disturbance within the limits of natural variability; effects not transmitted or accumulating; resources not impaired. Minimal pollution effect, contained locally.	1	2	3	4	5	6
	2	Temporary alteration/disturbance beyond natural variability; effects confined to site and not accumulating; resources temporarily affected. Minor pollution, slight or negligible impact, negligible remedial or recovery work. Short term, localised and insignificant impacts to habitat or populations. Rapid recovery – measured in hours.	2	4	6	8	10	12
	3	Alteration/disturbance of a component of an ecosystem; effects not transmitted or accumulating. Pollution with some onsite impact and recovery work; possible outside assistance to contain. Incidental changes to abundance/biomass of biota in affected area; insignificant changes to overall ecological function. Recovery period measured in days – months.	3	6	9	12	15	18
	4	Alterations to one or more ecosystems or component levels, but which are recoverable; effects can be transmitted/accumulating. Significant pollution with offsite impact and recovery work. Impact that will cause a detectable effect in local ecosystem factors. Recovery period measured in months.	4	8	12	16	20	24
	5	Irreversible alteration to one or more ecosystems or several component levels; effects can be transmitted, accumulating; lost sustainability of most resources. Massive site impact and recovery work. Detrimental effect that will cause a significant effect on local ecosystem factors. Recovery period measured in years.	5	10	15	20	25	30
	6	Irreversible alteration to one or more ecosystems or several component levels; effects can be transmitted, accumulating; lost sustainability of most resources. Massive pollution with significant recovery work. Large scale detrimental effect that is likely to cause a highly significant effect on local ecosystem factors such as water quality, nutrient flow, community structure and food webs, biodiversity, habitat availability and population structure. Long term recovery period measured in decades	6	12	18	24	30	36

Table 7-4 Detailed environmental risk assessment for general environmental and routine operations conducted at MRN.

7.6.1 General Environmental: Fauna and Flora

ID	Causes	Potential Impact	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
1	Earthworks	Impeded fauna movement	3	2	6	This FEMP only covers maintenance earthworks involved with road and tracks. It does not cover any new clearing works or new developments. As such, there is high certainty that any impacts to fauna movement will be minimal above those already existing tracks and roads.	• Personnel access to the facility and any site/area only by permit approved by the CLC and CTP; • Commence new works only once DPIR and stakeholder approvals are obtained; • Plan activities to minimise new land disturbance and make use of existing disturbance (where possible); • Any new earthwork equipment to be certified weed free before mobilisation to site; • • Carry out earthworks in accordance with approved CTP standards and procedures; • Site selection, construction and operation of borrow pits in accordance with the Schedule of Onshore Petroleum Exploration and Production Requirements 2012; • Avoid vegetation clearance except where consent has been obtained from the DPIR, CLC and other applicable stakeholders; • Implement fauna management measures for NT and Commonwealth listed species where identified as necessary in planning for new activities; • Implement weed control measures as outlined in this FEMP; • Conduct Job Hazard Analysis for any new task or use of equipment to ensure appropriate control measures are identified; • Encourage low height (<10cm) ground vegetation where possible; • Any fill material is to be sourced from weed free areas; • Annual environmental audit to survey for weeds in operational areas and along access tracks; • Site, construct and operate borrow pits in accordance with the Schedule of Onshore Petroleum Exploration and Production Requirements 2012; • Weed hygiene measures in place, e.g. weed wash downs prior to site mobilisation; and • Any standing water required for operation of MRN to be fenced to deter pest species, native fauna and stock.	2	1	2	Any impacts to occur in previously disturbed areas.. There may be temporary disruption to fauna access however this is expected to be of short duration and avoidable by most species.
		Injury or death of fauna	3	3	9	Uncertainty exists depending on time of year and climatic conditions, as this will dictate the density and movement patterns of local fauna.		4	1	4	As above minimal construction works located at previously disturbed sites. Mitigation measures relating to time of day for activates will reduce the risk to an acceptable level. There is still potential for impacts as fauna have unpredictable movements.
		Loss of vegetation and fauna habitat	2	2	4	This will be minimal and highly localised due to no new clearing being conducted under this FEMP.		2	1	2	Minimal impact as work to commence on previously disturbed sites only. Potential for regrowth flora species to be disturbed but impacts are likely to be low and localised.
		Introduction and / or spread of weeds and invasive species	4	3	12	Still potential for spread of weeds due to earthmoving machinery required for earthworks and use of fill material in road and track maintenance.		2	2	4	If good weed management measures are employed, as outlined in this FEMP, then the chance of weed distribution will be minimal. The impacts of any weeds that do establish will also be reduced by routine inspection and implementing control measures as soon as they are identified.
3	Erosion due to pipeline easement	Loss of vegetation and fauna habitat	3	3	9	Erosion left unchecked can have serious impacts on vegetation growth and soil stability. In OL4 there is high certainty that erosion and/or sedimentation process are likely to be re-occurring.	• Avoid vegetation clearance except where consent has been obtained from DPIR, CLC and other applicable stakeholders; • Install erosion and sediment control structures (e.g. berms, sediment fences) where necessary in accordance with DENR and IECA guidelines; • Undertake regular inspection of pipeline easements for erosion and rectify where detected; • Comply with the Preliminary Environmental Report (PER) for the Mereenie Alice Springs Crude Oil Pipeline (Dames & Moore 1985) as modified.	2	1	2	Continual monitoring of the pipeline easements will determine if erosion is occurring and allow for immediate remediation before the erosion issues escalate.
1	Presence of Borrow Pits	Injury to or loss of wildlife	2	3	6	Borrow pits can potentially create new fauna habitat features by exposing new layers in the soil profile. Uncertainty due to likelihood of fauna having pre-existing habitat in the borrow pits or having developed new ones. There is potential for fauna to be injured from falling into pits.	• Site selection, construction and operation of borrow pits in accordance with the Schedule of Onshore Petroleum Exploration and Production Requirements 2012; • Maintain permanent watering points for stock away from main operational areas; • Inspect borrow pits to determine if fauna habitat has developed prior to any new extraction of material; and • Implement fauna management measures for NT and Commonwealth listed species where identified as necessary by ensuring fauna access and exist ramps.	2	1	2	Borrow pits are established with gentle sloping access for fauna to escape if they become trapped. Inspection and regular use of borrow pits will ensure that any fauna are less likely to inhabit borrow pits.
		Dispersal of watering points – Stock/feral animal redistribution	3	4	12	During rain, borrow pits fill with water and draw stock, introduced fauna and native fauna into new areas. The uncertainty exists due to the preference of the new watering points if established water points exist.	• Site selection, construction and operation of borrow pits in accordance with the Schedule of Onshore Petroleum Exploration and Production Requirements 2012; • Maintain permanent watering points for stock away from main operational areas; and • Inspect borrow pits to determine if are attracted to borrow pits following rainfall events	2	2	4	Borrow pits will only hold water for minimal times following significant rainfall events. As such, the risk is acceptable as there will be a plentiful supply of water in the surrounding area and permanent watering points established which stock may choose in preference.

ID	Causes	Potential Impact	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
1, 2	Movement of heavy machinery and vehicles	Damage to native flora	2	2	4	Limited growth on any road due to constant use.	• Weed hygiene measures in place, e.g. weed wash downs of vehicles prior to site mobilisation; and • Conduct works during daylight, avoid dusk and dawn.	2	1	2	All movement of heavy machinery and vehicles will be on established roads and tracks.
		Injury or death of native fauna	3	3	9	Potential to be higher in periods of high fauna activity, during dusk and dawn and at night.		4	1	4	All movement of heavy machinery and vehicles will be on established roads and tracks. Risk acceptable due to unpredictable movement of fauna.
		Introduction and/or spread of weeds and invasive species	4	3	12	Highest probability of new weeds spread onto the OL area is from vehicles entering carrying seeds or parts of a weed or invasive species.		4	1	4	Acceptable as weed management measures will ensure that any spread or occurrence of weed species within the OL area is controlled.
4, 3	Loss of containment of gas or oil (pipeline rupture or leaks from plant equipment)	Injury or death of native fauna	3	4	12	Any leaks or spills from pipeline will be picked up quickly by remote monitoring and stopped before impacting a large area.	• Operate pipelines in accordance with operational procedures; • Implement the pipeline integrity management program; • Undertake regular inspection of pipeline easements for weeds or leaks/spills and rectify where detected; • Regularly monitor performance of cathodic protection devices to ensure adequate protection; • Regularly pig pipelines to remove water and sludge accumulated at low points within pipelines; • Conduct periodic pipeline integrity surveys as appropriate (including coating defect, metal loss, intelligent pig, and/or 3rd party intrusion surveys). • Ensure all fittings and equipment are routinely checked and maintained; • Ensure that any spills, leaks or points of excessive wear are appropriately reported and the necessary maintenance work and control measures undertaken without delay. If any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out.	2	2	4	Potential for leak to occur and impact fauna directly due to the unpredictable movement of fauna. Shut off valves will reduce the severity of consequences by reducing amounts of hydrocarbons or produced water released.
		Loss of vegetation and fauna habitat	3	3	9	Any spill or leak will be quickly identified and localised. Impacts to flora and fauna habitat will be small, with availability of similar habitat and flora in the surrounding undisturbed environment.		2	2	4	Small localised impacts of flora are expected, however, investigation into previous spills or leaks in pipeline show good regrowth after several years. Emergency response plan implementation to remediate any impacts to native flora.
4, 8	Spill or leak associated with compressor failure	Injury or death of native fauna	3	4	12	Area around the compressor station is highly disturbed land, with cleared spaces. Numbers of fauna in the area likely to be impacted by spilt material would be small.	• Implement fauna management measures as necessary in planning; • Implement fire prevention and control measures; • Ensure regular testing and monitoring of emergency shutdown valves, fire protection, detection and control systems; • Operate in accordance with operational procedures; • Implement fuel and chemical handling and storage measures; • Ensure appropriate housekeeping standards are maintained and that facilities are free of rubbish; • Ensure all fittings and equipment are routinely checked and maintained; • Ensure that any spills, leaks or points of excessive wear are appropriately reported and the necessary maintenance work and control measures undertaken without delay If any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out.	2	2	4	Compressor failure to be limited in extent to within the CTPL facility which is fenced from fauna access. There is still potential for avifauna to contact contaminants. Risk is acceptable due to sparse numbers of avifauna nesting in the area.
		Loss of vegetation and fauna habitat	2	4	8	Existing flora surrounding the compressor stations is minimal and impact on flora species from compressor spill would be highly localised and not impact the greater flora in the OL area.		2	2	4	Acceptable as area within CTPL is cleared and maintained and there is a buffer around the facility fencing. Potential for impacts on surrounding vegetation low except if failure occurred during times of high surface water flow.
4	Spill associated with pipeline pig recovery	Injury or death of native fauna	3	2	6	High evaporation rates and lack of available moisture will mean that there is unlikely to be a large amount of contaminated liquid remaining on the surface for an extended period and as the fauna presence is low at most times, impacts to fauna is expected to be low.	• Operate pig recovery in accordance with operational procedures; • Regularly pig pipelines to remove water and sludge accumulated at low points within pipelines; • Ensure all fittings and equipment are routinely checked and maintained; • 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; • Ensure that any spills, leaks or points of excessive wear are appropriately reported and the necessary maintenance work and control measures undertaken without delay – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • Implement fauna management measures as identified as necessary in planning e.g. fence high risk areas; • Conduct periodic pipeline integrity surveys as appropriate (including coating defect, metal loss, intelligent pig, and/or 3rd party intrusion surveys).	2	1	2	Small localised spills and high evaporation rates at the MR area would mean that water or liquid spilt would not remain available to wildlife for long. Small chance that unpredictable movement of fauna may directly impact one or two individuals.
		Loss of vegetation and fauna habitat	3	2	6	Area around pig recovery maintained clear of vegetation.		1	2	2	Small localised contamination of vegetation in an area that will be maintained vegetation free.
4, 7	Spill associated with transport of oil and condensate (via truck)	Injury or death of native fauna	3	3	9	It will depend on the location of spill and fauna in the area. In general, most areas have low fauna populations and as such it would only be less mobile species impacted and have the probability to be in the same area.	• 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; • Transport of oil and/or condensate offsite by external suitably qualified and NT EPA approved contractor; • If transport is required across state or territory borders it will be complaint with NEPM 2013 guidelines;	3	1	3	Depending on size and location of spill, there may be impacts on fauna. Emergency response plan to remediate impacts in case of a spill occurring. Acceptable as all means possible have been developed to reduce possibility of spill. Investigation will reveal if other mitigation or preventative measures may be developed to reduce likelihood further.

ID	Causes	Potential Impact	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
		Loss of vegetation and fauna habitat	3	3	9	Most vegetation and fauna habitat in the area is well represented in the surrounding undisturbed environment and as such any impacts will be localised and not impacted on presence of vegetation in surrounding area.	• All oil and condensate removed to be recorded and records kept on site; • Ensure that where drips and leaks occur, corrective actions are taken and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • Implement fuel and chemical handling and storage measures; • Implement fauna management measures as identified in planning.	2	2	4	Localised loss of flora in immediate vicinity of spill, emergency response plan and oil spill response plan will remediate any impacts of spill. Acceptable as all means possible have been taken to reduce possibility of spill. Investigation will reveal if other mitigation or preventative measures may be developed to reduce likelihood further.
7, 9	Spill or leak of workover fluids, diesel, fuel, oils and chemicals (handling and storage)	Injury or death of native fauna	3	3	9	Potential to impact less mobile species and dependant on time of year for fauna activity and density around sites or road ways.	• Install, maintain and routinely test blow-out preventers (BOPs) and related well control equipment on all workover rigs; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • Implement fuel and chemical handling and storage measures; • Implement fauna management measures as identified in planning; • Implement emergency response plan.	2	2	4	Acceptable with emergency response plan. Fauna in the area is sparsely populated; however, fauna have unpredictable movements and may be directly impacted at an individual level.
		Loss of vegetation and fauna habitat	3	2	6	Spill likely to occur in disturbed area, which will have a low density of vegetation					Acceptable with emergency response plan. Flora in the area is sparsely populated and will have been previously disturbed. Any impacts will be localised
4, 6, 7	Leaks or spills to land or water associated with transport of fuels and chemicals (via truck)	Loss of vegetation and fauna habitats	4	3	12	Uncertainty on type of material spilt and quantity.	• Implement fuel and chemical handling and storage measures; • Transport of fuels and chemicals to site in adequately bunded containers by licensed contractors; • 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; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; and • Implement fauna management measures as identified in planning.	3	1	3	Localised loss of flora in immediate vicinity of spill, emergency response plan will remediate any impacts of spill. Acceptable as all means possible have been developed to reduce possibility of spill. Investigation will reveal if other mitigation or preventative measures may be developed to reduce likelihood further.
		Injury or death of native fauna	3	3	9	Potential to impact less mobile species and level of impact is dependant on time of year for fauna activity and density around sites or roads.		2	2	4	Depending on size and location of spill, may impact fauna. Emergency response plan to remediate impacts in case of a spill occurring. Acceptable as all means possible have been developed to reduce possibility of spill. Investigation will reveal if other mitigation or preventative measures may be developed to reduce likelihood further.
4, 6	Leaks or spills associated with chemical and fuel storage and handling (e.g. tank farm)	Loss of vegetation	4	3	12	Uncertainty based on type of material spilt, quantity, location, current weather conditions and density and type of vegetation present at spill location.. Have increased the risk evaluation to account for uncertainty.	• Segregated and contained or bunded storage areas; • Perform a risk assessment for all new chemical products proposed for use on site; • Maintain hazardous goods register; • Handle, store and otherwise manage all hazardous goods in accordance with relevant Australian Standards and Codes of Practice; • Provide on-site SDS and handling procedures for hazardous chemicals and materials; • 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; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • Implement fuel and chemical handling and storage measures; • Implement fauna management measures as identified as necessary in planning; • Implement weed and vegetation control at operational sites.	2	2	4	Acceptable as a majority of spill or leak would be contained in the appropriate bunding, any spills outside of the bunding would be remediated under emergency response plan or oil spill response plan.
		Injury or death of native fauna	3	3	9	Potential to impact less mobile species and level of impact is dependent on time of year for fauna activity		2	2	4	Potential for fauna to access spilt liquids or material due to unpredictable movement of fauna. Area has sparse population of fauna species and as such the risk to fauna populations is low and acceptable.

ID	Causes	Potential Impact	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
1	Ignition of fire along access tracks	Loss of vegetation and fauna habitat	3	4	12	Depending on time of year and climatic conditions in the lead up to the high fire risk season (Oct-Nov) will determine the intensity and damage done by fire. Worst case scenario taken for risk rating.	• Implement fire prevention and control measures; • Implement emergency response plan; • Implement weed and vegetation control at operational sites; • Appropriate fire management and control equipment available in every vehicle; • 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; • Up to date information on current fire danger, presence of fire in the area and current vegetation condition from government websites.	3	1	3	Localised risk or fire and emergency response plan implemented to control impacts of fire.
		Injury or death of native fauna	4	3	12	Potential to impact less mobile species and level of impact is dependent on time of year for fauna activity. Will depend on climatic conditions in the lead up to the high fire risk season (Oct-Nov) on density of fauna.		2	2	4	Potential for fauna to access spilt liquids or material due to unpredictable movement of fauna. Area has sparse population of fauna species and as such the risk to fauna populations is low and acceptable.
2, 4	Explosion or fire on lease (during operations)	Loss of vegetation and fauna habitat	4	4	16	Depending on time of year and climatic conditions in the lead up to the high fire risk season (Oct-Nov) will determine the intensity and damage done by fire; and density of vegetation.	• Implement fire prevention and control measures; • Appropriate fire management and control equipment available; • 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; • Ensure adequate firefighting equipment available and personnel trained in its use; • Up to date information on current fire danger, presence of fire in the area and current vegetation condition from government websites; • Implement fuel and chemical handling and storage measures; • Implement fire prevention and control measures; • 4 m fire breaks maintained around all infrastructure and operational areas; • Implement emergency response plan.	3	2	6	Bushfire risk still present and may impact on substantial proportion of vegetation inside the OL area. This is dependent on climatic conditions and external ignition sources outside of control of CTP. Emergency response plan to mitigate impacts within the OL area.
		Uncontrolled release or spill of saline workover fluids / chemically treated water, or oil laden fluids causing injury or death to fauna	4	3	12	Depending on time of year and climatic conditions in the lead up to the high fire risk season (Oct-Nov) will determine the intensity and damage done by fire.		2	2	4	Explosion or fire may cause rupture of hazardous material or chemical stores causing contamination in the OL area due to volatile nature of hydrocarbons extracted and chemicals used and stored on site. There is risk of explosive fire having high severity. However, all means necessary have been taken to reduce the potential for fire and chemical storage areas from ignition sources. Emergency response plan implemented to control potential impacts from naturally occurring fires.
		Injury or death of native fauna	3	3	9	Uncertainty depending on fauna present in area directly impacted by fire or explosion; unpredictable movement of fauna.		2	2	4	Bushfire risk still present and may impact on less mobile fauna species inside the OL area. This is dependent on climatic conditions and external ignition sources outside of control of CTP. Emergency response plan to mitigate impacts within the OL area.
3	Explosion or fire along an oil or gas pipeline	Loss of vegetation and fauna habitat	3	4	12	Depending on time of year and climatic conditions in the lead up to the high fire risk season (Oct-Nov) will determine the intensity and damage done by fire. Worst case scenario taken for risk rating.	• Implement fuel and chemical handling and storage measures; • Implement fire prevention and control measures; • Implement emergency response plan; • Regular maintenance and inspection of pieplines; • Appropriate fire management and control equipment available; • Ensure regular testing and monitoring of emergency shutdown valves, fire protection, detection and control systems to ensure adequate protection; • Ensure adequate firefighting equipment available and personnel trained in its use.	2	2	4	As above for explosion or fire on lease (during operations).
		Injury or death of native fauna	4	3	12	Uncertainty depending on fauna present in area directly impacted by fire or explosion; unpredictable movement of fauna.		2	2	4	Bushfire risk still present and may impact on less mobile fauna species inside the OL area. This is dependent on climatic conditions and external ignition sources outside of control of CTP. Emergency response plan to mitigate impacts within the OL area.
1, 12	Flooding	Loss of vegetation and fauna habitat	3	3	9	Potential for flood waters to become contaminated and wash pollutants into surrounding environment. Dependant on size of flood, height of flood waters, location and duration.	• Implement emergency response plan; • Implement fuel and chemical handling and storage measures; • Maintain low vegetation (10cm) on cleared surfaces where possible; • Install erosion and sediment control structures (e.g. berms, sediment fences) where necessary in line with best practice guidelines by DENR and IECA.	2	2	4	Mitigation measure will limit any extra loss of vegetation because of activities or operations in the OL area by CTP.
2	Well kick	Injury or death of native fauna	3	3	9	Medium potential for fauna impact if well kick impacts surface structure and leads to release of gas or oil; or well blowout.	• Install hi-lo pressure valves on all high-pressure wells (exemption for low pressure wells); • PSVs on surface casing; • Install wellhead cellars on all oil wells; • Keep cellars free of oil and rubbish and maintain covers to prevent or minimise fauna and livestock access; • Implement fauna management measures; • Periodic well integrity testing including tubing and annulus pressures; • Ensure remote well telemetry system operational on all gas wells, injectors and selected oil wells;	2	2	4	Potential for impacts on less mobile fauna species with unpredictable movements. Emergency response plan to mitigate any impacts not contained.
		Loss of vegetation and fauna habitat	3	3	9	Medium potential for flora impact if well kick impacts surface structure and leads to release of gas or oil; or well blowout.		2	2	4	Acceptable as area is sparsely vegetated and vegetation is well represented in surrounding OL area. Emergency response plan implemented.

ID	Causes	Potential Impact	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
							• Inspect suspended and non-producing wells monthly including Christmas tree, tubing and annulus pressures; • Wells constructed to industry best practise principles and industry standards; • Emergency response plan.				
2	Well blowout	Injury or death of native fauna	4	4	16	High potential for significant impact to fauna depending on amount of oil or gas released and density of fauna in the area. Generally, the OL area has a low density of fauna but this can change due to prevailing climatic conditions and availability of food.	• Install, maintain and routinely test blow-out preventers (BOPs) and related well control equipment on all workover rigs; • Install hi-lo pressure valves on all high-pressure wells (exemption for low pressure wells); • PSVs n surface casing; • Install wellhead cellars on all oil wells; • Wells constructed to industry best practise principles and industry standards; • Keep cellars free of oil and rubbish and maintain covers to prevent or minimise fauna and livestock access; • Implement fauna management measures; • Periodic well integrity testing including tubing and annulus pressures; • Ensure remote well telemetry system operational on all gas wells, injectors and selected oil wells; • Inspect suspended and non-producing wells monthly including Christmas tree, tubing and annulus pressures; • Emergency response plan.	3	1	3	Potential for impacts on less mobile fauna species with unpredictable movements. Emergency response plan to mitigate any impacts not contained.
		Loss of vegetation and fauna habitat	4	4	16	High potential for considerable impact locally and depending on flora composition and density provides uncertainty on severity of consequences.		3	1	3	Acceptable as area is sparsely vegetated and vegetation is well represented in surrounding OL area. Emergency response plan implemented.
2, 8	Fluid handling equipment failure	Injury or death of native fauna	4	3	12	Uncertain due to amount of fluid released and location of release and presence of fauna.	• Implement fuel and chemical handling and storage measures; • Ensure adequate spill clean up material is located adjacent to fluid handling area; • Regular inspection and maintenance of fluid handling shut off valves; • Regularly test and maintain function of fluid handling equipment; • Implement fauna management measures as identified in planning; • Implement emergency response plan.	3	1	3	Low volume of fluids, acceptable risk.
		Loss of vegetation and fauna habitat	3	3	6	Uncertainty in extent and size of spill.		2	2	4	At least 4 m vegetation clearance buffer around all infrastructure
2	Casing failure	Injury or death of native fauna	3	3	9	Uncertainty due to amount of fluid potentially reaching the surface. Depends on where casing failure occurs and amount of fauna present when failure occurs.	• Ongoing monitoring and casing maintenance program to identify where corrosion may be taking place and target well intervention, remedial cementing, or casing repairs; • Install hi-lo pressure valves on all high-pressure wells (exemption for low pressure wells); • Implement pro-active remedial program for wells where cement or casing is failing to provide containment of gas, oil and formation water from petroleum reservoirs; • Well pressure constantly monitored for any drop indicating well failure; • Well design developed using industry best practise; • Methods for operation continually updated to meet industry best practise standards; • Casing used to seal off different geological and hydrogeological strata; • Emergency response plan; • Oil spill contingency plan; • Well sealed with cement plugs as soon as determined a casing failure exists; • Immediately clean-up and remediate; and • Maintain register of spills/leaks.	2	2	4	As problem occurs underground, direct fixing of the issues will take time, impacts to fauna expected to be minimal. Small spill possible at surface, emergency response plan required to mitigate in case of incident.
2	Poor primary cementing or cement failure	Injury or death of native fauna	3	3	9	Uncertainty due to amount of fluid potentially reaching the surface. Depends on where casing failure occurs and amount of fauna present when failure occurs.	• Ongoing monitoring and casing maintenance program to identify where corrosion may be taking place and target well intervention, remedial cementing, or casing repairs; • Install hi-lo pressure valves on all high-pressure wells (exemption for low pressure wells); • Implement pro-active remedial program for wells where cement or casing is failing to provide containment of gas, oil and formation water from petroleum reservoirs; • Well pressure constantly monitored for any drop indicating well failure; • Well design developed using industry best practise; • Methods for operation continually updated to meet industry best practise standards; • Casing used to seal off different geological and hydrogeological strata; • Implement emergency response plan; • Implement oil spill contingency plan; • Well sealed with cement plugs as soon as determined a casing failure exists; • Immediately clean-up and remediate; and • Maintain register of spills/leaks.	2	2	4	As problem occurs underground, direct fixing of the issues will take time, impacts to fauna expected to be minimal. Small spill possible at surface, emergency response plan required to mitigate in case of incident.

ID	Causes	Potential Impact	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
2, 5	Loss of containment of gas or oil while testing	Injury or death of native fauna	3	3	9	Uncertainty due to amount of oil or gas released during testing and that not contained; dependant on fauna presence in area at time of incident.	• Install wellhead cellars on all oil wells; • Keep cellars free of oil and rubbish and maintain covers to prevent or minimise fauna and livestock access; • Install hi-lo pressure valves on all high-pressure wells (exemption for low pressure wells); • Implement emergency response plan; • Implement oil spill contingency plan; • Ensure regular testing and monitoring of emergency shutdown valves, detection and control systems to ensure adequate protection; • Immediately clean-up and remediate; and • Maintain register of spills/leaks.	2	1	2	Emergency response plan to mitigate any impacts arising from an incident. Mitigation measures will limit extent of incident if occurs.
2, 4	Release of liquid hydrocarbons to flare pits	Injury or death of native fauna	3	2	6	Less uncertainty as most fauna will be deterred from constant flaring currently undertaken at MRN and flare pits are fenced.	• Monitor flare pits for any signs of hydrocarbon contamination; • Immediately clean-up and remediate any contamination; • No hazardous chemicals or hydrocarbons stored near to flare pit; • Maintain fencing around flare pits; and • Maintain register of spills/leaks.	2	2	4	Contamination contained in flare pit and remediated as soon as possible. Remote area with sparse population of fauna.
10, 12	Overflow of interceptor and/or evaporation pond due to heavy rainfall events	Injury or death of native fauna	3	3	9	Evaporation ponds contain hydrocarbons and produced waters due to PFW and evaporation concentration. Dependent on location and direction of spill, i.e. which side of evaporation ponds overflows.	• Ensure 1.5m of freeboard is maintained through regular inspection; • Monitor weather forecast data to ensure there is sufficient freeboard to accommodate predicated rainfall without overflow; • If necessary reduce level of water in evaporation ponds to accommodate extra rainfall; • In the event of a spill or leak, follow appropriate emergency response procedures; • Immediately clean-up and remediate all contaminated soil in the bio-remediation pits; and • Maintain register of spills/leaks.	2	2	4	Emergency response plan to remediate impacts from breach in evaporation pond outside of CTP control. All mitigation measures taken to ensure evaporation ponds do not overflow.
		Loss of vegetation and fauna habitats	3	3	9	Evaporation ponds contain hydrocarbons and produced waters due to PFW and evaporation concentration. Dependent on location and direction of spill, i.e. which side of evaporation ponds overflows.		2	2	4	Emergency response plan to remediate impacts from breach in evaporation pond outside of CTP control. All mitigation measures taken to ensure evaporation ponds do not overflow.
4, 7, 13	Spills or leaks associated with the transportation of produce water	Loss of vegetation and fauna habitats	4	3	12	Surveys from PVGF show that produced water spills can have a medium-term impact on flora species. With annual grasses and forbs returning within the first few years, but taking up to 5 years for shrubs to recover and longer still for mature trees that are impacted. Depends on location, vegetation type, soil and topography.	• Maintain all water carts, tanks, pumps and transfer hoses in good working order; • Where applicable, ensure pumps, tanks and transfer lines are located within suitably bunded areas; • Follow hazardous material storage, handling and transport procedures; • In the event of a spill or leak, follow appropriate emergency response procedures; • Immediately clean-up and remediate any contaminated soil in bio-remediation pits; and • Maintain register of spills/leaks.	3	1	3	Emergency response plan to remediate impacts from spill outside of control. Human error or unpredictable road condition could potentially still cause an accident.
1, 13	Creation of new water sources (turkey nests, dams)	Encouragement of wider distribution of feral animals	2	4	8	Water sources have been shown at MRN to attract introduced fauna to new previously undisturbed areas with detrimental impacts. Dedicated watering points have been established to combat this and keep the introduced horse populations in manageable locations.	• Ensure all artificial water sources are fenced to keep out fauna; • Except where provided for stock use; and • Limit the number of area for potential water pooling and containment.	2	2	4	Acceptable as stock managed through established watering points.
4, 12	Sump or tank overflow	Injury or death of native fauna	3	4	12	Dependant on surface water availability for spread and contamination of sump or tank waters prior to overflow.	• Monitor water levels in sump or tanks; • Maintain sufficient freeboard; • Routine inspection of tank and sump integrity and any potential failures to be remediated accordingly; • Location of sumps or tanks away from water course or significant drainage lines; • If open, consider potential rainfall events and adjust freeboard capacity accordingly; • Remove excess water from site by truck for disposal at nearest licensed waste facility; • Place bunding around downstream of tank or sump overflow to contain any overflow from entering surrounding environment.	2	2	4	Any overflow to be contained within external bunded area. Due to high evaporation rates, access to fauna will be limited. If overflow occurs, expected to be of small quantity due to careful monitoring and freeboard adjustment calculations based on climate.

ID	Causes	Potential Impact	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
4	Oil carryover to interceptor pond and / or evaporation pond	Injury or death of native fauna	4	3	12	Depending on availability of other surface water resources will dictate preference of fauna to utilise over flow liquid.	• Appropriate alarm systems on separator tanks; • Ensure that waters of unsatisfactory quality are suitably contained in ponds with impermeable liners; • Ensure suitable pond operating levels are maintained; • Monitor interceptor and evaporation ponds for any oil carryover; • Investigate reason for carryover; • Immediately clean-up and remediate; • Fix issue in interceptor or evaporation pond; and • Maintain register of spills/leaks.	2	2	4	Adequate fencing to stop ingress of fauna, avifauna still potential to access site, however, acceptable due to low recorded population of avifauna and other suitable water sources on lease.
10	Burning of wastes	Loss of vegetation and fauna habitats	4	3	12	Dependant on wind speed and direction; and climatic conditions and vegetation growth in the surrounding environment.	• Controlled burning of approved waste to be undertaken in purpose built facility within fenced enclosures; •Burn pit to have entry and exit ramps for fauna; • Check weather forecast to make sure low wind and not in fire danger period; • Ensure all staff are made aware when burning off waste is to be conducted; • Ensure adequate firefighting equipment available and personnel trained in its use; • Implement fire prevention and control measures; • Ensure fire break of at least 4m is maintained around burn pit; and • Implement emergency response plan if required.	3	1	3	All measures taken to reduce potential for fire from waste burning, emergency response plan available if the fire becomes uncontrolled.
		Injury or death of native fauna	3	3	9	Access to burn area by less mobile fauna species		2	1	2	Fenced area to deter larger animals from entering burn pit, still potential for less mobile species to be unable to exist in time.
4, 10	Release of oily and or saline water outside of containment area	Injury or death of native fauna	3	3	9	Dependent on location and direction of spill.	• Ensure waste management areas are suitably positioned and constructed to minimise the potential for off-site contamination; • 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; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out;	2	2	4	Appropriate bunding and containment areas make this risk acceptable. Any spill outside of containment area dealt with by emergency response plan.
		Loss of vegetation and fauna habitats	4	3	12	Dependent on location and direction of spill.		2	2	4	Appropriate bunding and containment areas make this risk acceptable. Any spill outside of containment area dealt with by emergency response plan.
4, 10	Storage and disposal of contaminated soil to bioremediation-pits	Injury or death of native fauna	2	3	6	Contamination contained within soil, limited exposure for fauna.	• Ensure all waste disposed in the bio-remediation pits are approved by DPIR; • Record all quantity and type of waste transported to bio-pits; • Ensure bioremediation-pits have sufficient bunding to contain 1 in 100-year flood event.	2	2	4	All waste to remain with bio pits, area fenced off from fauna or third-party access. Avifauna may still enter bio-pits and small fauna. Likelihood of ingestion or dermal contact issues is low and acceptable.
7, 10	Storage and transportation of domestic wastes	Scavenging by native and pest species	3	4	12	Dependant on availability of food resources within the surrounding environment and access for food scraps in domestic wastes.	• Ensure that appropriate housekeeping standards are maintained and that the facility is maintained free of rubbish outside waste disposal receptacles; • Keep the site and access to the site free of rubbish and use suitable containers for collection of rubbish for periodic removal; • Ensure pest/scavenger access to wastes is minimised by install of fauna proof containers; • Ensure waste management areas are fenced to minimise stock and wildlife access; and • Ensure waste management areas are suitably positioned and constructed to minimise the potential for off-site contamination.	2	1	2	If receptacles remain fauna proof, then acceptable risk.
		Pest and invasive species outbreaks	3	4	12	Requires combination of available food and water resources and unmanaged pest species.		2	2	4	Control of wastes as described will eliminate the potential for pest species to form large populations due to waste resource availability.
10	Spills or leaks associated with sewage plant chemical storage and handling	Injury or death of native fauna	3	4	12	Uncertainty due to amount of spill or of which chemical and current climatic and vegetation condition which will impact on fauna density around chemical stores.	• 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; • Use of biodegradable chemicals in sewerage treatment; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out.	2	2	4	Low fauna population in area adjacent to chemical stores, adequate bunding to reduce off-site contamination. Emergency response plan to mitigate any off-site contamination that may impact on fauna.

ID	Causes	Potential Impact	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
		Loss of vegetation and fauna habitats	2	3	6	Uncertainty due to amount of spill or of which chemical and current climatic and vegetation density.		2	1	2	Sewerage and chemicals likely to have short term localised impact on vegetation, potential to provide nutrients to vegetation in long term.
10	Spills or leaks associated with the treatment and disposal of sewage in septic tanks or to earthen pits	Injury or death of native fauna	3	3	9	Potential for disease spread through ingestion of untreated sewerage, dependant on fauna species utilising resources and concentration or number of pathogens digested.	• Monitor treatment facilities for any spills leaks or damage to equipment; • 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; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • In the event of a spill or leak, follow appropriate emergency response procedures; • Immediately clean-up and remediate; and • Maintain register of spills/leaks.	2	2	4	Sewerage waste potentially of minimal risk to wildlife and initial treatment facility is fully enclosed.
		Loss of vegetation and fauna habitats	2	3	6	Uncertainty due to amount of spill current climatic and vegetation density.		2	1	2	Sewerage likely to have short term localised impact on vegetation, potential to provide nutrients to vegetation in long term.
10	Sewage sludge storage and disposal	Injury or death of native fauna	2	3	6	Research indicates that sewerage sludge is largely beneficial to the environment; however, potential for other contaminates to be in the septic/sewerage system that may have detrimental impacts on the environment.	• 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; • Routinely monitor sewerage sludge storage and disposal facilities; • Ensure all licenses and approvals are followed; • Record all volumes of sewerage sludge disposed and location; • Use licensed and NT EPA approved waste disposal contractor for removal of all sewerage sludge.	2	2	4	Sewerage sludge after treatment in general is not hazardous for the environment. Potential for other materials to enter the sewerage system which may be potentially contaminating. Emergency response to mitigate any spills and testing to determine if further remediation is required.
10	Incorrect waste segregation and disposal	Loss of recyclable resources	1	4	4	Dependant on individual's strict application to separating waste.	• Segregate waste to maximise recycling; • Appropriately segregate and store (within bunded areas etc.) hazardous goods.	1	2	2	. Sufficient recycling facilities capable of handling all streams may not be locally available.

7.6.2 General Environmental: Land – Soil

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
1	Earthworks	Disturbance to natural drainage patterns	4	4	16	Any changes in cleared areas or road alignments required during maintenance works will impact on drainage. Uncertainty, as it will depend on the location of the works and final landform.	• Install erosion and sediment control structures (e.g. berms, sediment fences) where necessary in line with best practice guidelines by DENR and IECA; • Avoid vegetation clearance except where consent has been obtained from DPIR, CLC and other applicable stakeholders; • Stockpile top soil separately in low profile mounds; • Implement fuel and chemical handling and storage measures outlined in this FEMP; • Conduct Job Hazard Analysis for any new task or new use of equipment to ensure appropriate control measures are identified; • Encourage surface vegetation where possible; • Avoid driving following significant rainfall events; • Implement dust control measures where appropriate; • Conduct works during daylight; • Re-fuel with drip trays; • Ensure construction operation and level of final constructed surface account for 1 in 100 year flooding events.	2	2	4	Potential to impact on the natural drainage patterns or change existing drainage patterns. However, application of the DENR and IECA guidelines will reduce these impacts. Follow up monitoring will ensure that the measures implemented satisfy the requirements.
		Inversion of soil profile	3	3	9	Inversion of soil profile is potentially highly disruptive to future growth of vegetation as all nutrients and seed stock is contained in top soil.		2	1	2	Top soil management will ensure that soil integrity remains and soil inversion does not occur.
		Soil erosion and siltation of watercourses	4	4	16	This will depend on the location of earthworks, soil types and final landform. The risk is based on worst case scenario.		3	1	3	Following best practise guidelines, DENR and IECA, will ensure there is minimal impact on watercourse in the area. Follow up monitoring of and device installed will ensure it is meeting its requirements.
		Soil compaction	2	3	6	The level of compaction required will be site specific and depend on the extent of the works. Any major earthworks program outside of general maintenance will require a separate EMP.		2	2	4	Any soil compaction occurring under this FEMP will be in areas already compacted. The risk is acceptable as the soil compaction already exists.
3	Erosion due to pipeline easement or alignment	Disruption to land use (e.g. grazing and cultural) and exposure of pipeline	3	3	9	Erosion left unchecked can have serious impacts on vegetation growth. In OL4 there is high certainty that erosion and/or sedimentation process are likely to occur.	• Plan operational activities to minimise new land disturbance; • Obtain permission for activities (e.g. excavations) from CLC and DPIR before works commence; • Carry out earthworks in accordance with CTP standards and procedures • Install erosion and sediment control structures (e.g. berms, sediment fences) where necessary in accordance with DENR and IECA guidelines;	2	2	4	Acceptable risk as routine monitoring and inspection of the pipeline RoW will ensure that any erosion or sedimentation occurring that may expose the pipeline will be quickly remediated before any permanent damage is done. The sandy banks of most watercourses in the area mean that the

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
							• Follow-up monitoring of any control devices installed to ensure integrity following first significant rainfall event; • Undertake erosion monitoring and control along pipelines, particularly at gully/water course crossings; • Comply with the Preliminary Environmental Report (PER) for the Mereenie Alice Springs Crude Oil Pipeline (Dames & Moore 1985) as modified; • Undertake regular inspection of pipeline easements for erosion and rectify where detected; • Regularly monitor performance of cathodic protection devices to ensure adequate protection so pipe does not leak and displace soil; • Regularly pig pipelines to remove water and sludge accumulated at low points within pipelines; and • Conduct periodic pipeline integrity surveys as appropriate (including coating defect, metal loss, intelligent pig, and/or 3rd party intrusion surveys).				channel depth and location can change following flood events which are outside the control of CTP.
1, 2	Movement of heavy machinery and vehicles	Soil compaction	2	3	6	Compaction limited to cleared areas and established tracks.	• Avoid driving following significant rainfall events; • No off-road driving; • Implement dust control measures where appropriate; • Re-fuelling with drip trays; • Personnel access to the facility and any site/area by permit approved by the CLC; • Implement fuel and chemical handling and storage measures.	2	2	4	Any soil compaction occurring under this FEMP will be in areas already compacted. The risk is acceptable as the soil compaction already exists.
		Soil erosion	3	3	9	Depends on time of vehicle use and previous climatic conditions on the impact on the road from soil erosion.		2	2	4	Acceptable as road maintenance will ensure any erosion issue is remediated as soon as possible.
		Disruption to land use (e.g. grazing and cultural)	3	3	9	Only other land use currently active in the OL area is feral horse management by the TOs. Potential for impacts on the movement of trucks carrying livestock off-site.		2	1	2	Risk is acceptable as the land use of the area is limited to MRN operations and horse stock. Any disruption to land use will be temporary and localised; communication between CTP and TOs will be constant to inform of any large machinery movements that may impact their operations.
		Increased public access to remote areas, impacting soil	4	3	12	New roads have increased access to new areas not previously easily accessible. The use of the roads and tracks will depend on the benefit to be gained and is potentially seasonal, e.g. in relation to TOs hunting practices.		2	2	4	Area in remote location, minimal outside access. Main access will be from TOs, and numbers expected to be low due to low populations in the surrounding area.
4, 3	Loss of containment of gas or oil (pipeline rupture or leaks from plant equipment)	Contamination of soil	4	4	16	High certainty in the impacts of this occurring as there have been several at MRN with extent of contamination measured. The relative frequency of occurrence is likely to be lower than used in the risk assessment, however, past frequency is potentially not the best predictor of future frequency due to aging of pipe work.	• Operate pipelines in accordance with operational procedures; • Implement the pipeline integrity management program; • Undertake regular inspection of pipeline easements for weeds or leaks/spills and rectify where detected; • Regularly monitor performance of cathodic protection devices to ensure adequate protection; • Conduct periodic pipeline integrity surveys as appropriate (including coating defect, metal loss, intelligent pig, and/or 3rd party intrusion surveys); • Ensure all fittings and equipment are routinely checked and maintained; • Monitor pipeline pressure to quick identification ofany source of leak or rupture; • Ensure that any spills, leaks or points of excessive wear are appropriately reported and the necessary maintenance work and control measures undertaken without delay – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out.	2	2	4	Potential for leak or spill to occur along pipeline even with all prevention and mitigation measures in place. The emergency response plan will assist to remediate and reduce the long-term impact of any leak or spill on soil, and shut of valves aid in reduced extent of contamination.
		Disruption to land use (e.g. grazing and cultural)	3	3	9	Localised impacts in a large grazing area, stock highly mobile and will avoid area and find suitable resources elsewhere.		1	2	2	Impacts will be localised and hence have minimal impact on the other land use in the area, i.e. stock grazing. The area used for grazing is widespread and stock has free range to other suitable pasture.
4, 8	Spill or leak associated with compressor failure	Contamination of soil	5	4	20	High uncertainty as to the extent of the compressor failure and hence the extent of the damages. Provided in the risk assessment is the worst-case scenario of large failure inducing a spill or leak from the compressor.	• Implement fire prevention and control measures; • Ensure regular testing and monitoring of emergency shutdown valves, fire protection, detection and control systems to ensure adequate protection; • Operate in accordance with operational procedures; • Implement fuel and chemical handling and storage measures; • Ensure appropriate housekeeping standards are maintained and that facilities are free of rubbish; • Ensure all fittings and equipment are routinely checked and maintained; • Ensure that any spills, leaks or points of excessive wear are appropriately reported and the necessary maintenance work and control measures undertaken without delay – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out.	2	2	4	Impacts are likely to localise around the compressor facility, with potential still for further mitigation off-site depending on rainfall at the time. Emergency response and oil spill response plan will be implemented to reduce the severity of the consequences to an acceptable level.
		Disruption to land use (e.g. grazing and cultural)	3	3	9	Localised location, with potential to impact mustering if occurring at the same time. Uncertainty due to ability to re-schedule mustering or extent of spill and duration between clean-up.		1	2	2	Depending on timing, may impact on transport and mustering of stock. Localised impacts, unlikely to impact overall operation or use of surrounding area.
4	Spill associated with pipeline pig recovery	Contamination of soil,	3	3	9	Highly routine operation, chance of an accident occurring is minimal. However, due to uncertainties in equipment and human error, there may be a spill. If so, it would contaminate the impacted soil.	• Operate in accordance with operational procedures; • Regularly pig pipelines to remove water and sludge accumulated at low points within pipelines; • Ensure all fittings and equipment are routinely checked and maintained; • 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; • Ensure that any spills, leaks or points of excessive wear are appropriately reported and the necessary maintenance work and control measures undertaken without delay – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • Implement fauna management measures as identified as necessary in planning;	1	2	2	Any spills in pig launcher recovery would be contained in bunded area, small localised spill may occur which is acceptable and remediation actions would be carried out directly.

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
							• Conduct periodic pipeline integrity surveys as appropriate (including coating defect, metal loss, intelligent pig, and/or 3rd party intrusion surveys).				
4, 7	Spill associated with transport of oil and condensate (via truck)	Contamination of soil,	3	4	12	Any spill will have an impact on soil in the direct localised zone, availability of surface water, soil type and vegetation present at the location of the spill will determine the full extent of contamination. Equally so, hydrocarbons will impact soil more than condensate which will readily transition to gas phase and move into the atmosphere.	• 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; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • Implement fuel and chemical handling and storage measures; • Implement appropriate noise and dust control measures	2	2	4	Risk acceptable as all preventative and mitigation measures have been taken. Emergency response plan and oil spill response plan will deal with remaining remediation actions required. Still potential likelihood due to other traffic.
		Disruption to land use (e.g. grazing and cultural)	3	3	9	The same access roads are used for transporting oil and condensate as for the stock transport. Potential to impact on stock movements depending on timing and location of incident.		2	1	2	Potential to disrupt other land use, stock transport. However, impacts will be short lived and easily remediated by emergency response plan and oil spill response plan.
7, 9	Spill or leak of workover fluids, diesel, fuel, oils and chemicals (transportation, handling and storage)	Contamination of soil,	4	3	12	Depending on volume of material and concentration spilt will determine ultimate impact of spill. This provides for a level of uncertainty in the risk assessment and each transport of oils, condensate or hazardous goods should be individually risk assessed.	• Install, maintain and routinely test blow-out preventers (BOPs) and related well control equipment on all workover rigs; • 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; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • Implement fuel and chemical handling and storage measures.	2	2	4	Acceptable with emergency response plan and oil spill response plan. Impacts to watercourse will depend on rainfall and surface water at time of incident.
4, 6, 7	Leaks or spills associated with transport of fuels and chemicals (via truck)	Localised contamination of soil	4	3	12	Highly certain that any spill will have a localised impact on soil, extent and level of contamination is uncertain depending on the concentration and type of fluid spilt. Depending on volume of transported material and concentration will determine ultimate impact of spill. This provides for a level of uncertainty in the risk assessment and each transport of oils, condensate or hazardous goods should be individually risk assessed	• Implement fuel and chemical handling and storage measures; • 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; • Where appropriate contaminated soil to be remediated in bioremediation pits; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out.	2	2	4	Localised contamination may still be present if large rainfall event coincides with spill or leak and cause overtopping of bunding. Emergency response to assist in mitigation against long term impacts and further spread of contamination.
		Disruption to land use (e.g. grazing and cultural)	3	3	9	Uncertainty due to unknown location and timing of spill and how it would impact activities like mustering. Large undisturbed area surrounding any spill, so will not likely directly impact stock.		2	1	2	Potential to disrupt other land use, stock transport. However, impacts will be short term and easily remediated by following procedures outlined in this FEMP and the emergency response plan.
4, 6	Leaks or spills associated with chemical and fuel storage and handling (e.g. tank farm)	Localised contamination of soil	3	3	9	High certainty that any spill or leak will have localised soil contamination, the extent and required clean-up procedure would be determined depending on material spilt.	• Segregated and contained or bunded storage areas; • Perform a risk assessment for all new chemical products proposed for use on site; • Maintain hazardous goods register; • Handle, store and otherwise manage all hazardous goods in accordance with relevant Australian Standards and Codes of Practice; • Provide on-site SDS and handling procedures for hazardous chemicals and materials; • 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; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • Implement fuel and chemical handling and storage measures;	2	2	4	Localised contamination may still be present if large rainfall event coincides with spill or leak and causes overtopping of bunding. Emergency response to assist in mitigation against long term impacts and further spread of contamination.
1	Ignition of fire along access	Disruption to land use (e.g. grazing and cultural)	4	4	16	Depending on time of year and climatic conditions in the lead up (Sept-Nov) to the dry season, will determine the intensity and damage done by fire. Worst case scenario taken for risk rating.	• Implement fire prevention and control measures; • Implement emergency response plan; • Maintain at least a 4 m fire break around all infrastructure and operational areas; • Implement weed and vegetation control at operational sites to reduce fuel loads; • Appropriate fire management and control equipment available in every vehicle; • 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; • Up to date information on current fire danger, presence of fire in the area and current weather conditions from government websites.	2	1	2	All mitigation measures implemented to reduce likelihood of fire occurring. In unlikely case of fire, emergency response plan assist in mitigation of impact.
2, 4	Explosion or fire on lease (during operations)	Contamination of soil	4	4	16	Depending on time of year and climatic conditions in the lead up (Sept-Nov) to the dry season will determine the intensity and damage done by fire. Worst case scenario taken for risk rating.	• Implement fire prevention and control measures; • Appropriate fire management and control equipment available; • 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; • Maintain at least a 4 m fire break around all infrastructure and operational areas; • Ensure adequate firefighting equipment available and personnel trained in its use; • Up to date information on current fire danger, presence of fire in the area and current weather condition from government websites; • Implement fuel and chemical handling and storage measures; • Implement fire prevention and control measures; • Implement emergency response plan.	3	1	3	Explosion or fire may cause rupture of hazardous material or chemical stores causing contamination in the OL area due to volatile nature of hydrocarbons extracted and chemicals used and stored on site, there is risk of explosive fire having high severity. However, all means necessary have been taken to reduce the potential for fire and chemical storage areas are separated from ignition sources. Emergency response plan implemented to control impacts.
		Uncontrolled release or spill of saline workover fluids / chemically	4	3	12	Depending on time of year and climatic conditions in the lead up (Sept-Nov) to the dry season will determine the intensity and damage done by fire. Worst case scenario taken for risk rating.		2	2	4	All mitigation measures implemented to reduce likelihood of fire occurring. In the unlikely case of fire, emergency response plan mitigates impact.

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
		treated water, or oil laden fluids									
3	Explosion or fire along an oil or gas pipeline	Contamination of soil	4	3	12	Depending on time of year and climatic conditions in the lead up (Sept-Nov) to the dry season will determine the intensity and damage done by fire. Worst case scenario taken for risk rating. Amount of unburnt hydrocarbon will impact amount of soil contaminated.	• Implement fuel and chemical handling and storage measures; • Implement fire prevention and control measures; • Maintain at least a 4 m fire break around all infrastructure and operational areas; • Implement emergency response plan; • Appropriate fire management and control equipment available; • Ensure regular testing and monitoring of emergency shutdown valves, fire protection, detection and control systems to ensure adequate protection; • Ensure adequate firefighting equipment available and personnel trained in its use.	3	1	3	All mitigation measures implemented to reduce likelihood of fire occurring. In the unlikely case of fire, emergency response plan mitigates impact.
		Disruption to land use (e.g. grazing and cultural)	3	4	12	Depending on time of year and climatic conditions in the lead up will determine the intensity and damage done by fire. Worst case scenario taken for risk rating.		2	1	2	All mitigation measures implemented to reduce likelihood of fire occurring. In the unlikely case of fire, emergency response plan mitigates impact.
2	Explosion or fire at the ESS or CTPL	Contamination of soil	5	4	20	Dependent on extent of fire and amount of fuel accessible at time of incident within each facility. Location or part of process where incident takes place.	• Implement fuel and chemical handling and storage measures; • Implement fire prevention and control measures; • Implement emergency response plan; • Maintain at least a 4 m fire break around all infrastructure and operational areas; • Appropriate fire management and control equipment available; • Ensure regular testing and monitoring of emergency shutdown valves, fire protection, detection and control systems to ensure adequate protection; • Ensure adequate firefighting equipment available and personnel trained in its use.	4	1	4	All mitigation measures implemented to reduce likelihood of fire occurring. In the unlikely case of fire, emergency response plan mitigates impact.
1, 12	Flooding	Contamination of soil	3	3	9	Potential for flood waters to become contaminated and wash pollutants into surrounding environment. Dependant on size of flood, height of flood waters, location and duration.	• Implement emergency response plan; • Implement fuel and chemical handling and storage measures; • Ensure all chemical and fuel stores are in appropriately bunded containers; •Ensure all fuel and hazardous chemical stores are outside of drainage lines and above local 1 in 100-year flood lines; • Inspect infrastructure and operational areas following flooding event to determine potential erosion and sedimentation issues and remediate in accordance with ICEA and DLRM best practise principles; • Install erosion and sediment control structures (e.g. berms, sediment fences) where necessary in line with best practice guidelines by DENR and IECA.	3	1	3	Bunding and placement of dangerous goods outside of drainage lines has reduced all controllable risks. Emergency response plan will assist to mitigate off-site contamination in unlikely case that flooding is more severe than modelled.
		Soil erosion and siltation of watercourses	4	3	12	Dependant on size of flood, height of flood waters, location and duration.		2	2	4	Best practise guidelines and principles followed to prevent and remediate soil erosion from flooding.
2	Well kick	Contamination of soil from uncontrolled release of hydrocarbon (liquid or gas) to surface	3	3	9	Higher potential for localised damage to soil/land from well kick if there is a surface breach or a well blow out event is triggered.	• Install hi-lo pressure valves on all high-pressure wells (exemption for low pressure wells); • PSVs in surface casing; • Install wellhead cellars on all oil wells; • Keep cellars free of oil and rubbish and maintain covers to prevent or minimise fauna and livestock access; • Implement fauna management measures; • Periodic well integrity testing including tubing and annulus pressures; • Ensure remote well telemetry system operational on all gas wells, injectors and selected oil wells; • Inspect suspended and non-producing wells monthly including Christmas tree, tubing and annulus pressures; • Implement emergency response plan.	2	2	4	Acceptable due to use of current best practise techniques and routine inspections.
2	Well blowout	Contamination of soil uncontrolled release of hydrocarbon (liquid or gas) to surface	5	4	20	Uncertainty as the impacts will depend on the amount of oil or gas released. Potential for a spark or ignition source to turn the release into a large fire. Blow out preventer fitted as standard.	• Install, maintain and routinely test blow-out preventers (BOPs) and related well control equipment on all workover rigs; • Install hi-lo pressure valves on all high-pressure wells (exemption for low pressure wells); • PSVs in surface casing; • Remote telemetry on all gas wells, injectors and select oil wells; • Install wellhead cellars on all oil wells; • Keep cellars free of oil and rubbish and maintain covers to prevent or minimise fauna and livestock access; • Implement fauna management measures; • Periodic well integrity testing including tubing and annulus pressures; • Ensure remote well telemetry system operational on all gas wells, injectors and selected oil wells; • Inspect suspended and non-producing wells monthly including Christmas tree, tubing and annulus pressures; • Implement emergency response plan.	3	2	6	Acceptable due to use of current best practise techniques and routine inspections. Any surface spills extent and potential damage will be limited by the implementation of the oil spill contingency plan. Potential likelihood of well blow out occurring is low.
2, 8	Fluid handling equipment failure at well	Contamination of soil uncontrolled release or spill of saline workover fluids / chemically treated water, or oil laden fluids	3	3	9	Uncertain due to amount of fluid released and location of release, i.e. proximity to water course, soil type in the area, depth to groundwater, weather conditions.	• Implement fuel and chemical handling and storage measures; • Service and maintain pipelines regularly; • Hi-lo valves installed on all high-pressure wells (low pressure wells exempt); • Remote telemetry installed on all gas wells, injectors and select oil wells; • Periodic pressure inspections; and • Implement emergency response plan and oil spill response plan.	2	2	4	Low volume of fluids, acceptable risk.
2. 8	Tubing or drill pipe failure at drill floor	Temporary restricted control over well fluids and	3	3	9	Uncertain due to amount of fluid released and location of release.	• Hi-lo valves installed on all high-pressure wells (low pressure wells exempt); • Periodic pressure regulator inspection;	2	1	2	Low volume of fluids expected to be released due to mitigation measures implemented. Any release likely to be

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
		circulation system leading to low volume uncontrolled release or spill of saline workover fluids/chemically treated water at the surface					• Remote telemetry pressure monitoring for all gas wells, injectors and select oil wells; • Emergency shut off valve; • Implement emergency response plan.				contained quickly and hence extent of surface disturbance will be minimised.
2	Casing failure	Contamination of soil uncontrolled release of produced fluids to surface	4	4	16	Uncertainty due to amount of fluid potentially reaching the surface, depends on where casing failure occurs.	• Ongoing monitoring and casing maintenance program to identify where corrosion may be taking place and target well intervention, remedial cementing, or casing repairs; • Hi-lo valves installed on all high-pressure wells (low pressure wells exempt); • Remote telemetry on all gas wells, injectors and select oil wells; • Implement pro-active remedial program for wells where cement or casing is failing to provide containment of gas, oil and formation water from petroleum reservoirs; • Well pressure constantly monitored for any drop indicating well failure; • Well design developed using industry best practise; • Methods for operation continually updated to meet industry best practise standards; • Casing used to seal off different geological and hydrogeological strata; • Implement emergency response plan; • Well sealed with cement plugs as soon as determined a casing failure exists; • Immediately clean-up and remediate any surface contamination in bioremediation pits; and • Maintain register of spills/leaks.	3	2	6	As problem occurs underground, direct fixing of the issues will take time. Small spill possible at surface, emergency response plan required to mitigate in case of incident.
2	Poor primary cementing or cement failure	Contamination of soil uncontrolled release of produced fluids to surface	4	4	16	Uncertainty due to amount of fluid potentially reaching the surface, depends on where casing failure occurs.	• Ongoing monitoring and casing maintenance program to identify where corrosion may be taking place and target well intervention, remedial cementing, or casing repairs; • Implement pro-active remedial program for wells where cement or casing is failing to provide containment of gas, oil and formation water from petroleum reservoirs; • Well pressure constantly monitored for any drop indicating well failure; • Well design developed using industry best practise; • Methods for operation continually updated to meet industry best practise standards casing used to seal off different geological and hydrogeological strata; • Implement emergency response plan; • Well sealed with cement plugs as soon as determined a casing failure exists; • Immediately clean-up and remediate any surface contamination in bioremediation pits; and • Maintain register of spills/leaks.	2	2	4	As problem occurs underground, direct fixing of the issues will take time. Small spill possible at surface emergency response plan required to mitigate in case of incident. Potential likelihood of well blow out occurring is low.
2, 5	Loss of containment of gas or oil while testing	Contamination of soil	3	3	9	Uncertain to how much liquid hydrocarbon released.	• Well pressure constantly monitored for any drop indicating well failure; • Implement emergency response plan; • Ensure regular testing and monitoring of emergency shutdown valves, detection and control systems to ensure adequate protection; • Immediately clean-up and remediate any surface contamination in bioremediation pits; and • Maintain register of spills/leaks.	2	2	4	Emergency response plan to mitigate any impacts arising from an incident. Low likelihood of contamination reaching the surface.
2, 4	Release of liquid hydrocarbons to flare pits	Contamination of soil	3	3	9	Uncertain to how much liquid hydrocarbon released to pit.	• Monitor flare pits for any signs of hydrocarbon contamination; • Immediately clean-up and remediate any contamination any surface contamination in bioremediation pits; • No hazardous chemicals or hydrocarbons stored near flare pit; and • Maintain register of spills/leaks.	2	2	4	Contamination contained within flare pit
2, 4, 7, 13	Spill or leak during transportation of PFW, contaminated water or liquids	Localised contamination of soil	3	4	12	Uncertainty in amount of fluid transported, amount split or leaked, location of incident and current surface water at time of incident.	• Follow hazardous material storage, handling and transport procedures; • Maintain all water carts, tanks, pumps and transfer hoses in good working order; • Where applicable, ensure pumps, tanks and transfer lines are located within suitably bunded areas; • In the event of a spill or leak, follow appropriate emergency response procedures; • Immediately clean-up and remediate any surface contamination in bioremediation pits; and • Maintain register of spills/leaks.	2	2	4	Emergency response plan to remediate impacts from spill outside of control. Human error or unpredictable road condition could potentially still cause an accident.
2	Spill of water flood tracer	Localised contamination of soil	3	3	9	Uncertainty in amount of fluid split or leaked; location of incident and current surface water at time of incident.	• Follow specific operating procedures for working with tracer's materials; • Undertake regular inspection of maintenance of plant and equipment to prevent water leakage; • In the event of a spill or leak, follow appropriate emergency response procedures; • Immediately clean-up and remediate any surface contamination in bioremediation pits; and • Maintain register of spills/leaks.	2	2	4	Emergency response plan to remediate impacts from spill outside of control. Human error or incident that may cause spill.

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
10, 12	Overflow of interceptor and/or evaporation pond due to heavy rainfall events	Contamination of soil	4	3	12	Evaporation ponds contain hydrocarbons and produced waters due to PFW and evaporation concentration. Dependent on location and direction of spill, i.e. which side of evaporation ponds overflows.	• Ensure suitable pond operating levels are maintained; • Use of temporary evaporation pit to reduce water level in interceptor or evaporation pond; • Investigate and develop alternate means to quickly reduce water level in interceptor and/or evaporation pit; • In the event of a spill or leak, follow appropriate emergency response procedures; • Immediately clean-up and remediate; and • Maintain register of spills/leaks.	2	2	4	Emergency response plan to remediate impacts from breach in evaporation pond outside of CTP control. All mitigation measures taken to ensure evaporation ponds do not overflow.
4, 12	Sump or tank overflow	Localised contamination of soil	3	4	12	Dependant on surface water availability for spread and contamination of sump or tank waters prior to overflow.	• Monitor water levels in sump or tanks; • Maintain sufficient freeboard; • Monitor forecast weather conditions; • If open consider potential rainfall events and adjust freeboard capacity accordingly; • Remove excess water from site by truck for disposal at nearest licensed and NT EPA approved waste facility; • Place bunding around downstream of tank or sump overflow to contain any overflow from entering surrounding environment.	2	2	4	Careful monitoring of tank and sump capacity and predicted rainfall events will allow sufficient time to increase freeboard to avoid overflow. In unlikely event overflow to be contained within bunded area to limit extent of soil contamination into space that can be easily remediated.
10	Process waste disposal	Contamination of soil from incorrect handling and disposal of naturally occurring radioactive materials (NORMS)	4	3	12	Depends on nature, concentration and number of NORMS.	• Ensure that all waste materials generated from activities are managed in accordance with site or activity-specific waste management plans or procedures; • SDS available in site office and at storage and use locations; • Only staff trained in storage, use and handling of NORMS can do so • Disposal off site of NORMS by licensed and NT EPA approved contractors; If disposal is across sate or territory borders then NEPM 2013 guidelines will be followed.	2	2	4	Waste management procedure to handle all wastes appropriately and disposal of in the right location. No unregulated disposal of wastes.
4, 10	Release of oily and or saline water outside of containment area	Contamination of soil	3	3	9	Dependent on location and direction of spill.	• Ensure waste management areas are suitably positioned and constructed to minimise the potential for off-site contamination; • 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; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out.	2	2	4	Appropriate bunding and containment areas make this risk acceptable. Any spill outside of containment area dealt with by emergency response plan.
4, 10	Storage and disposal of contaminated soil to bioremediation-pits	Localised contamination of soil	3	4	12	No recorded contamination outside of bioremediation pits historically. Contamination stays highly localised within bunded pit area.	• Only dispose of wastes approved by the DPIR in eth bioremediation pits; • Record quantity and type of waste transported to bioremediation pits; • Ensure bioremediation pits have sufficient bunding to contain 1 in 100-year flood event.	2	1	2	All waste to remain with bioremediation pits, area fenced off from fauna or third-party access. In extreme events, rainfall may cause overtopping of bioremediation pits and transfer contamination off site. In these cases, the emergency response plan details appropriate mitigation measures.
7, 10	Storage and transportation of domestic wastes	Localised contamination of soil from spill of waste	2	3	6	Uncertainty depending on location of spill and amount spilt	• Ensure that appropriate housekeeping standards are maintained and that the facility is maintained free of rubbish; • Keep the site and access to the site free of rubbish and use suitable containers for collection of rubbish for periodic removal; • Ensure pest/scavenger access to wastes is minimised through the use of covers; • Ensure waste management areas are fenced to minimise stock and wildlife access; • Ensure waste management areas are suitably positioned and constructed to minimise the potential for off-site contamination.	2	2	4	Possibility for unpredictable spill or leak caused during transport, mitigated through emergency response plan.
6, 10	Disposal of chemical waste to approved disposal facility	Localised contamination of soil	3	3	9	Depends on final location of disposal	• Only dispose of domestic waste in a DPIR and NT EPA approved waste disposal location.	2	2	4	All waste stored in appropriate area and bunded accordingly. Emergency response plan to accommodate for any spills outside of these areas, i.e. in transport.
10	Spills or leaks associated with sewage plant chemical storage and handling	Contamination of soil	3	4	12	Uncertainty due to amount of spill or which chemical and current climatic and vegetation condition for extent.	• Ensure appropriate measures are in place (e.g. lining, bunding) to prevent fluids or other waste chemical and/or hydrocarbon fluids from contaminating soil in area not approved for waste disposal; • Use of environmentally biodegradable chemicals; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out.	2	2	4	Industry best practise techniques utilised in sewerage treatment facility and all chemicals required stored in bunded containers and clearly labelled.
10	Spills or leaks associated with the treatment and disposal of sewage in septic tanks or to earthen pits	Contamination of soil	4	3	12	Dependant on amount of spill and level of treatment undergone before spill. High evaporation rate and small numbers of onsite staff will keep most spills impact to localised areas directly in contact with the spill.	• Monitor treatment facilities for any spills leaks or damage to equipment; • Use of environmentally biodegradable chemicals; • 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; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • In the event of a spill or leak, follow appropriate emergency response procedures;	2	2	4	Industry best practise techniques utilised in sewerage treatment facility.

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
							• Immediately clean-up and remediate any contaminated soil in bioremediation pits; and • Maintain register of spills/leaks.				
10	Sewage sludge storage and disposal	Localised contamination of soil	2	3	6	Research indicates that sewerage sludge is largely beneficial to the environment; however, potential for other contaminates to be in the septic/sewerage system that may have detrimental impacts on the environment.	• 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; • Use of environmentally biodegradable chemicals; • Routinely monitor sewerage sludge storage location for contamination outside of approved area; •Disposal offsite by licensed and approved NT EPA contractors; • Ensure all licenses and approvals are followed; • Record all volumes of sewerage sludge disposed and location; • Use licensed waste disposal contractor for removal of all sewerage sludge.	2	2	4	Sewerage sludge after treatment in general is not hazardous for the environment. Potential for other materials to enter the sewerage system which may be potentially contaminating. Emergency response to mitigate if any spills and testing to determine if further remediation is required.
10	Incorrect waste segregation and disposal	Loss of recyclable resources adding to landfill contaminating soils	1	4	4	Dependant on individual's strict application to separating wastes.	• Segregate waste to maximise recycling and ensure only approved waste is burned;	1	2	2	Acceptable, often the environmental impact transporting the material for recycling is greater than disposing of it. Sufficient recycling facilities capable of handling all streams may not be locally available.
7, 10	Incorrect hazardous waste segregation and disposal	Contamination of soil	4	4	16	Dependant on the amount, type and location of any spills or stores of wastes. Surface water availability will also impact the spread of contamination if it occurs.	• Removal of waste for off-site disposal to be checked and signed by NT EPA approved and licensed contractor; • Maintain register of all wastes removed for disposal; • 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; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • In the event of a spill or leak, follow appropriate emergency response procedures; • Appropriately segregate and store (within bunded areas, etc.) hazardous goods; • No unregulated disposal of wastes;	3	1	3	Emergency response to mitigate any spills that occur due to accidents.

7.6.3 General Environmental: Heritage

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
1, 3	Earthworks	Disturbance to cultural heritage sites	4	2	8	As the OL area has been in operation for close to 30 years and there is a strong relationship with the TOs for the area, it is unlikely that any new heritage and culturally significant sites would be disturbed during maintenance programs. However, the OL area covers a large area and there is potential for heritage or cultural sites not yet identified to be disturbed. CLC and AAPA clearances have been obtained for all operational areas.	• Induct all staff into location and identification of cultural and heritage sites.	4	1	4	All staff are made aware of location and identification of cultural and heritage sites in the OL area. If any site not previously identified is discovered then work will cease immediately, the incident will be reported to the site manager who will inform the Department of Heritage and the CLC for advice before further work continues.
1, 2, 3, 5, 7	Movement of heavy machinery and vehicles	Disturbance to cultural heritage sites	2	2	4	No cultural heritage sites exist along the roads or access tracks.	• Conduct works during daylight; • Journey management plan filled in and approved; and • Personnel access to the facility and any site/area by permit approved by the CLC.	2	1	2	All staff are made aware of location and identification of cultural and heritage sites in OL area. Movement of vehicles and heavy machinery restricted to established access roads and tracks.
1, 2, 3, 5, 7	Ignition of fire along access	Disturbance to cultural heritage sites	4	3	12	Depending on time of year and climatic conditions in the lead up (Sept-Nov) to the dry season, will determine the intensity and damage done by fire. Worst case scenario taken for risk rating.	• Implement fire prevention and control measures; • Implement emergency response plan; • Implement weed and vegetation control at operational sites; • Appropriate fire management and control equipment available in every vehicle; • 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; • Up to date information on current fire danger, presence of fire in the area and current weather condition from government websites.	3	1	3	Potential for unidentified and identified cultural and heritage sites to be impacted from fire. Acceptable as all means taken to reduce extra fire because of activities in the OL area.
1, 2, 3, 5, 7	Increased public access to remote areas	Disturbance to cultural heritage sites	4	3	12	New roads have increased access to new areas not previously easily accessible, the use of the roads and tracks will depend on need, for example TOs hunting practises.	• Personnel access to the facility and any site/area by permit approved by the CLC; • Journey management plan filled in and approved; • Driving only on designated roads; • Signage to restrict movement and provide information on road condition and no-go areas.	2	2	4	Area in remote location, minimal outside access. Main access will be from TOs, and numbers expected to be low due to low populations in the surrounding area.

7.6.4 General Environmental: Water

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
1, 3	Earthworks	Disturbance to natural drainage patterns	4	4	16	Any changes in cleared areas or road alignments required during maintenance works will impact on drainage. Uncertainty as it will depend on the location of the works and final landform.	• Install erosion and sediment control structures (e.g. berms, sediment fences) where necessary in accordance with best practice principles and guidelines by DENR and IECA; • Follow up monitoring of any control device following first significant rainfall to ensure integrity;	2	2	4	Potential to impact on the natural drainage patterns or change existing drainage patterns. However, application of the DENR and IECA guidelines will reduce these impacts. Follow up monitoring will ensure that the measures implemented satisfy the requirements.
		Erosion and siltation of watercourses	4	4	16	This will depend on the location of earthworks, soil types and final landform. The risk is based on worst case scenario.	• Conduct Job Hazard Analysis for any new task or new use of equipment to ensure appropriate control measures are identified; • Inspect operational area following significant rainfall events for erosion and rectify as required; • Ensure construction operation and final constructed surface account for 1 in 100 year flooding events;	3	1	3	Following best practise guidelines, DENR and IECA, will ensure there is minimal impact on watercourse in the area. Follow up monitoring of and control device installed as required will minimise long term impacts.
1, 3	Presence of borrow pits	Dispersal of watering points – stock and feral animals	3	4	12	During rain, borrow pits fill with water and draw stock, introducing fauna and native fauna into new areas. The uncertainty exists due to the likely preference of the new watering points if pre-existing ones remain.	• Site, construct and operate borrow pits in accordance with the Schedule of Onshore Petroleum Exploration and Production Requirements 2012; • Maintain permanent watering points for stock; • Install drainage in borrow pits so they do not fill with water following rainfall.	2	2	4	Borrow pits will only hold water for minimal times following significant rainfall events. As such, the risk is acceptable as there will be a plentiful supply of water in the surrounding area and permanent watering points established which stock will choose in preference.
2, 3, 6, 9, 10	Loss of containment of gas or oil (pipeline rupture or leaks from plant equipment)	Contamination of watercourse	4	3	12	High certainty in the impacts of this occurring as there have been several at OL area with extent of contamination measured. The relative frequency of occurrence is likely to be lower than used in the risk assessment, however, past frequency is potentially not the best predictor of future frequency due to aging of	• Operate pipelines in accordance with operational procedures; • Implement the pipeline integrity management program; • Undertake regular inspection of pipeline easements for weeds or leaks/spills and rectify where detected; • Regularly monitor performance of cathodic protection devices to ensure adequate protection; • Regularly pig pipelines to remove water and sludge accumulated at low points within	3	2	6	Potential for leak or spill to occur along pipeline even with prevention and mitigation measures in place. The emergency response plan will remediate and reduce the long-term impact of any leak or spill on watercourse.

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
						pipe work. Impacts on water course will depend on time of year and current weather conditions.	pipelines; • Conduct periodic pipeline integrity surveys as appropriate (including coating defect, metal loss, intelligent pig, and/or 3rd party intrusion surveys). • Ensure all fittings and equipment are routinely checked and maintained; • Ensure that any spills, leaks or points of excessive wear are appropriately reported and the necessary maintenance work and control measures undertaken without delay – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out.				
3, 4	Spill associated with pipeline pig recovery	Contamination, surface water	3	3	9	Highly routine operation, chance of an accident occurring is minimal. However, due to uncertainties in equipment and human error, there may be a spill. If so, it would contaminate the impact soil with the potential to go into surface water. Unlikely to impact groundwater and more likely to form surface run-off.	• Operate in accordance with operational procedures; • Regularly pig pipelines to remove water and sludge accumulated at low points within pipelines; • Remediate all contaminated soil in bioremediation pits; • Ensure all fittings and equipment are routinely checked and maintained; • 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; • Ensure that any spills, leaks or points of excessive wear are appropriately reported and the necessary maintenance work and control measures undertaken without delay – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out;; • Conduct periodic pipeline integrity surveys as appropriate (including coating defect, metal loss, intelligent pig, and/or 3rd party intrusion surveys).	1	2	2	Any spills in pig launcher recovery would be contained in bunded area, small localised spill may occur which is acceptable and remediation actions would be carried out directly.
		Contamination of groundwater	2	2	4	Average depth of groundwater in the OL area is 200 m, any spill due to pig recovery likely to be localised on the surface.		2	1	2	Any spill from pig recovery will be remediated quickly and contained to surface.
2, 6, 7, 9	Spill associated with transport of oil and condensate (via truck)	Contamination groundwater and /or watercourses	3	4	12	Any spill will have an impact on soil in the direct localised zone. Availability of surface water, soil type and vegetation present at the location of the spill will determine the full extent of contamination. Equally so, hydrocarbons will impact water more than condensate which will readily transition to gas phase and move into the atmosphere.	• 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; • Remediate all contaminated soil in bioremediation pits; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • Implement fuel and chemical handling and storage measures;	3	2	6	Risk acceptable as all preventative and mitigation measures have been taken. Emergency response plan and oil spill response plan will deal with remaining remediation actions required.
		Contamination of groundwater	2	2	4	Average depth of groundwater in the OL area is 200 m, any spill likely to be localised on the surface.		2	1	2	Any spill from pig recovery will be remediated quickly and contained to surface.
2, 4, 5, 6, 7, 9	Spill or leak of workover fluids, diesel, fuel, oils and chemicals (transportation, handling and storage)	Contamination watercourses	4	3	12	Depending on volume of material and concentration spilt will determine ultimate impact of spill. This provides for a level of uncertainty in the risk assessment and each transport of oils, condensate or hazardous goods should be individually risk assessed.	• Install, maintain and routinely test blow-out preventers (BOPs) and related well control equipment on all workover rigs; • 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; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • Implement fuel and chemical handling and storage measures.	2	2	4	Acceptable with emergency response plan and oil spill response plan. Impacts to watercourse will depend on rainfall and surface water at time of incident.
		Contamination of groundwater	2	2	4	Average depth of groundwater in the OL area is 200 m, any spill likely to be localised on the surface.		2	1	2	Any spill from pig recovery will be remediated quickly and contained to surface.
5, 6, 7, 9	Leaks or spills associated with transport of fuels and chemicals (via truck)	Contamination of surface water	4	3	12	Depending on volume of transported material and concentration will determine ultimate impact of spill. This provides for a level of uncertainty in the risk assessment and each transport of oils, condensate or hazardous goods should be individually risk assessed. Current climatic condition an presence of surface water.	• Implement fuel and chemical handling and storage measures; • 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; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out.	2	2	4	Risk acceptable as all preventative and mitigation measures have been taken. Emergency response plan will deal with remaining remediation actions required.
		Contamination of groundwater	2	2	4	Average depth of groundwater in the OL area is 200 m, any spill due likely to be localised on the surface.		2	1	2	Any spill from pig recovery will be remediated quickly and contained to surface.
6, 7, 9	Leaks or spills associated with chemical and fuel storage and handling (e.g. tank farm)	Contamination of surface water	4	3	12	Depending on time of year and availability of surface water creates uncertainty in risk rating; large surface waters may potentially dilute contamination though moderate surface water will likely spread contamination further. Also, dependant on which land system the spill occurs.	• Segregated and contained or bunded storage areas; • Perform a risk assessment for all new chemical products proposed for use on site; • Maintain hazardous goods register; • Handle, store and otherwise manage all hazardous goods in accordance with relevant Australian Standards and Codes of Practice; • Provide on-site SDS and handling procedures for hazardous chemicals and materials; • 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; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • Implement fuel and chemical handling and storage measures.	4	1	4	Due to ephemeral nature of watercourse in the area, low likelihood that any spill or leak would contaminate water resources in the OL area. Groundwater at sufficient depth (>30m) to not be impacted by surface spills.
		Contamination of groundwater	2	2	4	Average depth of groundwater in the OL area is 200 m, any spill likely to be localised on the surface.		2	1	2	Any spill from pig recovery will be remediated quickly and contained to surface.
2, 3, 4, 5, 6, 8, 9	Explosion or fire on lease (during operations)	Contamination watercourses	4	3	12	Depending on time of year and climatic conditions in the lead up (Sept-Nov) to the dry season will determine the intensity and damage done by fire. Worst case scenario taken for risk rating. Presence of surface	• Implement fire prevention and control measures; • Appropriate fire management and control equipment available; • 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	2	2	4	Explosion or fire may cause rupture of hazardous material or chemical stores causing contamination in the OL area due to volatile nature of hydrocarbons extracted and chemicals used and stored on site. There is risk of explosive

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						water is unpredictable due to ephemeral nature of water courses.	ratings; • Ensure adequate firefighting equipment available and personnel trained in its use • Up to date information on current fire danger, presence of fire in the area and current vegetation condition from government websites; • Implement fuel and chemical handling and storage measures; • Implement fire prevention and control measures; • Implement emergency response plan.				fire having high severity, however, all means necessary have been taken to reduce the potential for fire and chemical storage areas are distant from ignition sources. Emergency response plan implemented to control follow on impacts.
3	Explosion or fire along an oil or gas pipeline	Contamination of watercourse	3	3	9	Depending on time of year and climatic conditions in the lead up (Sept-Nov) to the dry season will determine the intensity and damage done by fire. Worst case scenario taken for risk rating. . Presence of surface water is unpredictable due to ephemeral nature of water courses.	• Implement fuel and chemical handling and storage measures; • Implement fire prevention and control measures; • Implement emergency response plan; • Appropriate fire management and control equipment available; • Ensure regular testing and monitoring of emergency shutdown valves, fire protection, detection and control systems to ensure adequate protection; • Ensure adequate firefighting equipment available and personnel trained in its use.	2	2	6	As above for explosion or fire on lease (during operations).
4	Explosion or fire at the ESS or CTPL	Contamination of watercourse	4	4	16	Dependent on extent of fire and amount of fuel accessible at time of incident within each facility. Location or part of process where incident takes place.	• Implement fuel and chemical handling and storage measures; • Implement fire prevention and control measures; • Implement emergency response plan; • Appropriate fire management and control equipment available; • Ensure regular testing and monitoring of emergency shutdown valves, fire protection, detection and control systems to ensure adequate protection; • Ensure adequate firefighting equipment available and personnel trained in its use.	2	2	4	As above for explosion or fire on lease (during operations).
12	Flooding	Sedimentation of watercourses	4	3	12	Potential for flood waters to become carry large sediment loads. Dependant on size of flood, height of flood waters, location and duration.	• Implement emergency response plan; • Implement fuel and chemical handling and storage measures; • Ensure all chemical and fuel stores are in appropriately bunded containers; • Inspect operational areas following flood events to determine extent of sedimentation and remedial actions taken as required; and • Install erosion and sediment control structures (e.g. berms, sediment fences) where necessary in line with best practice guidelines by DENR and IECA.	2	2	4	Unrelated to CTP activities, flooding will move soil around in the natural environment, emergency response plan to mitigate off-site contamination.
		Contamination of watercourses	3	3	9	Potential for flood waters to become contaminated and wash pollutants into surrounding environment. Dependant on size of flood, height of flood waters, location and duration.		3	1	3	Flooding will occur regardless of all mitigation measures developed by CTP. The risk is acceptable as all measures have been implemented to respond to this emergency.
2, 4, 5	Well kick	Groundwater contamination through crossflow into aquifer	4	3	12	Potential to impact on casing of sealed groundwater interaction sections of the well annulus.	• Hi-lo valves on all high-pressure wells (low pressure wells exempt); • Remote telemetry monitoring on all gas wells, injectors and select oil wells; • Install wellhead cellars on all oil wells; • Keep cellars free of oil and rubbish and maintain covers to prevent or minimise fauna and livestock access; • Implement fuel and chemical handling and storage measures; • Inspect production wells regularly (at least daily) including tubing and annulus pressures and evidence of communication; • Inspect suspended and non-producing wells monthly including tubing and annulus pressures; • Implement emergency response plan.	2	2	4	Acceptable due to use of current best practise techniques and routine inspections. The extent of any groundwater interactions and potential damage will be limited by the implementation of the groundwater containing layers being sealed off as the well is constructed.
		Groundwater pressure reduction	4	2	8	Potential loss of pressure if casing fails or fractures are developed in the aquifer zones.		2	2	4	Aquifer in the target location is not related to fresh water aquifer in the OL area. Loss of aquifer pressure below would be difficult to remediate. Use of best practise techniques renders this residual risk acceptable.
		Contamination of watercourses	3	2	6	Potential for localised impacts to surface watercourse if kick leads to blow out or excess fluid released to the surface.		2	2	4	Acceptable due to use of current best practise techniques and routine inspections. Any extent of surface contamination and potential damage will be limited by the implementation of the emergency response plan.
2, 4, 5	Well blowout	Groundwater contamination through crossflow into aquifer	5	4	20	Uncertainty as the impacts will be underground and hence full extent of impacts will take time to determine.	• Install, maintain and routinely test blow-out preventers (BOPs) and related well control equipment on all workover rigs; • Hi-lo valves on all high-pressure wells (low pressure wells exempt); • Remote telemetry monitoring on all gas wells, injectors and select oil wells; • Install wellhead cellars on all oil wells; • Keep cellars free of oil and rubbish and maintain covers to prevent or minimise fauna and livestock access; • Implement fuel and chemical handling and storage measures; • Inspect production wells regularly (at least daily) including tubing and annulus pressures and evidence of communication; • Inspect suspended and non-producing wells monthly including tubing and annulus pressures; and • Implement emergency response plan and oil spill response plan.	3	2	6	Acceptable due to use of current best practise techniques and routine inspections. The extent of any groundwater interactions and potential damage will be limited by the implementation of the groundwater containing layers being sealed off as the well is constructed.
		Groundwater pressure reduction	4	5	20	Uncertain due to the pocket of the aquifer intersected and amount of gas or oil released.		3	2	6	Aquifer in the target location is not related to fresh water aquifer in the OL area. Loss of aquifer pressure below would be difficult to remediate. Use of best practise techniques renders this residual risk acceptable.
		Contamination of watercourses	4	5	20	Uncertainty as the impacts will depend on the amount of oil or gas released to the surface. Blow out preventer fitted as standard.		2	2	4	Acceptable due to use of current best practise techniques and routine inspections. Any surface spills extent and potential damage will be limited by the implementation of the oil spill contingency plan.
2, 4, 5, 6, 8	Fluid handling equipment failure	Contamination of watercourses	4	4	16	Uncertain due to amount of fluid released and location of release.	• Implement fuel and chemical handling and storage measures; • Implement emergency response plan.	3	1	3	Low volume of fluids expected to be released based on mitigation measures following best practise principles, acceptable risk.
2, 5	Casing failure	Groundwater contamination by cross-flow of oil or gas from exposed formations	5	4	20	Depending on location of failure and amount of oil or gas released before containment remediation works can be enacted. Uncertainty due to underground location of incident.	• Ongoing monitoring and casing maintenance program to identify where corrosion may be taking place and target well intervention, remedial cementing, or casing repairs; • Hi-lo valves on all high-pressure wells (low pressure wells exempt); • Remote telemetry monitoring on all gas wells, injectors and select oil wells; • Implement pro-active remedial program for wells where cement or casing is failing to provide containment of gas, oil and formation water from petroleum reservoirs; • Well pressure constantly monitored for any drop indicating well failure; • Well design developed using industry best practise;	3	2	6	Aquifer contamination difficult to remediate and yet likelihood is low due to use of best practise mitigation techniques and equipment. Emergency response plan to assist with the extra risks that are not mitigatable.
		Groundwater pressure reduction	4	5	20	Depending on location of failure and amount of oil or gas released before containment remediation works can be enacted. Uncertainty due to underground location of incident.		3	2	6	Aquifer contamination difficult to remediate and so residual risk is still high. Emergency response plan to assist with the extra risks that are not mitigatable.

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			C	L	Risk Rating			C	L	Risk Rating	
		Contamination watercourses	4	4	16	Uncertainty due to amount of fluid potentially reaching the surface, depends on where casing failure occurs.	• Methods for operation continually updated to meet industry best practise standards. • Casing used to seal off different geological and hydrogeological strata; • Emergency response plan; • Well sealed with cement plugs as soon as determined a casing failure exists; • Long term groundwater monitoring and remediation as required; • Immediately clean-up and remediate any surface spills in the bioremediation pits; and • Maintain register of spills/leaks.	2	2	6	Small spill possible at surface, emergency response plan required to mitigate in case of incident.
2, 5	Poor primary cementing or cement failure	Groundwater contamination by cross-flow of oil or gas from exposed formations	5	4	20	Depending on location of failure and amount of oil or gas released before containment remediation works can be enacted. Uncertainty as location of incident with the underground strata will determine the potential impact of event.	• Ongoing monitoring and casing maintenance program to identify where corrosion may be taking place and target well intervention, remedial cementing, or casing repairs; • Implement pro-active remedial program for wells where cement or casing is failing to provide containment of gas, oil and formation water from petroleum reservoirs; • Hi-lo valves on all high-pressure wells (low pressure wells exempt); • Remote telemetry monitoring on all gas wells, injectors and select oil wells; • Well design developed using industry best practise; • Methods for operation continually updated to meet industry best practise standards; • Surface spills contained within drill/well pad area; • Casing used to seal off different geological and hydrogeological strata; • Emergency response plan; • Well sealed with cement plugs as soon as determined a casing failure exists; • Immediately clean-up and remediate any surface spills in the bioremediation pits; and • Maintain register of spills/leaks.	3	2	6	Aquifer contamination difficult to remediate and so residual risk is still high. Emergency response plan to assist with the extra risks that are not mitigatable.
		Groundwater pressure reduction	4	5	20	Depending on location of failure and amount of oil or gas released before containment remediation works can be enacted. Uncertainty as location of incident with the underground strata will determine the potential impact of event.		3	2	6	Aquifer contamination difficult to remediate and so residual risk is still high. Emergency response plan implemented to mitigate extra risks that are outside of normal operational risks.
		Contamination of surface watercourses	4	4	16	Uncertainty due to amount of fluid potentially reaching the surface, depends on where casing failure occurs.		2	2	4	Spill possible at surface likely contained within cleared drill pad area and emergency response plan implemented to control further spread of spill impacting surrounding areas.
2, 3, 5	Loss of containment of gas or oil while testing	Contamination groundwater	3	3	9	Uncertainty due to amount of oil or gas released during testing that is not contained. Presence of surface water unpredictable due to ephemeral nature of water courses	• Hi-lo valves on all high-pressure wells (low pressure wells exempt); • Remote telemetry monitoring on all gas wells, injectors and select oil wells; • Emergency response plan; • Ensure regular testing and monitoring of emergency shutdown valves, detection and control systems to ensure adequate protection; • Immediately clean-up and remediate any surface spills in the bioremediation pits; • Location and volume of any spill recorded and details of remediation undertaken; and • Maintain register of spills/leaks.	2	2	4	Shut down valves to limit release of oil onto surrounding soil and thus limiting extent of contamination. Emergency response plan to mitigate any impacts arising from an incident.
4	Release of liquid hydrocarbons to flare pits	Contamination of surface water	3	2	6	Uncertain to how much liquid hydrocarbon released to pit.	• Monitor flare pits for any signs of hydrocarbon contamination; • Immediately clean-up and remediate any contamination surface soil in the bio-remediation pits; • No hazardous chemicals or hydrocarbons stored near to flare pit; and • Maintain register of spills/leaks.	2	2	4	Contamination contained within flare pit, routinely checked and remediated if required. Excess hydrocarbons likely to be burnt by constant flare.
2, 4, 5, 6, 8, 9, 12, 13	Injection of produce water into the target producing formations	Groundwater contamination from cross flow into non-target aquifers	4	3	12	Potential for contamination of different aquifer zone depending on well bore casing integrity.	• Comply with all DPIR licences, permits and approvals; • Remote telemetry monitoring on all gas wells, injectors and select oil wells; • Ensure regular testing and monitoring of emergency shutdown valves; • Regularly test injection waters to ensure suitability for re-injection; • Avoid contact with air as much as possible to reduce oxygen levels in injection water to reduce corrosive effects; • Conduct compatibility studies prior to water injection; • Filter water to promote efficient injection into formation; • Monitor water quality of target and other aquifers periodically; • Test new polypropylene pipeline to design conditions; • Conduct regular inspections and regular maintenance of injection pipeline and equipment; • In the event of a spill or leak, follow appropriate emergency response procedures and record all information of the event, including size, location and issue; • Immediately clean-up and remediate any contaminated surface soil in the bio-remediation pits; and • Maintain register of spills/leaks.	2	2	4	Any incident or spill underground outside of target zone could have detrimental impacts that are difficult to remediate or mitigate immediately. Sealing individual formation layers will enable cross-contamination to be contained within section where cement failure occurred.
2, 5	Contamination of other aquifers by injection treatment chemicals (biocides, scale inhibitors, tracers)	Groundwater contamination from cross flow into non-target aquifers	5	3	15	Uncertainty due to quantity of treatment chemicals used and lost. Integrity of well bore casing. All chemicals and hazardous material used have individual risk assessments.	• Comply with all DPIR licences, permits and approvals; • Remote telemetry monitoring on all gas wells, injectors and select oil wells; • Ensure regular testing and monitoring of emergency shutdown valves; • SDS sheets available in site office and next to location of use and storage of any chemical on site; • Undertake regular inspection and maintenance of pipeline and injection equipment to prevent water leakage; • In the event of a spill or leak, follow appropriate emergency response procedures and record all information of the event, including size, location and issue; • Monitor fresh water aquifer quality.	2	2	4	Any incident underground could have detrimental impacts that are difficult to remediate or mitigate. Sealing individual formation layers will enable cross-contamination to be contained within section where cement failure occurred. Constant monitoring of well head pressure will reduce volume of contamination potential. SDS contain appropriate information on clean-up required in case of spill.
2, 4, 7, 10	Spills or leaks in transport	Localised contamination surface watercourses	3	3	9	Uncertainty in amount split or leaked, location of incident and current surface water at time of incident.	• Follow hazardous material storage, handling and transport procedures; • In the event of a spill or leak, follow appropriate emergency response procedures;	2	2	4	Therefore any surface spill will be contained and remediated without considerable extent of impacts.

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			C	L	Risk Rating			C	L	Risk Rating	
	pipeline network of PFW						• Removal all contaminated material to bio-remediation pits; • Immediately clean-up and remediate; and • Maintain register of spills/leaks.				Emergency response plan to remediate impacts from spill outside of control.
		Contamination of groundwater	3	1	3	Average depth of groundwater in the OL area is greater than 200m.		2	1	2	Due to high evaporation rates and depth of groundwater table, it is probable that it will not impact on groundwater resources.
2, 5	Spill of water flood tracer in transport	Localised contamination of surface watercourses	3	3	9	Uncertainty in amount of fluid spilt or leaked; location of incident and current surface water at time of incident.	• Follow specific operating procedures for working with tracer's materials; • Undertake regular inspection and maintenance of plant and equipment to prevent water leakage; • Use of non-radioactive tracer; • In the event of a spill or leak, follow appropriate emergency response procedures; • Remove any contaminated material to bio-remediation pits; • Record location, volume and remediation techniques used for any spill; • SDS for tracer chemical kept in site office and at storage and use locations; • Immediately clean-up and remediate; and • Maintain register of spills/leaks	2	2	4	Emergency response plan to remediate impacts from spill outside of control. Human error or incident that may cause spill.
		Contamination of groundwater	3	1	3	Average depth of groundwater in the OL area is greater than 200m.		2	1	2	Due to high evaporation rates and depth of groundwater table, it is probable that it will not impact on groundwater resources.
13	Extraction of water from groundwater reservoirs	Depletion of groundwater supplies	3	3	9	Groundwater table is approximately 230m (taken from a crestal well) from the surface and there are no clearly defined groundwater dependant ecosystems present. However, there is potential for interconnectivity of surface and groundwater in locations due to variation in underground aquifer connectivity.	• Comply with all DPIR licences, permits and approvals; • Minimise water use and wastage where possible; • Where possible and suitable, reuse process and/or camp waste water in preference to extraction of additional ground waters; • Undertake regular inspection and maintenance of plant and equipment to prevent water leakage; • Annual environmental audit of the field to inspect for signs of vegetation stress potentially linked to groundwater extraction rates (determined from visual inspection coupled with static water level monitoring results and groundwater quality testing); • Monitor extraction quantity quarterly; • Monitor extraction water quality and static water level; • In the event of substantial drawdown, consider placing new bore or lowering extraction rate; and • Obtain authorisation from the DPIR prior to undertaking any works on a water bore or sinking any new water bores.	4	1	4	Continual monitoring will provide early warning signs of aquifer depletion. However, any damage done will be difficult to remediate as it occurs underground.
2, 4, 10	Overflow of interceptor and/or evaporation pond due to heavy rainfall events	Contamination of surface water	4	3	12	Evaporation ponds contain hydrocarbons and high salinity water due to PFW and evaporation concentration. Dependent on location and direction of spill, i.e. which side of evaporation ponds overflow, and presence of surface water.	• Ensure suitable pond operating levels are maintained; • Implement measures to maintain sufficient freeboard e.g. dispose of excess water off-site, use of temporary grisly ponds to increase evaporation, or incinerator to remove excess water; • In the event of a spill or leak, follow appropriate emergency response procedures; • Remediate contaminated soil in the bio-remediation pits; • Record location, timing and extent of any spill; • Monitor current and forecast climatic conditions from weather; and • Maintain register of spills/leaks.	3	1	3	Emergency response plan to remediate impacts from breach in evaporation pond outside of CTP control. All mitigation measures taken to ensure evaporation ponds do not overflow.
7,10, 11	Storage and disposal of contaminated soil in bioremediation-pits	Localised contamination of surface watercourses	3	2	6	No recorded contamination outside of bioremediation-pits to date. Pits are located on a rise away from any drainage or watercourse lines in a stable area.	• Only dispose of wastes as approved and regulated by DPIR; • Record all quantity and type of waste transported to bioremediation-pits; • Periodic ripping and addition of fertilizer in bioremediation pits; • Loose, uneven surface encourages water infiltration instead of run-off; • Ensure bioremediation-pits have sufficient bunding to contain 1 in 100-year flood event.	2	1	2	All waste to remain within bioremediation pits, area fenced off from fauna or third-party access. In extreme events, rainfall may cause overtopping of bioremediation pits and transfer contamination off site. In these cases, the emergency response plan details appropriate mitigation measures.
7, 10	Storage and transportation of domestic wastes	Localised contamination of surface water	2	3	6	Depends on material classified as domestic waste and adequacy of waste receptacles.	• Ensure that appropriate housekeeping standards are maintained and that all rubbish is stored in appropriate containers; • Waste streams separated; • Ensure rubbish collection is periodically removed by NT EPA approved and licensed contractor to nearest licensed waste facility for disposal; • Ensure pest/scavenger access to wastes in minimised using covers and fauna proof lids; • Ensure waste management areas are fenced to minimise stock and wildlife access and reduce wind transport; and • Ensure waste management areas are positioned away from watercourses and drainage lines.	2	1	2	All waste stored in appropriate area and bunded accordingly. Emergency response plan to accommodate for any spills outside of these areas. Transport by licensed contractors and so responsibility of waste containment is theirs from collection.
7, 10	Spill of chemical waste during transport for disposal	Localised contamination of surface watercourses	3	3	9	Uncertainty depending on location of spill and amount spilt, time to remediation, soil type present and surface water.	• Only dispose of wastes as approved and regulated by DPIR; • Have relevant SDS at storage location and in vehicle transporting the wastes; • Any transport across state or territory borders to comply with NEPM 2013 guidelines; • Transport by NT EPA approved and licensed waste disposal contractors; • All transport around site, chemical waste to be in a sealed and bunded container; • Appropriate spill kits located in storage and transfer location; • Records of all chemical waste transported within and from site for disposal to be recorded; • Documents signed by external contractor for release of wastes once collected for transport;	2	2	4	Possibility for unpredictable spill or leak caused during transport, mitigated through emergency response plan. External contractor to be suitably qualified to transport the wastes.

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
							• Records of all spills kept including volume, type of material, time and remediation carried out; • Only DPIR approved wastes disposed in the bioremediation-pits.				
6, 7, 8, 9, 10	Spills or leaks associated with sewerage plant chemicals storage and handling	Contamination of surface watercourse	3	3	9	Uncertainty due to volume and type of chemical spilt; climatic condition and location.	• Ensure appropriate measures are in place (e.g. lining, bunding) to prevent spill of leak of sewerage system chemicals during storage or handling; • SDS available in site office and at storage location; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out.	2	2	4	Ephemeral nature of watercourses in the area and distance between sewerage treatment facilities and water courses make this an acceptable risk. Industry best practise techniques utilised in sewerage treatment facility and all chemicals used are stored in bunded containers and clearly labelled.
10	Spills or leaks associated with the treatment and disposal of sewerage in septic tanks or to earthen pits	Contamination of surface watercourse	3	3	9	Dependant on amount of spill and level of treatment undergone before spill. High evaporation rate and limited numbers of onsite staff will keep most spills impact to localised areas directly in contact with the spill.	• Monitor treatment facilities for any spills, leaks or damage to equipment; • Ensure appropriate measures are in place (e.g. lining, bunding) to prevent fluids or other wastes entering the surrounding environment; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • In the event of a spill or leak, section off the area and follow appropriate emergency response procedures for remediation; • Ensure all DPIR licenses and approvals are followed; • Routinely monitor sewerage sludge storage and disposal facilities; • Use NT EPA approved and licensed waste disposal contractor for removal of all sewerage sludge; • Immediately clean-up and remediate area with wastes transported to earthen pit or bioremediation pits; and • Maintain register of spills/leaks.	1	2	2	Ephemeral nature of watercourses in the area and distance between sewerage treatment facilities and water courses make this an acceptable risk. Industry best practise techniques utilised in sewerage treatment facility.
6, 7, 9, 10, 11	Incorrect hazardous waste segregation and disposal	Contamination of surface watercourse	4	4	16	Dependant on the amount, type and location incorrectly disposed wastes. Surface water availability will also impact the spread of contamination if it occurs.	• Ensure appropriate measures are in place (e.g. lining, bunding) to prevent fluids or other wastes from impacting surrounding environment; • Use of NT EPA approved and licensed contractor to dispose of hazardous wastes; • All wastes to be inspected and signed off by licensed waste contractor for off-site disposal; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • In the event of a spill or leak, follow appropriate emergency response procedures; • Appropriately segregate and store (within bunded areas, etc.) hazardous goods; • SDS available in site office and near intermediate waste storage facility; • No unregulated disposal of wastes	2	2	4	Emergency response to mitigate any spills that occur due to accidents. Waste inspected and signed off by external appropriately qualified contractor for disposal.
2, 4, 5, 8	General operations use of roads and access tracks for routine operations e.g. wells monitoring, production testing	Sedimentation of surface watercourses	4	4	16	This is particularly relevant in OL4 where the soils are predominantly highly erodible and there exists a series of interconnected streams and drainage lines. OL5 is dominated by sand dunes with soils having a high infiltration rate and generally lower erodibility.	• Stick to designated speed limits as signed; • Use of water trucks around high traffic areas as required to control dust; • Surrounding water course and drainage channels annually assessed to ensure sedimentation levels are not increasing.	2	2	4	As watercourses are ephemeral, increased sediment load is unlikely to impact the health of flora and fauna using the creeks when they are in flow (due to increased turbidity etc.). It may change the flow pattern slightly or increase flooding potential. Acceptable risk as all reasonable measures have been taken to reduce risk of occurring.

7.6.5 General Environmental: Social

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
1, 3, 4	Earthworks	Dust generation impacting surrounding stakeholders.	2	3	6	All earthmoving operations will create dust. The extent, duration, location and timing of works adds uncertainty to the amount of dust created. Low external population and surrounding stakeholders.	• Carry out earthworks in accordance with approved CTP standards and procedures; • Plan activities to minimise new land disturbance and make use of existing disturbance (where possible); • Conduct Job Hazard Analysis for any new task or new use of equipment to ensure appropriate control measures are identified; • Implement dust control measures where appropriate including use of water trucks.	2	1	2	Due to the dry arid environment at MRN, even with the utilisation of water trucks it is still likely that dust will be created during construction and maintenance works. However, the risk is acceptable as all means have been taken to actively control the total amount of dust production.
3, 4, 6, 7, 9	Explosion or fire at the ESS or CTP	Danger to health and safety of employees, contractors and possibly the public	5	4	20	Dependent on extent of fire and amount of fuel accessible at time of incident within each facility. Location or part of process where incident takes place and amount of staff within vicinity.	• Appropriate fire management and control equipment available; • Use of non-intrinsically safe material only allowed inside the facilities if accompanied by a gas detector; • All staff and visitors accessing the facilities must be inducted into the emergency response plan for each facility; • Ensure regular testing and monitoring of emergency shutdown valves, fire protection,	2	2	4	All mitigation measures implemented to reduce likelihood of fire occurring, in unlikely case of fire, emergency response plan mitigates impacts

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
							detection and control systems to ensure adequate protection; • Ensure adequate firefighting equipment available and personnel trained in its use; • Run emergency drills regularly; • Maintain at least a 4 m wide fire break around all operational areas; • Monitor internet based websites for current fires, fire risk and weather conditions; •Test emergency warning system daily; •Implement fuel and chemical handling and storage measures; • Control weeds within CTPL and ESS; • Implement fire prevention and control measures; • Implement emergency response plan.				
10	Burning of wastes	Uncontrolled fire impacting health and safety of workers and contractors	3	3	9	Dependant on wind speed and direction; and climatic conditions and vegetation growth in the surrounding environment.	• Controlled burning of approved waste to only occur within the burn pit under conditions as stipulated by DPIR license to do so; • At least one staff member to monitor fire until it is finished; • Maintain fire break buffer of at least 4 m around perimeter of burn pit; • Check weather forecast to make sure low wind and not in fire danger period; • Wind sock in clear view from burn pit; • Monitor wind direction by observing wind sock; • Ensure all staff are made aware of when burning of waste is to be conducted; • Ensure adequate firefighting equipment available and personnel trained in its use; • Implement fire prevention and control measures; and • Implement emergency response plan if required.	3	1	3	All measures taken to reduce potential for fire from waste burning, emergency response plan available if the fire becomes uncontrolled.
10	Process waste disposal	Incorrect handling and disposal of naturally occurring radioactive materials (NORMS) (Health effects.)	4	3	12	Depends on nature, concentration and number of NORMS.	• Ensure that all waste materials generated from activities are managed in accordance with site or activity-specific waste management plans or procedures; • SDS available in site office and at storage and use locations; • No unregulated disposal of wastes; • Only staff trained in storage, use and handling of NORMS can do so.	2	2	4	Waste management procedure to handle all wastes appropriately and disposal of in the right location.
7	Travel and access on site	Dust generation impacting surrounding stakeholders.	2	3	6	There will be minimal movement of large vehicles associated with general routine activities. Any large movement of vehicles or predicted change in the number of vehicle movements around site and this value will need to be re-assessed.	• Implement dust control measures where appropriate; • Drive to speed limits as signed; • Journey management plans approved by CTP; • Use of water trucks to control dust around high traffic volume areas and staff.	1	3	3	Due to the dry arid environment at OL area, even with the utilisation of water trucks, it is still likely that dust will be created during routine travel. However, the risk is acceptable as all means have been taken to actively control the total amount of dust production.
6, 9, 10, 11	Incorrect hazardous and flammable material/wastes handling and disposal	Fire, explosion causing danger to health and safety of employees, contractors and possibly the public	4	3	12	Uncertain due to the variation of flammability of hazardous material stored and used on site. Climatic conditions and vegetation growth will impact on the spread and intensity of fire.	• Ensure appropriate measures are in place (e.g. lining, bunding) to prevent hazardous material from leaving storage or designated use areas and entering surrounding environment; • Ensure that where drips and leaks occur, corrective actions are raised and repairs are undertaken in a practical timeframe – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out; • In the event of a spill or leak, follow appropriate emergency response procedures to remediate as soon as possible; • Store flammable material separately and of sufficient distance from staff and infrastructure; • Ensure wind sock is visible from flammable stores area; • SDS available in site office and at storage and use locations; • Maintain fire breaks of at least 4m around flammable material stores; • Regularly test and maintain emergency shut off valves; • Transport and off-site disposal of flammable and hazardous waste to be undertaken by appropriately qualified contractors; • Appropriately segregate and store (within bunded areas, etc.) hazardous and flammable goods; • No unregulated disposal of wastes).	2	2	4	Emergency response plan to mitigate against any fire or explosion that occurs outside of CTP's control; due to external factors or accident. Appropriate storage, handling and use of hazardous and flammable material will restrict potential for uncontrolled fire occurring.

7.6.6 General Environmental: Air

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
1, 2, 4, 5, 7, 11	Movement of heavy machinery and vehicles	Dust generation	2	4	8	There will be minimal movement of large vehicles associated with general routine activities. Any large movement of vehicles or predicted change in the	• Implement dust control measures where appropriate including water trucks; • Remote location unlikely to impact on surrounding users; • Vegetation in no-use area to be left undisturbed;	1	2	2	Due to the dry arid environment at the OL area, even with the utilisation of water trucks, it is still likely that dust will be created during daily operations, construction and maintenance works. However, the risk is acceptable as all

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
						number of vehicle movements around site will require re-assessment of this value.	• Low ground cover (<10cm) to be maintained on low traffic areas and around well heads to maintain fire safety while minimising dust.				means have been taken to actively control the total amount of excess dust production from operations in the OL area..
3	Loss of containment of gas or oil (pipeline rupture or leaks from plant equipment)	Atmospheric pollution (gas)	3	3	9	Low residential or other industrial processes/ developments in the area. Any release of gas will be dispersed into the surrounding unpolluted atmosphere and be negligible. Greenhouse gas emissions are recorded. Potential for localised impacts on air quality to staff in the OL area.	• Operate pipelines in accordance with operational procedures; • Implement the pipeline integrity management program; • Hi-lo valves on all high-pressure wells (low pressure wells exempt); • Remote telemetry monitoring on all gas wells, injectors and select oil wells; • Undertake regular inspection of pipeline easements for weeds or leaks/spills and rectify where detected; • Regularly monitor performance of cathodic protection devices to ensure adequate protection; • Regularly pig pipelines to remove water and sludge accumulated at low points within pipelines; • Conduct periodic pipeline integrity surveys as appropriate (including coating defect, metal loss, intelligent pig, and/or 3rd party intrusion surveys); • Test and maintain emergency shut-off valves; • Ensure all fittings and equipment are routinely checked and maintained; • Ensure that any spills, leaks or points of excessive wear are appropriately reported and the necessary maintenance work and control measures undertaken without delay – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out.	2	2	4	Potential for release of gas to occur, remote monitoring and emergency shut off valves to reduce extent of impacts in remote location, so gas loss will be negligible in impacts to surrounding stakeholders or the environment.
4, 5	Release of gas associated with compressor failure	Atmospheric pollution (gas)	3	3	9	Uncertainty as to how much gas processed in the OL area dependant on demand. If demand significantly increases or other industry develops in the vicinity of the OL area, this will need to be reassessed.	• Ensure that any spills, leaks or points of excessive wear are appropriately reported and the necessary maintenance work and control measures undertaken without delay – if any delays occur, provide drip trays or absorbent material until repair and maintenance work can be carried out. • Ensure regular testing and monitoring of emergency shutdown valves, fire protection, detection and control systems to ensure adequate protection; • Operate in accordance with operational procedures; • Ensure all fittings and equipment are routinely checked and maintained.	2	2	4	Currently the plant operates under small production of gas which is mainly used for re-injection. Therefore, there would only be a small release of gas from compressor facility and remote location so impacts to environment and surrounding land users will be minimal.
1, 2, 3, 4, 5, 6, 7, 8, 9, 10	Explosion or fire on lease (during operations)	Release of particulate emissions to the atmosphere	2	4	8	Depending on time of year and climatic conditions will determine the intensity and damage done by fire. Remote location so impacts from airborne particulates will be localised; remote distance to surrounding stakeholders.	• Implement fire prevention and control measures; • Maintain fire breaks of at least 4 m around all operational areas; • Implement emergency response plan; • Implement weed and vegetation control at operational sites; • Excess dead vegetation matter from clearing or other, disposed of in designated burn pit under conditions of DPIR approval to do so; • Appropriate fire management and control equipment available; • 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; • Up to date information on current fire danger, presence of fire in the area and current weather condition from government websites.	2	1	2	All mitigation measures implemented to reduce likelihood of fire occurring. In unlikely case of fire emergency, response plan mitigates impacts. Remote location and low vegetation in arid environment will limit extent and potential impact on external parties from particulate matter. No surrounding industry lowers potential cumulative impacts of airborne particulates.
2, 5	Well blowout	Atmospheric pollution (gas release)	3	3	9	Uncertainty as the impacts will depend on the amount of gas released. Blow out preventer fitted as standard.	• Install, maintain and routinely test blow-out preventers (BOPs) and related well control equipment on all workover rigs; • Install wellhead cellars on all oil wells; • Hi-lo valves on all high-pressure wells (low pressure wells exempt); • Remote telemetry monitoring on all gas wells, injectors and select oil wells; • Keep cellars free of oil and rubbish and maintain covers to prevent or minimise fauna and livestock access; • Implement fuel and chemical handling and storage measures; • Inspect production and suspended wells regularly including tubing and annulus pressures and evidence of communication; • Implement emergency response plan.	2	2	4	Remote location not likely to directly impact any surrounding stakeholders, amount of gas lost recorded and accounted for in greenhouse gas emissions records.
2, 5	Loss of containment of gas on workover or testing	Atmospheric pollution	3	3	9	Uncertainty due to amount released.	• Well pressure constantly monitored for any drop indicating well failure; • Implement emergency response plan; • Ensure regular testing and monitoring of emergency shutdown valves, detection and control systems to ensure adequate protection; • Record any loss of gas in greenhouse gas register.	2	2	4	Remote area, gas emissions lost recorded in greenhouse gas emission inventory records. Emergency shut off valves to quickly isolate and stop release of gas.
4	Fugitive emissions from the process plant	Atmospheric pollution	2	3	6	In remote area with no other producers surrounding, impacts will likely dissipate in the atmosphere.	• Ensure regular testing and monitoring of emergency shutdown valves; • Remote telemetry monitoring on all gas wells, injectors and select oil wells; • Operate in accordance with operational procedures; • Any fugitive emissions are recorded on the greenhouse gas emissions record; • Ensure all fittings and equipment are routinely checked and maintained; and • Ensure that any points of excessive wear are appropriately reported and the necessary maintenance work and control measures undertaken without delay.	1	2	2	Acceptable as any emission will have small environmental impact and be readily remediated.

ID	Causes	Potential Impacts	Risk Analysis			Valuation and Uncertainty	Mitigation Measures	Residual Risk			Acceptability
			C	L	Risk Rating			C	L	Risk Rating	
2, 4, 5	Flaring from process plants or during testing	Excessive emissions to atmosphere (greenhouse gases)	2	4	8	In remote area with no other producers surrounding, impacts will likely dissipate in the atmosphere.	• Implement weed and vegetation control around flares to prevent bushfires; • Flaring to occur within specifically built flare pits; • Minimise gas venting to atmosphere and flaring by: - Restricting remote production of oil wells and tying them into the gathering system so that associated gas is recovered; - Limiting flaring of associated gas from the Eastern Satellite Station to a maximum rate approved by the Regulator by choking back production of high gas to oil ratio (GOR) oil wells; - Limiting flaring of LPG from the CTP by maximising the hydrocarbon dew point in the sales gas; and - Maximising liquid hydrocarbon recovery to tanks and vessels (instead of flaring). • Record amount of gas to flare in greenhouse gas register; • Keep updated with current weather conditions and bushfire risk; • Ensure adequate firefighting equipment available and personnel trained in its use; • Implement fire prevention and control measures; and • Implement emergency response plan if required.	2	2	4	Acceptable as is an unavoidable process required in the oil and gas extraction at MRN. All efforts made to ensure complete combustion and reduce contamination of the flare gas.
10	Inappropriate waste segregation for burning of wastes	Release of atmospheric pollutants from burning incorrect wastes	3	3	9	Dependant on staff adherence to waste segregation policy. In remote area with no other producers surrounding, impacts will likely dissipate in the atmosphere.	• Controlled burning of approved waste to be undertaken in purpose built enclosure following conditions of DPIR approval; • Check weather forecast to make sure low wind and low fire danger; • Ensure all staff are made aware of when burning of waste is to be conducted; • Burning of waste to be monitored until finished; • Ensure adequate firefighting equipment available and personnel trained in its use; • Segregate waste to ensure only approved waste is burned; • Implement fire prevention and control measures; and • Implement emergency response plan if required.	2	2	4	Only approved waste burnt so no chemicals or hazardous material released.

8 ENVIRONMENTAL OUTCOMES, PERFORMANCE STANDARDS AND MEASUREMENT CRITERIA

The following environmental management plans (EMP) have been developed to specifically protect and ensure the integrity of the existing and surrounding environment identified in Section 7 from risks from operations in the OL area. They provide:

- Environmental Objectives;
- Environmental Performance Standards; and
- Measurement Criteria.

The principles and practises developed in these EMPs are based on Ecologically Sustainable Development (EcSD). These management plans aim to provide measurable procedures and practises, implemented at defined frequencies to reduce the identified risks in Section 7 to residual risks that are ALARP and acceptable by CTP management and the DPIR for operations to proceed. This will ensure that the operation of MRN in the OL area will have the minimal negative environmental impact as possible, and at completion of operations, the environment within the OL area will be returned to a suitable landscape conductive to future rehabilitation success.

There will be continual stakeholder engagement and consultation throughout the operation of the OL area and implementation of the EMP's 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.

These EMPs are legally binding documents and CTP will provide full disclosure of these EMPs and result of audits and conformance checks against these EMPs to the DPIR as required.

8.1 Ecological Sustainable Development

Ecological Sustainable Development is a concept based on implementing practices and principles that meet the needs of people today without impeding on future generations to meet theirs. There is no universally accepted definition of EcSD however the Commonwealth Government of Australia suggested the following definition of EcSD in Australia:

- 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).

CTP will implement the concept of EcSD into all aspects of their operations at MRN.

The aim is to utilise the natural environment to meet the current needs of CTP without jeopardising it for future CTP operations or other land managers. All aspects of environmental impacts will be assessed and preventative and mitigation measures implemented from the start up to ensure that all aspects of the OL area are managed and developed in accordance with the EcSD concepts.

Forward planning and adaptation of EcSD concepts from inception of development will ensure that the environmental impacts of operations at MRN are minimised throughout the life span of CTP's occupation and for future land managers

8.2 Environmental Objectives and Outcomes at MRN

CTP operation standards requires that environmental objectives be developed, each with corresponding targets against which performance can be measured.

Table 8-1 provides the environmental objective and outcomes for each environmental aspect potentially impacted by operations at MRN:

- Biodiversity – Flora and fauna;
- Land and soil – Erosion and sediment control;

- Water – Hydrology and hydrogeology;
- Waste – Operational and produced;
- Air and noise – Emissions, vibration and lighting;
- Fire – Bushfire and operational; and
- Culture and heritage – Indigenous and non-indigenous.

Table 8-1 Environmental objectives and outcomes for the MRN

BIODIVERSITY – Flora and fauna	
ENVIRONMENTAL OBJECTIVE	
To prevent a loss of biodiversity because of activities conducted in the OL area through adoption of EcSD principles and practices.	
Environmental outcomes	
1	Minimise injury to native fauna
2	No unauthorised loss or disturbance to native flora, fauna and fauna habitat
3	Weed species spread and occurrence controlled as per NT and Commonwealth government requirements; and no new species introduced
4	No increase in level of predator species
5	Reduce or have no increase in level of introduced fauna
6	Register and Closeout of Correcting Actions (RCCA) maintained and up to date
7	No interference with fauna
LAND AND SOIL – Erosion and sedimentation	
ENVIROINMENTAL OBJECTIVE	
To prevent land degradation because of activities conducted in OL area.	
Environmental Outcomes	
1.	Control erosion and sedimentation on OL area
2	New roads and cleared areas to be approved and appropriate environmental clearances conducted
3	Construction, maintenance and any clearing to follow erosion and sediment control best practice guidelines as stipulated by the DENR and IECA
4	No new erosion and/or sedimentation issues
5	Any erosion and sedimentation control device to be designed and constructed following DENR and IECA guidelines and best practice principals
6	Maintain and conserve the integrity of nutrient rich top soil
7	Reduce wind borne erosion
8	Ensure EcSD principles and practises are employed
WATER – Hydrology and Hydrogeology	
ENVIRONMENTAL OBJECTIVES	
To prevent surface and ground water degradation, contamination or alteration because of activities conducted in the OL area by following EcSD principles and practises.	

Environmental outcomes	
1.	Maintain natural drainage patterns and flow lines
2.	No contamination to ground or surface water
3.	No impact on downstream water courses
4.	No increase in sediment loads in existing watercourses
WASTES – Operational and Produced	
ENVIRONMENTAL OBJECTIVES	
To ensure all waste streams generated in the OL area are dealt with and contained; to have minimal impact on the environment.	
Environmental Outcomes	
1.	No uncontrolled releases of wastes
2.	No fauna interaction with waste
3.	Waste streams separate and stored appropriately for offsite disposal as required
4.	Handling and disposal of waste by appropriately licensed contractor
5.	No unregulated release of wastes
AIR AND NOISE – Emissions, Vibrations and Lighting	
ENVIRONMENTAL OBJECTIVES	
To minimise the adverse effects on air quality and noise to surrounding receptors from the operation in the OL area.	
Environmental Outcomes	
1.	No uncontrolled release of gas
2.	No unauthorised flaring of gas
3.	No open flames
4.	Smoking restricted to designated areas
5.	Noise complaints register maintained and accessible to surrounding stakeholders
6.	All vehicles running at optimum performance
7.	No increase in levels of airborne soil particulate matter
8.	No impact to human health
9.	No loss of air quality due to fire
FIRE – Natural and Operational	
ENVIRONMENTAL OBJECTIVES	
To minimise the adverse effects on people, infrastructure and the surrounding receptors from fire, either caused by operations in the OL area or natural causes.	
Environmental outcomes	
1.	No death or injury to human life or health from fire
2.	No impacts to infrastructure

3.	No excess damage to surrounding environment from operations at Mereenie
HERITAGE AND CULTURE – Indigenous and Non-indigenous	
ENVIRONMENTAL OBJECTIVES	
To ensure that all heritage and culturally significant sites are identified and protected within the OL area.	
Environmental outcomes	
1.	No impact to registered heritage or culturally significant site or object
2.	No impact to unregistered heritage or culturally significant site or object
3.	No unauthorised clearing or access

8.2.1 Biodiversity – Flora and Fauna

Table 8-2 outlines the implementation of mitigation and preventative measures to reduce biodiversity risks identified in Section 7 to ALARP in the OL area.

Table 8-2 Implementation strategy for mitigation and preventative measures to reduce biodiversity risks in the OL area

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
Zero off road driving	Routine inspection of the OL area and well pads to include visual assessment of any off-road driving. Any off-road driving to be reported to the supervisor and investigated.	Journey management Plan (v5)	Superintendent	Records of attendance by all employees	Annual External
No speeding	Zone designated speed limits unless authorised (e.g. emergency)	Journey management Plan (v5)	Superintendent	Records of any off-road driving and corrective action taken	Annual External
No driving at night time unless authorised (e.g. emergency)	All vehicles to remain parked between sunset to sunrise	Health, Safety, Security and Environment Handbook	Superintendent	Records of any no conformance and corrective actions taken	Annual External
No driving under the influence of alcohol, BAC = 0	Random BAC testing to cover all drivers, frequency of at least 4 times per year	Drug and Alcohol Policy	Superintendent	Records of testing results	Annual Internal
Zero fauna fatalities	Fauna fatalities register to be filled in for each incident or near miss and appropriate action taken to reduce potential for further incidents, e.g. speed zone	Health, Safety, Security and Environment Handbook	Superintendent	Fauna fatalities register	Annual External
No fauna access to waste	All waste receptacles to have secure lids to prohibit fauna access or interference	Waste Management Plan	Superintendent	Monthly records of checks	6 Months Internal; Annual External

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
No weeds in areas where fill has been used	All fill sourced from approved borrow pits on site; weed free. Routine site inspection to look for emergence of weeds and remove or spray accordingly.	Weed Management Plan	Superintendent	Any fill brought to site to have a weed free certificate	Annual External
No new infestations of weeds	Disturbed areas checked for emergence of weeds, and removed or dealt with in accordance with DENR and WoNS guidelines	Weed Management Plan	Superintendent	Records of six-month checks	Annual External
No spills or leak of hazardous material into surrounding environment	All hazardous waste stored in designated bunded area, with appropriate spill kit and SDS. Any spill recorded in RCCA for remediation action implementation	Chemical – Hazardous Materials Management Procedure	Superintendent	Map showing location of hazardous waste storage	Annual External
No unauthorised land clearing	Clearance from DPIR, CLC and/or AAPA before any new clearing works undertaken.	Land Disturbance Policy	Superintendent	Records of clearance for any land clearing works	Annual External
No unauthorised third-party access	Travel management plan filled in and submitted to site supervisor before arrival. Visitor to report to camp on arrival. Records of all visitors and staff inducted and compliant with site policies.	Health, Safety, Security and Environment Handbook / Journey management Plan (v5)	Superintendent	Records of all travel management plans. Sign in sheets maintained. Records of inductions show 100% attendance	Annual Internal
All spills or leaks of hazardous material to be remediated	Adequate remediation of spills or leaks in conformance to NEPM 2013 guidelines. RCCA maintained and updated	Chemical – Hazardous Materials Management Procedure	Superintendent	Records showing location; type of spill; cause; amount and remediation effort	Annual External
Scheduled vehicle maintenance and safety checks	As a minimum, all vehicles serviced to vehicle manufacturer specifications and frequency requirements; and Northern Territory Motor Vehicle	Journey management Plan (v5)	Superintendent	Vehicle log books maintained	Annual Internal

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
	registry standards. Weekly safety checks				
No feeding of local fauna	Records of all staff inducted and compliant with site policies. Routine observations to record if increased presence of fauna occurring and corrective actions and staff briefing taken.	Health and Safety policy	Superintendent	Records of all staff inductions	Annual Internal
All areas no longer required for safe operation rehabilitated	Commence to rehabilitate disturbed areas within 12 months of decommission. As a minimum rehabilitated surface to: • Be deep ripped if heavily compacted or surface scarified if not; • Surface left rough to encourage water pooling and seed collection; • Run rips or any furrows along the contour; • Whoa-boys or diversion bunds installed in accordance with DENR or IECA guidelines on slopes greater than 3%; and • Final surface profile to match surrounding topography.	Rehabilitation Plan	Superintendent	Records of all areas rehabilitated and works carried out	Annual External

8.2.2 Land and Soil – Erosion and Sedimentation

Table 8-3 outlines the implementation strategy for mitigation and preventative measures to reduce land and soil risks in the OL area to ALARP.

Table 8-3 Implementation strategy for mitigation and preventative measures to reduce risks to the land and soil in the OL area.

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
No unauthorised clearing	Clearance from DPIR, CLC and/or AAPA before any new clearing works undertaken.	Land Disturbance Policy	Superintendent	Records showing third party approval to clear	Annual External
Location of top soil mounds clearly marked and less than 1.5m high	Top soil stored in low profile mounds (<1.5m) and irrigated if stored for more than six months	Land Disturbance Policy	Superintendent	Records to indicate location of top soil mounds and planned long term management	Annual External
Zero off road driving	Routine inspection of the OL area and well pads to include visual assessment of any off-road driving. Any off-road driving to be reported to the supervisor and investigated.	Journey management Plan (v5)	Superintendent	Records of any incidents and details of corrective actions taken	Annual External
No unauthorised third-party access.	Travel management plan filled in and submitted to site supervisor before arrival. Visitor to report to camp on arrival. Records of all visitors and staff inducted and compliant into site policies.	Health, Safety, Security and Environment Handbook	Superintendent	Records of all travel management plans. Sign in sheets maintained. Records of inductions show 100% attendance	Annual Internal
All areas no longer required for safe operation rehabilitated	Commence to rehabilitate disturbed areas within 12 months of decommission. As a minimum rehabilitated surface to: • Be deep ripped if heavily compacted or surface scarified if not; • Surface left rough to encourage water pooling and seed collection;	Land Disturbance Policy	Superintendent	Records of location of rehabilitation works, work undertaken and timing.	Annual External

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
	• Run rips or any furrows along the contour; • Whoa-boys or diversion bunds installed in accordance with DENR or IECA guidelines on slopes greater than 3%; and • Final surface profile to match surrounding topography.				
All erosion and sedimentation control devices compliant with DENR and IECA best practise guidelines	Install erosion and sediment control devices in accordance with DENR and IECA guidelines to: • Slow surface water on slopes greater than 3%; • Divert water into the surrounding environment to encourage natural sheet flow; • Sediment catch drains installed (to stop sediment flowing into water courses); • Reference the DENR or IECA guidelines for a full list or control devices and how to install.	Land Disturbance Policy	Superintendent	Records of works undertaken with reference to relevant guidelines. Checks undertaken to ensure integrity after significant rainfall events	Annual External
No windrows or concentration points.	Inspection of all access tracks, roads and cleared areas within the OL area to ensure no windrows or concentration points.All erosion gully heads removed and flattened to encourage laminar flow and	Land Disturbance Policy	Superintendent	Photo records to indicate no concentration points and gully heads.	Annual External

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
	reduce further development of erosion.				
Landform consistent with surrounding environment, no blocking of drainage channels or water courses.	Restore drainage channels and water course to original alignment and elevation after construction where applicable.	Land Disturbance Policy	Superintendent	Photo records of drainage channel condition before and after disturbance works	Annual External
Ensure no new erosion or sedimentation occurs on rehabilitated surfaces after first significant rainfall	After significant rainfall inspect rehabilitated surfaces to ensure that there is: • No erosion; • No sedimentation; • No blocking of drainage lines; and • An indication of vegetation growth.	Environmental Monitoring Handbook	Superintendent	Records of checks and any works conducted after significant rainfall.	Annual External
All staff inducted to this FEMP	Inductions to show 100% attendance and compliance with this FEMP	Health, Safety, Security and Environment Handbook	Superintendent	Records show attendance by all staff	Annual Internal

8.2.3 Water – Hydrology and Hydrogeology

Table 8-4 outlines mitigation measures and their implementation to reduce the risks identified in section 7 to water in the OL area to ALARP. Groundwater extraction is recorded by inline flow meters every three months. Quality is tested daily in the camp kitchen; all other areas are tested weekly. There is an impermeable layer between the fresh water and stone aquifer and the target gas containing formation with produced water. If predicted operations changed on the OL area or a spill or incident occurred that may have the potential to impact of hydrology in the area, a specifically designed ground and surface water sample program would be developed.

Table 8-4 Implementation strategy for m**itigation and preventative measures for water management in the OL area**

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
No clearing works or disturbance to affect long term stability of existing drainage channels or water courses	Clearance from DPIR before any clearing works are undertaken.	Land Disturbance Policy	Superintendent	Photo records of before and after disturbance. Any consultation with third party consultants.	Annual External
No long-term impact to groundwater resources in the area.	Regular testing of groundwater quality, extraction volumes and static water level recorded. Results of testing, analysed to show no impact.	Water Management Plan	Superintendent	Annual recording of SWL in any bores used for extraction and a nearby monitoring bore. Record of groundwater quality sample analysis and quarterly extraction rates.	Bi-annual external audit on groundwater extraction, water quality samples and extraction rate.
No uncontrolled or unregulated release of wastes.	Waste discharge license from NT EPA and approval by affected stakeholders before any release of wastes into surrounding environment that will impact areas off the OL area.	Waste Management Plan	Superintendent	As per NTEPA licensing requirements. Document location and type of any uncontrolled release and actions taken.	Annual Internal
No waste or hazardous material stored with potential for impact on water courses.	All hazardous waste stored in designated bunded areas, with appropriate spill kit and SDS. As a minimum no hazardous waste to be stored within riparian buffer zones as stipulated by DLRM.	Chemical – Hazardous Materials Management Procedure	Superintendent	Record location of hazardous waste storage.	Six months Internal; Annual External
No unregulated disposal of grey water	All grey water treated in existing sewerage systems	Waste Management Plan	Superintendent	Record any breaches as observed.	Annual External

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
All staff inducted to this FEMP	Inductions to show 100% attendance and compliance with this FEMP	Health, Safety, Security and Environment Handbook	Superintendent	Records show attendance by all staff	Annual Internal

8.2.4 Waste – Listed and Non-listed

Table 8-5 outlines mitigation and preventative measures and their implementation to reduce the risks identified in section 7 from waste in the OL area.

Table 8-5 Implementation strategy for mitigation and preventative measures for waste management in the OL area

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
No fauna access to waste	All waste receptacles fitted with fauna proof and secure lids	Waste Management Plan	Superintendent	Record all waste receptacle lids fitted; photos.	Annual External
All waste separated and stored appropriately in accordance with this FEMP.	Routine inspection of waste storage area to ensure all waste are in the appropriate place. All waste removed by an approved NT EPA contractor.	Waste Management Plan	Superintendent	Photo and document showing waste separation requirements and locations	Annual External
All waste not requiring routine removal to be stored in waste management area for either re-use or ultimate disposal offsite.	Excess material stored in designated waste management facility area.	Waste Management Plan	Superintendent	Record of all waste in waste management area	Annual External
Final waste disposal off-site	Waste removed by appropriately licensed and NT EPA approved contractor (where required)	Waste Management Plan	Superintendent	Record all waste removed, date and by whom	Annual Internal
All waste removed from site recorded	Quantity and type of waste removed from site recorded. Waste streams monitored to	Waste Management Plan	Superintendent	Record quantities of waste removed	Annual Internal

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
	ensure all waste is appropriately removed.				
Only approved waste burnt in designated burn pit.	Appropriate waste burned in designated burn pit under suitable climatic conditions – low wind.	Waste Management Plan	Superintendent	Records of conditions when burning carried out and what is burnt.	Annual External
Minimise increase in predator species and introduced fauna.	Fauna monitored around waste storage sites to show no sign of increased numbers.	Waste Management Plan	Superintendent	Records of any increased fauna activity around waste sites	Annual External
No increase in invasive flora, NT declared weeds or WoNS in waste disposal area	Regular site of inspection for emergence of weeds or invasive species. Any weed species identified to be removed following specific management plans i.e. mechanically or chemically.	Weed Management Plan	Superintendent	Records of any weed or invasive flora species identified in wastes storage areas	Annual External
No unregulated disposal of NT EPA listed waste	All listed waste disposed of in accordance with the NT EPA listed waste register	Waste Management Plan	Superintendent	Records of any disposal of listed waste and volumes	Annual External
All hazardous waste material to be separated in the appropriate area for disposal according to their SDS, this FEMP and the hazardous goods register.	Visual inspection and results of external and internal annual audits indicate all hazardous waste stored in appropriate location.	Managing Hazardous Chemicals Workplace Risk Assessment	Superintendent	Records of all SDS and storage in accordance with recommendations	Annual External
All waste to be stored in appropriately bunded area.	Visual inspection of storage locations and records indicate compliance. Bunding for tank storage of waste in a storage facility should be 120% of total volume of largest tank for non-flammable and 133% for any flammable material; away from drainage lines.	Waste Management Plan	Superintendent	Records and photos of all waste storage locations.	Annual External

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
	Bunding for storage of wastes material contained in drums needs to be at least 25% of the total volume of stored material per Australian Standards.				
The waste reduction hierarchy followed: • Reduce; • Reuse; • Recycle; and • Dispose	Records clearly show efforts made to reduce material imported to site and measures to re-use where possible or separation for recycling.	Waste Management Plan	Superintendent	Records of efforts to reuse, recycle and order only that which is required.	Annual Internal
No waste found outside of designated areas.	All waste generated to be placed in on-site waste receptacles.	Waste management Plan	Superintendent	Records of six monthly site check to ensure all waste in appropriate areas.	Annual External
No accumulation of waste in vehicles.	Vehicles cleaned before crew change; removing waste materials.	Traffic Management Plan	Superintendent	Records of any vehicle that is left in unkempt state.	Annual Internal
No contamination to soil from liquid waste containers.	Record shows active inspection of liquid waste containers and no leaks. External and internal annual audits show no sign of soil contamination.	Waste management Plan	Superintendent	Quarterly check of all liquid waste containers stored on site.	Annual External
Clean-up/spill kits in all relevant areas.	Visual inspection to indicate compliance.	Waste management Plan	Superintendent	Monthly record of check of all spill kits to ensure adequately stocked.	Annual External
All clean up material appropriately disposed for off-site disposal.	Records show location and removal of any clean-up materials in incident log report. Used clean-up materials appropriately contained for off-site disposal.	Waste management Plan; and Incident Investigation Procedure.	Superintendent	Records showing location and date when clean-up material was removed from site.	Annual Internal

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
All spills and/or leaks are remediated as soon as possible.	Records show clean-up procedures. Routine visual inspection of waste storage area to ensure no leaks or spills. If any spill or leak identified then appropriate action taken to rectify the problem as soon as possible. Records kept of remediation steps taken..	Waste Management Plan; and Incident Investigation Procedure.	Superintendent	Records of any spills and remediation works carried out	Annual Internal
All spills and leaks reported to the regulator as required.	Records show communication with DPIR if spill occurs and details of initial investigation and future investigations. A contaminated site investigation carried out with GPS reference point and soil sample locations for reportable incidents: • 300 L (80L inland waters) liquid hydrocarbon spill; or • 500 m^3 in gaseous form. All items on the RCCA closed.	Waste Management Plan; and Incident Investigation Procedure	Superintendent	Records of spill location, type and amount. Records of correspondence with the DPIR and timing. All remediation works carried out	Annual External
No unregulated disposal of wastes.	NT EPA waste discharge license before any waste disposed outside of or likely to impact receptor outside the OL area. Evidence of waste discharge license and conditions of approval if area outside of OL impacted.	Waste Management Plan	Superintendent	Copy of any NT EPA discharge license as required	Annual External
All staff inducted to this FEMP	Inductions to show 100% attendance	Health, Safety, Security and Environment Handbook	Superintendent	Records show attendance by all staff	Annual Internal

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
Visitors and contractors inducted depending on the nature of their work					

8.2.5 Air and Noise – Emission, Vibrations and Lighting

Table 8-6 outlines the implementation strategy for mitigation and preventative measures to reduce the air and noise risks identified in in the OL area to ALARP.

Table 8-6 Implementation strategy for mitigation and preventative measures to reduce air and noise risks in the OL area

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
No open flames or fires outside of designated areas	Burning of approved waste and gas flaring in designated area only. Routine site inspection to record any fires outside of designated area. If any fires or burning occur outside of the designated area then staff made aware of the incident and corrective actions taken.	MRN Operations Manual	Superintendent	Records show any incident of burning outside designated areas	Annual External
No smoking outside of restricted areas.	Smoking to only occur within designated smoking areas facilitated with appropriate waste receptacles and signage. If incident observed then corrective actions to be taken and recorded.	MRN Operations Manual	Superintendent	Records show any incidence of smoking outside designated area and action taken	Annual External
Minimise greenhouse gas/fugitive emissions.	Annual NGERS measurement criteria and reporting to include: • Gas to flare; • Emissions from plant and vehicles; and	MRN Operations Manual Environmental Monitoring Handbook	Superintendent	Daily monitoring and annual emissions report	Annual Internal

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
	• Any fugitive emissions. Records show routine inspection of all joints to ensure no leaks				
Noise complaints minimised	Active stakeholder engagement and complaints management through CLC. Noise complaints register maintained at camp. Consult with surrounding stakeholders when major operation will occur likely to impact air and noise quality. Consultation log shows active consultation with surrounding stakeholders on any potential noise increase and results of these consultations.	Community Landholder Consultation; and MRN Operations Manual	Superintendent	N/A due to remote location	-
No decrease in air quality due to increased inefficient vehicle emissions.	As a minimum standard, all vehicles serviced to vehicle manufacturer specifications and frequency. Ensure all vehicles compliant with Northern Territory Motor Vehicle registry regulations and work health and safety regulations. Consult with surrounding stakeholders when major operation will occur likely to impact air and noise quality. Consultation log shows active consultation with surrounding stakeholders on any potential	Journey management Plan (v5)	Superintendent	Log books maintained	Annual Internal

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
	noise increase and results of these consultations.				
.No decrease in air quality due to fires in the OL area.	Firefighting equipment available and serviced as required per original equipment manufacturer specifications. Firefighting equipment available at each facility, in all vehicles and adjacent to flammable material stores and handling areas. Only burning or flaring of gas in designated areas. No open flames outside of these areas. Smoking in designated areas with appropriate waste disposal facilities. Existing and new fire breaks maintained to keep at least 4 m clear around all infrastructures or at low vegetation cover (<10cm)	MRN Operations Manual	Superintendent	Records show serviced every six months. Six monthly check of fire break integrity; in August/September before fire season.	Annual External
All staff inducted to this FEMP.	Inductions to show 100% attendance	Health, Safety, Security and Environment Handbook	Superintendent	Records show attendance by all staff	Annual Internal

8.2.6 Fire – Natural and Operational

Table 8-7 outlines the implementation strategy for mitigation and preventative measures to reduce fire risks in the OL area to ALARP.

Table 8-7 Implementation strategy for mitigation and preventative measures to reduce fire risks in the OL area

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
No open flames or fires outside of designated areas.	Routine inspections to ensure that only approved waste burnt in designated burn pit under suitable climatic conditions i.e. low wind. Gas flared in flare pits with climatic conditions monitored.	MRN Operations Manual	Superintendent	Records show any incident of burning outside designated areas.	Annual External
No smoking outside of designated area.	Designated smoking area with appropriate waste receptacles.	MRN Operations Manual	Superintendent	Records show any incidence of smoking outside designated area and corrective action taken.	Annual External
No petrol vehicles on site.	Only diesel vehicles used in operations. Any petrol vehicle brought to site to have specific hazardous substance management plan developed.	Journey management Plan (v5)	Superintendent	Records of all vehicles on and accessing the site	Annual External
No combustible material stored around flare pit,	Regular inspection of the flare pit to maintain a cleared vegetation buffer of at least 4 m maintained. Combustible materials cleared from the area surrounding the flare pit (as per FESA/DPIR requirements)	MRN Operations Manual	Superintendent	Records of any combustible material in flare pit removed	Annual External

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
	Regular visual inspection of flare pit integrity. Ensure flare pit is constructed to best practise principles, bunded to contain flame and integrity maintained.				
Spread, intensity and duration of fire to be controlled appropriately.	SDS available and appropriate firefighting equipment next to all flammable material stores. Visual confirmation in external and internal audit. Staff trained in the emergency response procedures and basic firefighting skills.	Chemical - Hazardous Materials Management Procedure	Superintendent	Copies of SDS kept in office for any hazardous material used or stored on site.	Annual External
All staff trained in use of firefighting equipment	Records of all staff participating in regular fire and emergency drills. Firefighting equipment available and serviced as required per original equipment manufacturer specifications.	Emergency Response Plan	Superintendent	Records show fire drills carried out and at what frequency.	Annual Internal
Minimise volume of gaseous wastes to be flared where possible.	Records show efforts to re-use gas where possible to limit gas flaring. Volume of gas to flare monitored and flame adjusted to maintain full combustion.	Environmental Monitoring Handbook	Superintendent	Records indicating any change in gas to flare ratios.	Annual Internal

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
No transport or storing of flammable material within 25m of flare pit.	Visual inspection during external and internal audits with no flammable material stored within 25m of flare pit. Ensure vegetation stockpiles are stored away from ignition sources and in low profile mounds.	Chemical - Hazardous Materials Management Procedure	Superintendent	Photo evidence and records show no flammable material stored within 25m of flare pit.	Annual External
Complete combustion of gas to flare	Visual inspection of sparkler or other means to ensure flame stays on. Regular inspection of the flare pit to determine if any contamination occurring from unburnt fuel or external incidents.	Emergency Response Plan	Superintendent	As required, if any measures fail or require maintenance.	Annual Internal
Existing fire breaks maintained.	Fire breaks maintained to a minimum of 4m around any infrastructure.	MRN Operations Manual	Superintendent	Records every annual inspection of fire break and slashing if required	Internal and Annual External

8.2.7 Heritage and Culture – Indigenous and Non-Indigenous

Table 8-8 outlines implementation strategy for mitigation and preventative measures to reduce Heritage and Cultural risks in the OL area to ALARP.

Table 8-8 Implementation strategy for mitigation and preventative measures to reduce heritage and cultural risks in the OL area

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
No unauthorised third-party access.	Travel management plan filled in and submitted to site supervisor before arrival.	Journey management Plan (v5)	Superintendent	Records of all visitor sign in and travel management plans	Annual Internal

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
	Visitor to report to camp on arrival. Records of all visitors and staff inducted and compliant with site policies.				
No unauthorised clearing	Clearance from CLC, AAPA, and DPIR before any clearance works undertaken.	Land Disturbance Policy	Superintendent	Records of third party clearance for any new clearing works	Annual Internal
Zero illicit drugs and alcohol on site	Random checks of camp and offices	Cultural Heritage Management	Superintendent	Records of routine checks and any breach and corrective action taken.	Annual Internal
No unauthorised fire arms on site	Random checks of camp and offices. Access is restricted to licenced persons only. There is a usage log kept with the firearm. The firearm is kept secured at Mereenie and is registered and licenced to Central Petroleum's NT Corporate licence. The licence is current until 2022. Users of the firearm at Mereenie must have completed a government firearm course and obtain a special NT corporate licence which allows the user to access and use that firearm only. The firearm is subject to standard weapons licencing laws	Cultural Heritage Management	Superintendent	Record of usage log and staff licenses.	Annual Internal
No impact to cultural heritage sites	CLC and/or AAPA clearance required before any work occurs next to a previously unrecorded cultural heritage site.	Cultural Heritage Management	Superintendent	Records of any previously unidentified cultural or heritage site discovered.	Annual Internal

Mitigation Measure / Performance Standard	Measurement Criteria	Implementation Strategy / Procedure	Responsibility	Internal Recording	Internal/External Audits
Access by TOs at any time	All staff to allow access to the site by TOs at any time. TOs to notify the supervisor on shift that they will be accessing the site. Access is not to interfere with operation of the site.	Cultural Heritage Management	Superintendent	Records of TO access, numbers and reason	Annual Internal
All staff inducted to this FEMP.	Inductions to show 100% attendance and compliance with this FEMP.	Health, Safety, Security and Environment Handbook	Superintendent	Records of all inductions	Annual External

9 ENVIRONMENTAL MANAGEMENT IMPLEMENTATION SYSTEM

9.1 CTP Health, Safety and Environment Integrated Management System

The feasibility, planning and assessment of the MRN operations are undertaken within the framework of the CTP HS&E MS, which incorporates environmental management. CTP has specific operating procedures in place for the MRN operations that, along with the HS&E MS, form a system of operational control. These operating procedures are maintained as controlled documents and are available electronically.

The key elements of the CTP HS&E MS include:

- Matching of legal obligations to the practical needs of all operations;
- Assignment of responsibilities required to meet the commitments set out in the CTP HS&E MS Policy;
- A common measurement/audits process to check that standards are complied with;
- Encouragement of improvement in process and performance through feedback processes;
- Appropriate and comprehensive documentary support; and
- 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 or levels of documents:

- Standards;
- Policies;
- Procedures;
- Work instructions;
- Registers; and
- Other records and supporting documentation.

To provide for a comprehensive HS&E MS, the following Standards have been developed:

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 CTP. The following subsections outline the responsibilities allocated to key personnel.

Although it is everybody's responsibility to ensure the OL area's environmental standards are maintained, the Super Intendant at MRN is responsible for maintaining and implementing this FEMP. The General Manager of Operations is responsible for submitting new revisions of this document to the DPIR and the CLC.

9.2.1 Workforce

The permanent MRN workforce (approximately 30 people) works on a two-week on/off roster, with 15 permanent employees on site at any one time. None of the personnel live permanently on site. They drive in/out from Alice Springs, where several reside, and others fly to/from other Australian locations.

Visiting support staff and contract construction personnel can increase onsite number to 80; however, there are typically a total of 20 people on site. The main support services companies associated with MRN are:

- Oil transport – triple road tanker trucks operate every day, transporting oil from MRN;
- Seismic activities – covered by separate EMPs as required;
- Drilling activities – covered by separate EMPs as required;
- Catering at the camp;
- Waste management and removal;
- Vehicle maintenance; and
- Specific site projects and support.

9.2.2 CTP General Manager of Operations

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

- Ensure that the requirements of the FEMP are implemented and updated accordingly;
- Conformance with the CTP HS&E MS;
- Ensure required permits and approvals are in place and complied with;
- Internal and external audits are carried out bi-annually;
- Ensure that all environmental incidents are reported to the CTP management team and (where required) to the regulator;
- Ensure contractors HS&E systems are compliant with CTP's HS&E MS and this FEMP; and
- Ensure that appropriate communications are in place between CTP, the land owner and other stakeholders to keep them informed of project issues and developments that may affect their activities.

9.2.3 Mereenie Super Intendant

It is the responsibility of the Superintendent to:

- Ensure that all aspects of the FEMP for which he/she is responsible for are conducted (see Table 8-2 to Table 8-8);
- Ensure that all site construction vehicles are free of vegetative material and soil prior to mobilising to the site and records maintained.
- Ensure site inductions are provided to all personnel, contractors and visitors prior to, or immediately upon, entering the site, including maintaining records of all inductions;
- Ensure a site/project specific induction, including a *Site Orientation Checklist,* is conducted prior to any contractor commencing work on site, and
- 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.

9.2.4 CTP HS&E Coordinators / Environmental Engineer

It is the responsibility of the HS&E Coordinators / Environmental Engineer to:

- Work with the CTP General Manager of Operations and Mereenie Super Intendant 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 CTP General Manager of Operations and Mereenie Super Intendant to ensure contractors HS&E management systems comply with CTP's HS&E MS or a bridging document 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 CTP HS&E MS policies and procedures;
- Ensure compliance with all relevant legislative requirements;
- Maintain operating practices which meet CTP 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.

9.2.5 Operators / Contractors / Personnel / Visitors

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

- Follow CTP's procedures and work instructions;
- Complete CTP's registers and forms as required;
- Encourage improvement wherever possible;
- Promptly report all HS&E hazards, incidents and near misses to their immediate supervisor;
- Take all reasonable care to ensure his or her safety and that of other persons is never compromised;
- Report to work in a fit condition, i.e. not influenced by alcohol, drugs, fatigue or any condition that may affect the employee's ability to complete any assigned task in a safe and effective manner;
- Comply with CTP HS&E MS policies and procedures;
- Correctly use tools, equipment and personal protective equipment (PPE) in accordance with agreed safe work practices;
- 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 CTP HS&E MS standards;
- Cooperate with rehabilitation programs to assist in the recovery of work-related injury/illness; and,
- Actively participate in CTP HS&E MS and training initiatives.

9.3 Training and Awareness

CTP will take all steps to ensure ongoing training and awareness is conducted with all personnel and contractors. This will enable CTP, its workforce and contractors to cooperate effectively in developing and promoting measures to ensure an elevated level of HS&E knowledge and compliance.

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

- Compulsory site inductions;
- Activity specific inductions;
- Pre-start (Toolbox) meetings;
- Routine HS&E meetings and reports;
- Shift handovers; and

- Dissemination and display of HS&E related information.

Additional training will be provided on an as required basis.

9.3.1 Site Inductions

Site inductions are compulsory and are the key mechanism CTP employs to ensure all personnel, contractors and visitors are informed of CTP HS&E MS and this FEMP; including legislative responsibilities. As a minimum, CTP will ensure all personnel and contractors are trained in and are aware of the following CTP systems:

- Permit to Work system;
- Isolation and tagging procedures;
- Job Hazard Analysis (JHA);
- Remote communication equipment and procedures;
- Filed Operations Emergency Response Plan; and
- This FEMP.

Visitors will receive a limited site induction that covers emergency response and the key concepts of this FEMP. All visitors must be signed in by and be accompanied by a CTP representative always whilst on site unless a full site induction is provided.

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

9.3.2 HS&E Meetings

As a minimum, HS&E meeting will be held quarterly with all personnel, including all contractors and visitors that are onsite. 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;
- Itemise the key issues discussed at the meeting and agree on action items; and
- Assign a nominee to close out any action item, safety issue or other matter raised in the meeting.

All action items are to be transferred to the site RCCA for tracking and close out.

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

9.3.3 HS&E Reports

Mereenie Super Intendant will send a quarterly HS&E MS report to CTP Management including the CTP General Manager of Operations and CTP HS&E Coordinator for their review and comment. The quarterly HS&E MS report will include:

- HS&E meeting minutes;
- Site HS&E statistics;
- RCCA; and
- Results of emergency response 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 with those activities;

- Any hazards identified in the last 24 hours that may affect the work force or operations; and
- Any incidents or accidents that have occurred in the last 12 hours.

9.3.5 Shift Handovers

CTP 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;
- Any personnel or crew issues that the relief needs to be aware of; and
- Third party equipment or operation in the area.

9.3.6 HS&E Related Information

CTP makes relevant HS&E information available by display on the site safety notice board. This may include:

- Policies and environment and safety management documentation;
- Legislation, standards and guidelines;
- Emergency contact information;
- Appropriate signs relating to fire, safety and PPE requirements;
- Emergency evacuation plans;
- Safety alerts and technical bulletins;
- HS&E minutes; from weekly and monthly HS&E meetings or at a minimum quarterly meeting;
- Emergency response exercise reports; and
- The RCCA.

9.4 Monitoring

The Super Intendant is responsible for organising and reporting on all monitoring undertaken at the MRN. Section 8 describes the performance standards, measurement criteria and frequency of audits required to meet the environmental objective and targets set out in this FEMP (Table 8-1). A bi-annual audit, as minimum, will be conducted by a suitable qualified environmental consultant to ensure that these criteria are being met. Internal monitoring will occur at a frequency not later than once a year to ensure environmental compliance. The results of these audits will be reported on in the annual environmental report submitted to the DPIR.

The specific activities to be monitored in relation to potential impacts on environmental aspects are provided in Table 9-1.

Table 9-1 Monitoring requirements for the MRN

Activity	Monitoring	Frequency
Evaporation ponds	Quantity and composition	Weekly check of water levels to maintain free board. Checked during internal and third party environmental audit
Oil-water separator	Quantity and composition; records of amount removed	As required before off-site disposal. Checked in bi-annual environmental audit
Gas flare	Amount and frequency; greenhouse gas reporting	Automatically recorded daily
Oil to gas flare ratio	Composition monitored	Recorded daily. Regular checks by engineers at head office to address any problems
Waste streams	Amount in and out from site	As required, depending on activity, on site waste streams may require more frequent monitoring
Hazardous chemical register	Amount in and out from site	As required, dependant on activity
Any incidents affecting the environment	Incident specific monitoring to be detailed in the RCCA	As required
Sewerage water treated and amount removed or disposed on site	Quantity and frequency	As required
Erosion and sedimentation on site	Location and size	As required or during third party environmental audit
Presence of introduced fauna	General number and location	As required or during third party environmental audit
Change in presence or quantity of fauna, introduced or native	General number and location	As required or during third party environmental audit
Amount of waste burnt	Quantity and timing	As required
Bio-remediation pits	Amount of waste soil remediated, status and general site condition. Annual soil sampling	As required or during third party environmental audit to monitor concentration in soil

Activity	Monitoring	Frequency
Vehicle servicing	Quantity, frequency and location	As required, monthly statistics recorded
Weed wash downs and wash down site for weed growth	Quantity, frequency and location	As required
Groundwater extraction	Quantity recorded on flow meters, weekly testing of water quality	Daily summation of water extracted and weekly water quality testing for camp use
Gas reinjection	Quantity, frequency and location	Amount and location recorded daily
Waste receptacles	Ensure no fauna tampering with waste storage locations	As required or during third party environmental audit
Fauna strike	Number of injuries or mortalities from vehicle collisions	As required

9.5 Auditing

Environmental audits against the performance standards and measurement criteria set out in this FEMP to reduce the identified risk to ALARP and comply with CTPs environmental objectives are conducted annually (internal audits) and bi-annually, as minimum, by third party auditor. One audit is carried out internally by CTP's Environmental Coordinator and the other is conducted by a suitable qualified consultant.

The HS&E MS is comprised of many Management Standards and Hazard Standards. The auditing and assessment requirements are detailed in *HS&E MS 16 - Audit*. Each HS&E MS standard contains an auditor guide used to determine the level of implementation of and compliance with the standard.

Assessments of Mereenie operations against requirements of the HS&E MS are performed annually. Results of these assessments form the basis for targeted improvement initiatives.

Conducting audits by external assessors and conducting frequent internal self-checks, give a quantitative measure of statistics, which ensure operations meet and exceed environmental objectives and standards.

Corrective actions raised from audits and inspections are entered the audit database for action assignment and tracking of action progress to closure in the RCCA.

9.6 Continuous Improvement and Adaptive Management

CTP is committed to continual improvement and adaptive management in its HS&E MS performance. As a part of this process, the HS&E MS are annually reviewed for each operation and updated periodically as necessary. If a deficiency or shortcoming of the HS&E MS is identified a HS&E improvement plan (IP) will be developed. These plans are developed in accordance with *HS&E MS 04 - Improvement Plans (IP)* Policy.

The content of a HS&E IP must reflect the management of key environmental risks highlighted in this FEMP, be supportive of strategic improvement initiatives and objectives and targets, and highlight any improvement actions necessary to address compliance deficiencies and audit findings.

Regular review of any MRN HS&E IP's must be made indicating progress against the FEMP. Updates must be posted and be reviewed at site HS&E committee meetings as appropriate.

9.7 Incident and Non-conformance Management

CTP'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 CTP near miss/incident statistics, and
- Identify potential losses and suitable corrective actions.

It is CTP'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 CTP Management Standard *HS&E ME 15 - Incident Investigation*.

Environmental incidents that may arise during MRN operations include:

- Petroleum, produced water, chemical or sewage spills (including uncontrolled escapes);
- Fauna injury/fatality (vehicle collisions);
- Uncontrolled fire;
- Erosion and sedimentation process;
- Unapproved clearing of threatened flora species;
- Unapproved clearing of threatened fauna species habitat; and
- Identification and/or disturbance to cultural or heritage sites.

If a reportable incident occurs, work is to cease in the incident until advice is sought from the relevant government agency or suitably qualified consultant (except in case of fire, where available firefighting equipment will be used to control the fire and emergency response plan followed).

All environmental incidents and near misses that arise due to the presence of hazards on site are reportable to CTP management for inclusion in the RCCA. Environmental incidents defined under Section 14 of the *Waste Management and Pollution Control Act* will be reported as soon as possible (at most within 24 hours) to the regulator.

CTP will adhere to legislative incident reporting requirements in accordance with the NT *Petroleum Act 2016* and the *Schedule for Onshore Petroleum Exploration and Production Requirements 2016;* including reporting to the DPIR forthwith or as soon as practicable of an incident involving:

- Liquid petroleum spills greater than 300 L (80 L in areas of inland waters);
- Petroleum in a gaseous form greater than 500 m^3; and
- Uncontrolled escapes or ignitions of petroleum or any other flammable or combustible materials.

Incident and non-conformance data are summarised weekly with management review against performance objectives and targets and recorded in the RCCA. Incidents and investigation findings are reviewed at regular site HS&E communication meetings.

The RCCA process is used to record, track and close out incidents and non-conformances. The process also provides a mechanism to analyse the collated data and identify areas requiring improvement. Each incident is recorded, collecting the date, location, volume, substance, root cause, event descriptions; any required reporting to regulatory bodies, and the remedial actions taken.

9.8 Emergency Preparedness

CTP's emergency planning includes:

- Emergency response plan, manual and procedures;
- 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 MRN operations include:

- Spills – chemical or hazardous substance (particularly hydrocarbons and produced water);
- Plant explosion or failure;
- Fire (bushfire or because of operations);
- Medical; and
- External Communications (e.g. bomb threat).

CTP 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.

CTP's emergency response plan, manuals and procedures are reviewed and up-dated to incorporate additional information arising from incidents, near misses and emergency simulation training exercises

9.9 Communication

The CTP HS&E MS 07: *Consultation*, details the requirements for appropriate communication and consultation mechanisms. The standard includes requirements to establish and maintain communication links with employees, contractors and external stakeholders, including local communities, government agencies and other organisations.

Regular HS&E workgroup meetings are held at MRN to communicate and discuss HS&E issues. Standing agenda items include incident and RCCA review and HS&E IP status reporting. Regular communications are also held with external stakeholders (including DPIR and CLC). To facilitate this, a Contact Directory has been established and maintained for the MRN operations.

Reporting and notification of HS&E incidents to the appropriate government agency occurs as required.

9.10 Commitments Table

Environmental commitments are detailed in Section 8 for each environmental aspect.

10 REPORTING

10.1 Internal and External Routine Reporting

Activity specific reporting frequency and requirements are detailed in Table 8-2 to Table 8-8.The following reports and registers in Table 10-1 will be maintained and submitted to the DPIR as stipulated for compliance:

Table 10-1 Routine reporting frequency

Report	Internally Recorded	Submitted to the DPIR
Environmental Report	Updated 6 monthly – collating all daily, weekly and monthly reports	Annually
Corrective Action Register	As required	Annually
Close-out Reports	As required	3 months after completion
Incident and Contaminated Site Reports	As required	3 months after completion
Environmental Compliance Audit	Annually	Annually

10.2 Incident Reporting

External communication and internal incident management and reporting requirements are outlined in Sections 8 and 9.

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

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

10.2.1 Mereenie Oil and Gas Field Incidents

Incidents associated with the MRN are reported in accordance with the requirements of the *Schedule of Onshore Petroleum Exploration and Production Requirements 2016* (the Schedule), Part 2, Division 1 Section 214 as follows:

> *214 Petroleum and or chemical spill*
>
> *Where an escape or ignition of petroleum and or chemicals occurs, such action as is necessary to minimise the loss of petroleum and the pollution of the area and to protect persons and property shall be taken in accordance with an approved spill contingency plans and a report required by this Schedule shall be forwarded to the Minister.*

Other clauses under the Schedule should be referred to for reporting requirements in relation to:

- Emergency Response Plans (Part 2, Division 1 Section 203),
- Radiation monitoring (Part 2, Division 1 Section 213), or
- Serious property damage because of a potentially hazardous event (Part 2, Division 2 Section 287).

10.2.2 MASP Incidents

Reporting of incidents associated with the operation of the MASP shall be reported in accordance with the requirements of the:

- *Energy Pipelines Act* 2015, and
- Energy Pipelines Regulations 2015.

It is noted that as the MASP is mothballed, the likelihood of any reportable incident is low.

The following incident reporting clause of the Energy Pipelines Regulations 2015, Part 5 Section 43 is key:

> *43 Reportable Incidents*
>
> *(1) A pipeline licensee must give notice of a reportable incident for a pipeline under the licence in accordance with this regulation.*
>
> *(2) The pipeline licensee must give notice (either oral or written) of the incident, together with all material details of the incident that are reasonably available to the licensee, to the Minister or an inspector as soon as possible after the incident happens.*
>
> *(3) The pipeline licensee must give a written report of the incident to the Minister -*
>
> *(a) If the Minister specifies a reasonable period for giving the report -within that period; or*
>
> *(b) In any other case - as soon as practicable after the incident happens.*
>
> *(4) The report is to set out fully -*
>
> *(a) All the material facts and circumstances of the incident that the licensee knows or is able, by reasonable search and inquiry, to find out, including the following:*
>
> *(i) The date, time and place of the incident;*
>
> *(ii) The particulars of any loss or damage caused by the incident;*
>
> *(iii) If energy-producing hydro-carbons escaped from the pipeline or ignited - the amount of those energy-producing hydro-carbons and the measures taken to control the escape or fire;*
>
> *(iv) The cause of the incident;*
>
> *(v) The repairs (if any) carried out, or proposed to be carried out, for the pipeline; and*
>
> *(b) The corrective action that has been taken, or is proposed to be taken, to prevent another incident of that kind.*

10.2.3 Brewer Estate Incidents

If reopening of Brewer Estate occurs, all incidents associated with its operations shall be reported to the NT Pollution Hotline (ph. 1800 064 567). The Pollution Hotline is managed by DENR. The report shall be in accordance with the requirements of the:

- *Waste Management and Pollution Act* 2016; and
- Waste Management Pollution Control (Administration) Regulations 2013.

It is noted that as Brewer Estate is mothballed, the likelihood of any reportable incident is low.

The following incident reporting clause of the *Waste Management and Pollution Act* Part 3 Section 14 is key:

> *14. Duty to notify of incidents causing or threatening to cause pollution*

(1) *Where -*

(a) *An incident occurs in the conduct of an activity; and*

(b) the incident causes, or is threatening or may threaten to cause, pollution resulting in material environmental harm or serious environmental harm, the person conducting the activity must notify the Administering Agency in accordance with subsection (3) as soon as practicable after (and in any case within 24 hours after) first becoming aware of the incident or the time he or she ought reasonably be expected to have become aware of the incident.

(2) *Where -*

(a) An incident occurs in the conduct of an activity; and

(b) The incident causes, or is threatening or may threaten to cause, pollution resulting in material environmental harm or serious environmental harm, The person must not intentionally fail to notify the Administering Agency in accordance with subsection (3) as soon as practicable and in any case within 24 hours after first becoming aware of the incident.

(3) A *notification* under subsection (1) or (2) is to specify -

(a) The incident causing or threatening to cause pollution;

(b) The place where the incident occurred;

(c) The date and time of the incident;

(d) How the pollution has occurred, is occurring or may occur;

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

(f) The identity of the person notifying.

(4) It is a defence to a charge of committing an offence against subsection (1) or (2) if the defendant establishes that he or she believed, on reasonable grounds, that the Administering Agency had been notified of the incident before 24 hours after the person first became aware, or ought reasonably be expected to have become aware, of the incident.

(5) For the purposes of this section, "incident" includes -

(a) An accident, emergency or malfunction; and

(b) A deliberate action, whether or not that action was taken by the person conducting the activity in the course of which the incident occurred.

(6) Notification provided under subsection (1) or (2) is not to be used as evidence in proceedings before a court, other than proceedings for an offence against this section.

10.3 Operations Annual Environmental Reporting

Annual environmental reporting of the MRN operations is prepared for continual operational improvement and submitted to the DPIR for compliance. The scope of the report includes:

- Operational activity and facility changes;
- Significant environmental incidents;
- Environmental monitoring status and results;
- Closure activities (RCCA);
- Stakeholder engagement and results thereof;
- Environmental programs and studies; and
- Audits and regulator visits.

11 REHABILITATION MANAGEMENT PLAN

11.1 Scope

The rehabilitation management plan applies to the whole of the OL area, including:

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

11.2 Objectives

- Remove all infrastructure and decommission plant
- Return all disturbed areas to a safe and stable landform as close as possible to the surrounding environment
- Ensure final landform is conductive to the re-establishment of native vegetation
- No residual contamination
- No land management issues for future land managers

11.3 Environmental Actions and Monitoring

Table 11-1 summarise the environmental issues and requirements of decommissioning and rehabilitation.

Table 11-1 Rehabilitation and closure plan management and monitoring

Activity	Factors Assessed/Actions	Timing
Future land holders/managers	Agreement for infrastructure or disturbed areas to be left for future land holders/managers at their request	Before rehabilitation works commence
Decommissioning	• Removal of all above ground infrastructure • Removal of rubbish • Re-spread vegetation • All RCCA items closed out to satisfaction of the DPIR	Within 12 months of site/infrastructure closure
Soil Stability	• Return soil profile with top soil replaced as final layer; • Remove any flow concentration points that may block overland sheet flow; • Re-instate natural drainage channels; • Ensure all cleared areas have a rough surface to aid in water catchment; • All compacted areas to be deep ripped; and • Erosion and sedimentation devices maintained and installed as appropriate to best practise guidelines by the DENR and IECA	Within 12 months of site closure
Revegetation	• Allow for natural passive re-seeding; and • Assess within 12 months and apply active re-seeding if inadequate growth	To be assessed 12 months after rehabilitation completed

Activity	Factors Assessed/Actions	Timing
Monitoring	Assess against pre-disturbance photo monitoring points and vegetation survey results, so to bench mark against in later surveys. The following monitoring program is proposed: • Immediately after rehabilitation works completed: *Check for integrity of works and ability for future rehabilitation success*; • Following first wet season: *Stability of soil, landform, vegetation type and re-growth and appearance of weeds*; • One year after rehabilitation*:* *Re-vegetation success*; • Three years after: *Soil stability, landscape and vegetation re-growth and type after several wet seasons*; and • Five years after: *Long term rehabilitation success measured by landform stability and vegetation re-growth.* Photo monitoring and vegetation surveys conducted at each monitoring event to compare progress	As prescribed

11.4 Reporting

Submit to the DPIR an annual report with information regarding:

- Total area rehabilitated;
- Photo monitoring points GPS locations and results;
- Any areas left in an agreement with future land holders/managers;
- 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;
- Any issues noticed and remedial actions taken (RCCA); and
- Monitoring of contaminated sites (RCCA).

12 STAKEHOLDER CONSULTATION

The following sections need to be considered in relation to seeking approvals for new or amended projects or activities and operations within the OL area. A register is maintained that details all stakeholder consultation, engagement and issues. CTP has ongoing consultation arrangements with the DPIR, local Indigenous communities, and the CLC.

There are 3 agreements which Central Petroleum Mereenie as trustee for the Central Petroleum Mereenie Unit Trust (**Central**) entered into with the CLC and/or respective land holders. They are:

1. Mereenie Joint Venture Central Land Council Agreement – Deed of Assignment and Assumption;
    a. Under which Central assumed a 50% interest in the Central Land Council Agreement dated 28 Feb 2003 relating to the renewal of the Mereenie Leases
2. *Deed of Assignment of Lease (Tnorala Aboriginal Corporation)* dated 19 August 2016
    a. Tnorala Aboriginal Land Corporation is headlessor over land comprised in Certificate of Title Volume 772 Folio 458 being NT Portion 937
    b. The Conservation Land Corporation is lessor of the land (outlined in (a) above) pursuant to Lease No. 237621; and
    c. Under the Deed of Assignment (attached), Central assumed a 50% interest in Sublease No. 750620 dated 28 August 2008, which sublease was granted by the Conservation Land Corporation and is for a term commencing 1 March 2008 and expiring 9 October 2089.
3. Deed of Assignment of Lease (Uruna Aboriginal Land Trust; Ntaria Aboriginal Land Trust; Roulpmaulpma Aboriginal Land Trust; Haasts Bluff Aboriginal Land Trust; and Ltalaltuma Aboriginal Land Trust (together the **Aboriginal Land Trusts**);
    a. The Aboriginal Land Trusts are registered proprietor of land detailed in the table at recital A of the Deed;
    b. Under the Deed of Assignment, Central assumed a 50% interest in Lease No. 163476 between Santos QNT Pty, Santos Limited and the Aboriginal Land Trusts dated 3 June 1958 for a term commencing 1 June 1985 and expiring on the date of expiry of the Mereenie Lease.
    c. This relates to the Mereenie Pipeline.

12.1 NT Government Approval

This FEMP has been designed to meet the DPIR requirements for an Environmental Plan – as detailed in the document *Petroleum (Environmental) Regulations.* Should this document be reviewed, the FEMP must also be reviewed and, if required, amended.

This FEMP has been developed to cover the principal activities and projects undertaken at the MRN operational areas. However, there may be a requirement, on occasion, to amend activities or seek approvals for new projects or activities that may not be covered under this FEMP.

If:

- An amendment is required to an existing exploration or production activity, or
- A new activity or project is proposed;

The Schedule of Onshore Petroleum Exploration and Production Requirements 2016 will be reviewed for approvals requirements.

The following Sections of the Schedule relate to approvals:

- Section 501 – Approval to Drill.
- Section 502 – Approval of Drilling Equipment.

- Section 528 – Approval to Abandon or Suspend a Well.
- Section 601 – Approval for Production Equipment and Safety Systems.
- Section 619 – Approval to Vent or Flare.
- Section 703 – Approval to carry out Geological and Geophysical Survey.

12.2 Approvals Process

Approval for a revised or new process is required when:

- It is stipulated under the Schedule, and the activity is covered by this FEMP. In this event the application would simply request approval and state that the hazards will be controlled as per the approved FEMP; or
- It is stipulated under the Schedule, but the approved FEMP does not cover the hazards that could arise from the proposed activity / project. In this case there will be a need to provide additional supporting information on the management of hazards with the approval request.

To define the process for providing the DPIR additional project-specific information for new projects / programs at MRN, an Activity Specific Environment Plan template has been developed. This is provided in Appendix 3. The template is based on *HS&E MS09.5 Environmental Impact Assessment and Approvals*, and sets out the information to address the DPIR's requirements for an *Onshore Environmental Plan*:

- Description of the Project Activity.
- Description of the Project Environment.
- Reporting (activity specific).
- Consultation.

It is noted that for a significant activity / project change, the NT Government may require assessment under the *Environmental Assessment Act 2013,* i.e. the preparation of a Public Environmental Report or Environmental Impact Statement. This could also be initiated if the Commonwealth assessment process is triggered, as discussed below.

12.3 Commonwealth Approval

A check needs to be made in relation to any future activity or project on whether the Commonwealth *Environment Protection and Biodiversity Conservation Act* (EPBC Act) 1999 is triggered. The *EPBC Act* provides that certain actions, especially actions that may have a significant impact on defined 'matters of national environmental significance' (MNES) outlined below, are subject to an assessment process and may require approval from the Commonwealth Environment Minister.

The seven MNES defined under the *EPBC Act* are:

1. World Heritage properties;
2. RAMSAR wetlands;
3. Nationally threatened species and ecological communities;
4. Migratory species;
5. Commonwealth marine areas;
6. Nuclear actions (including uranium mining); and
7. National and Commonwealth heritage places (as of 1 January 2004).

In addition to the above, actions that may have a significant impact on Commonwealth land (even if taken outside Commonwealth land), and actions taken on Commonwealth land that may have a significant impact on the environment generally, are also covered by the *EPBC Act*.

The approval process is initiated by preparing a Referral under the *EPBC Act*, which would be used to determine the level of assessment (if any further is required). If it is determined through the Referral process that an action does require the Minister's approval, i.e. is a Controlled Action under the *EPBC Act*, then that action must be assessed. As a bilateral agreement is in place with the NT government,

the NT can assess the action under the terms of the agreement. However, in the assessment process, the Commonwealth will also consider whether any conditions (additional to any Territory conditions) should be required to meet any specific Commonwealth requirements, e.g. to protect any listed Commonwealth flora or fauna species.

As part of the Referral process, an *EPBC Act* PMSR needs to be prepared for the area of interest, supported by any survey or other work as considered necessary to enable assessment of whether any MNES have been triggered. Appendix 2 contains a PMSR prepared for a line between two coordinates (10 km buffer) covering the extent of current operations at MRN. The results have been discussed in Section 5.

12.4 Traditional Owner Approvals

Approval from the TOs is required for any activities at the MRN operations involving ground disturbance, including survey work, drilling, construction of petroleum gathering and processing facilities, access roads, pipelines and camp and ancillary facilities. This requirement is detailed under Clause 5.2 and Clause 5.3 of the Mereenie Agreement (2003), which is a legal agreement between Santos, CTP and its Joint Venture partners and the CLC (the body corporate representing the TOs).

As part of this approval process, inspection by TOs and/or a professional archaeologist may be required to finalise locations for proposed activities involving ground disturbance (agreements in Appendix 1). Once locations are finalised, and prior to any site activity, further field inspection reports are undertaken for each location, in accordance with the CTP HS&E MS.

12.5 Stakeholder Management

CTP is committed to upholding its reputation. CTP 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.

In the case of new projects and activities, CTP will prepare Stakeholder Management Plans (SMP) to achieve the above objectives. The SMP is used by the project team to develop effective engagement and management of stakeholders.

The principal objectives of 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; and
- Establishment of a sense of ownership in the project by stakeholders.

Stakeholder identification regarding MRN was conducted early and the relevant stakeholders are as follows:

- Community;
- Landholders (in this case indigenous, CLC);
- Indigenous;
- Government;
- Other key non-commercial external stakeholders (e.g. NGOs and industry bodies);
- Industrial Relations stakeholders;
- Other commercial external stakeholders; and
- Internal stakeholders.

Stakeholder engagement during this project involved many engagements:

- Public release of key documents;

- Stakeholder needs survey;
- Project newsletters;
- Public displays;
- Staffed Environmental Impact Statement displays;
- Regular updates to central website;
- Fact sheets;
- Project sustainability reports;
- 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; and
- Other direct and indirect engagement mechanisms.

12.6 Stakeholder Approvals:

In the case of MRN, the stakeholders needing to formally approve of plant operations are as follows:

Land authority stakeholders

- Central Land Council
- Urunga Aboriginal Land Trust
- Ntaria Aboriginal Land Trust
- Roulpmaulpma Aboriginal Land Trust
- Haast Bluff Aboriginal Land Trust
- Ltalaltuma Aboriginal Land Trust

Industry stakeholders

- United Oil and Gas Co
- CANSO Resources Limited
- Oilmin N.L.
- Petromin No Liability
- Transoil
- Farmout Drillers
- International Oil Proprietary
- Moonie Oil N.L.

Signed approvals along with the most recent complete approved stakeholder certificate are in Appendix 1.

12.7 Communication Log

All correspondences between CTP and stakeholders is recorded in the stakeholder communication log which is provided in Appendix 8.

12.8 Written Responses from Stakeholders

To date there have been no written response or grievances from stakeholders against CTP. There have been no incidents or complaints made that CTP have need to address. If a written or verbal response grievance is lodged then CTP will take all means to address the issue and mediate an effective solution.

12.9 Ongoing Stakeholders Consultation

CTP conduct the following routine and ongoing consultation with stakeholders:

- Monthly discussions with CLC on any issues or changes;
- Local stakeholder engagement through employment of Traditional Owner Anslem Impu Jnr in operations
- Annual stand at the Alice Springs show;
- Continue to work closely with the AAPA on any new developments in the OL area or changes to AAPA policy and procedures; and
- Active notification of CTP programs and regular operation updates through media channels and the ASX

13 APPENDICIES

Appendix 1 Approved Stakeholder Agreements

[redacted]

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IN WITNESS WHEREOF the Parties have hereunto executed this Deed on the day and year first hereinbefore written.

SIGNED FOR AND ON BEHALF of MAGELLAN PETROLEUM (N.T.) PTY. LTD. by JOHN SCOTT HUMPHREY its Attorney under Power of Attorney dated 26 JUNE, 1985 who hereby certifies he has no notice of revocation) of such Power of Attorney

J. Humphrey

SIGNED FOR AND ON BEHALF of UNITED OIL & GAS CO. (N.T.) PTY. LTD. by JOHN SCOTT HUMPHREY its Attorney under Power of Attorney dated 26 JUNE, 1985 who hereby certifies he has no notice of revocation) of such Power of Attorney

J. Humphrey

SIGNED FOR AND ON BEHALF of CANSO RESOURCES LIMITED by COLIN PHILLIP SMARTT its Attorney under Power of Attorney dated 25 JUNE 1985 who hereby certifies he has no notice of revocation) of such Power of Attorney

SIGNED FOR AND ON BEHALF of MOONIE OIL N.L. by PATRICK ALEXANDER MACKEY its Attorney under Power of Attorney dated 25 JUNE 1985 who hereby certifies he has no notice of revocation) of such Power of Attorney

SIGNED FOR AND ON BEHALF of TRANSOIL NO LIABILITY by PATRICK ALEXANDER MACKEY its Attorney under Power of Attorney dated 25 JUNE, 1985 who hereby certifies he has no notice of revocation) of such Power of Attorney

-6-

SIGNED FOR AND ON BEHALF)
of PETROMIN NO LIABILITY)
by PATRICK ALEXANDER MACKEY)
its Attorney under Power)
of Attorney dated)
25 JUNE, 1985)
who hereby certifies he)
has no notice of revocation)
of such Power of Attorney)

THE COMMON SEAL of CENTRAL)
LAND COUNCIL was hereunto)
affixed by the authority of a)
resolution of the Council in)
the presence of:)

CENTRAL LAND COUNCIL
COMMON SEAL

SIGNED FOR AND ON BEHALF)
of FARMOUT DRILLERS N.L.)
by COLIN PHILLIP SMARTT)
its Attorney under Power)
of Attorney dated)
25 JUNE, 1985)
who hereby certifies he)
has no notice of revocation)
of such Power of Attorney)

SIGNED FOR AND ON BEHALF)
of INTERNATIONAL OIL)
PROPRIETARY by)
PATRICK ALEXANDER MACKEY)
its Attorney under Power)
of Attorney dated)
26 JUNE, 1985)
who hereby certifies he)
has no notice of revocation)
of such Power of Attorney)

(i) in the case of the Lessors:-

C/- Central Land Council,
75 Hartley Street,
Alice Springs N.T. 5750

Telex AA 81325

(ii) in the case of the Lessees:-

C/- Oilmin N.L.,
Level 23,
12 Creek Street,
Brisbane Qld. 4000

Telex AA41040

PROVIDED THAT the Lessors or the Lessees may change their respective address for service on not less than ten (10) days' notice to the other of them.

4.11 This Lease shall be binding upon and enure for the benefit of the Lessors and the Lessees and their respective successors and permitted assigns and the term "Lessors" and "Lessees" shall be deemed, where appropriate, to include such successors and assigns.

4.12 Where a covenant or agreement is entered into herein by the Lessees then unless the context is to the contrary, such agreement or covenant shall bind each of the Lessees severally as tenants in common in the proportion of their respective interests in the pipeline licence referred to in the Third Schedule hereto which initially are to be Magellan 19.8%, United 13.2%, Canso 17%, Oilmin 21%, Petromin 7.5%, Transoil 9%, Parmout 6.25% and International 6.25%.

DATED this third day of June 1985.

IN WITNESS WHEREOF the Uruna Aboriginal Land Trust, the Ntaria Aboriginal Land Trust, the Roulpmaulpma Aboriginal Land Trust, the Haasts Bluff Aboriginal Land Trust and the Ltalaltuma Aboriginal Land Trust have hereunto affixed their common seals as Lessors this 7th day of June 1985.

THE COMMON SEAL of URUNA ABORIGINAL LAND TRUST was hereunto affixed in the presence of:

THE COMMON SEAL of NTARIA ABORIGINAL LAND TRUST was hereunto affixed in the presence of:

THE COMMON SEAL of ROULPMAULPMA ABORIGINAL LAND TRUST was hereunto affixed in the presence of:

THE COMMON SEAL of HAASTS BLUFF ABORIGINAL LAND TRUST was hereunto affixed in the presence of:

THE COMMON SEAL of LTALALTUMA ABORIGINAL LAND TRUST was hereunto affixed in the presence of:

The abovenamed Magellan Petroleum (N.T.) Pty. Ltd., United Oil & Gas Co. (N.T.) Pty. Ltd., Canso Resources Limited, Oilmin N.L., Petromin No Liability, Transoil No Liability, Parmout Drillers N.L. and International Oil Proprietary DO HEREBY ACCEPT this Lease of the Said Land to be held as Lessees and subject to the conditions restrictions and covenants above set forth.

THE COMMON SEAL of MAGELLAN PETROLEUM (N.T.) PTY. LTD. Was hereunto affixed in accordance with its Articles of Association in the presence of:

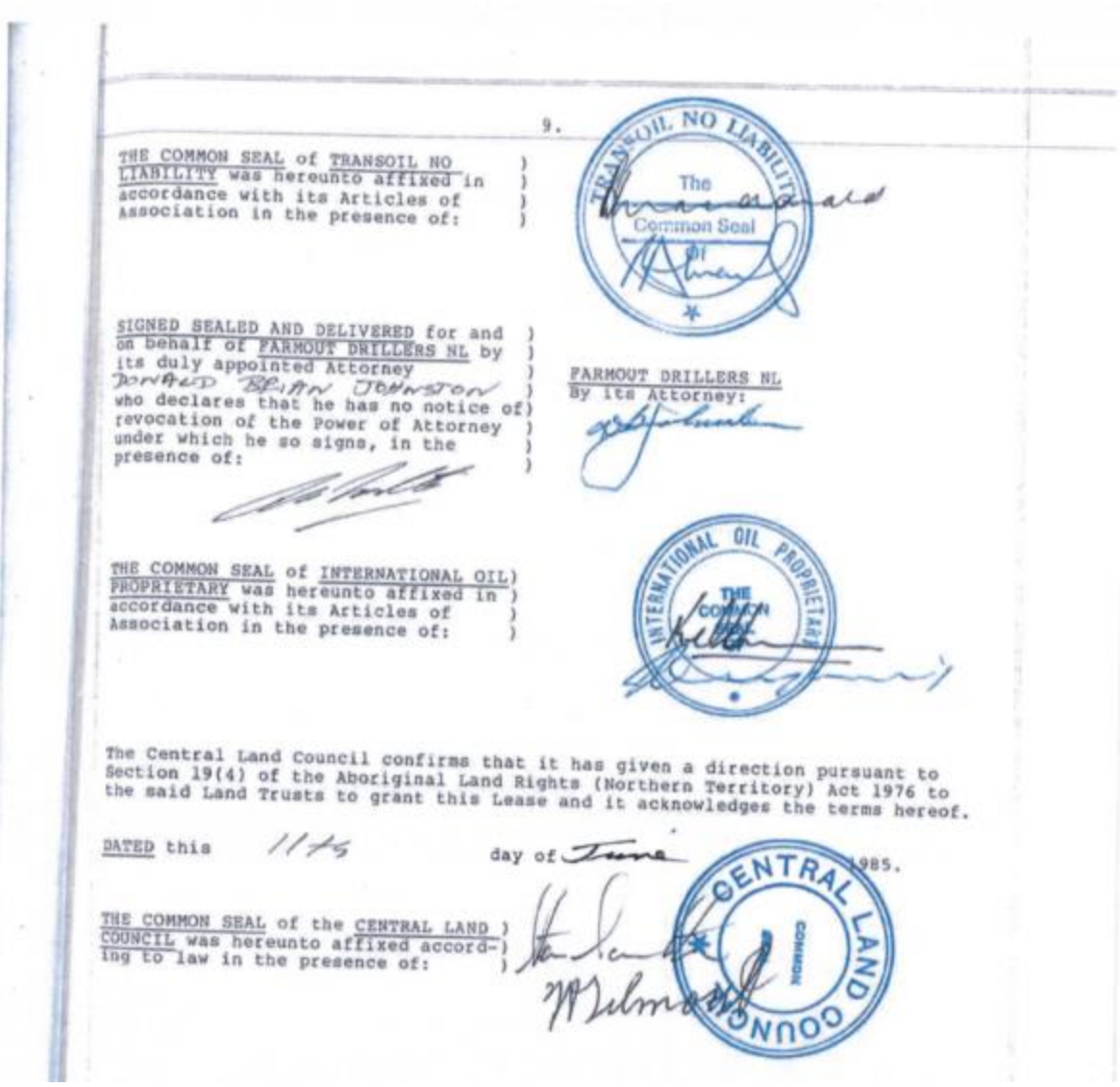
THE COMMON SEAL of UNITED OIL & GAS CO. (N.T.) PTY. LTD. was hereunto affixed in accordance with its Articles of Association in the presence of:

SIGNED SEALED AND DELIVERED for and on behalf of CANSO RESOURCES LIMITED by its duly appointed Attorney DONALD BRIAN JOHNSTON who declares that he has no notice of revocation of the Power of Attorney under which he so signes, in the presence of:

CANSO RESOURCES LIMITED
By its Attorney:

THE COMMON SEAL of OILMIN N.L. was hereunto affixed in accordance with its Articles of Association in the presence of:

THE COMMON SEAL of PETROMIN NO LIABILITY was hereunto affixed in accordance with its Articles of Association in the presence of:



9.

THE COMMON SEAL of TRANSOIL NO LIABILITY was hereunto affixed in accordance with its Articles of Association in the presence of:

TRANSOIL NO LIABILITY
The Common Seal

SIGNED SEALED AND DELIVERED for and on behalf of FARMOUT DRILLERS NL by its duly appointed Attorney DONALD BRIAN JOHNSTON who declares that he has no notice of revocation of the Power of Attorney under which he so signs, in the presence of:

FARMOUT DRILLERS NL
By its Attorney:

THE COMMON SEAL of INTERNATIONAL OIL PROPRIETARY was hereunto affixed in accordance with its Articles of Association in the presence of:

INTERNATIONAL OIL PROPRIETARY
THE COMMON

The Central Land Council confirms that it has given a direction pursuant to Section 19(4) of the Aboriginal Land Rights (Northern Territory) Act 1976 to the said Land Trusts to grant this Lease and it acknowledges the terms hereof.

DATED this 11th day of June 1985.

THE COMMON SEAL of the CENTRAL LAND COUNCIL was hereunto affixed according to law in the presence of:

CENTRAL LAND COUNCIL
COMMON

CENTRAL LAND COUNCIL

URUNA ABORIGINAL LAND TRUST

NTARIA ABORIGINAL LAND TRUST

ROULPMAULPMA ABORIGINAL LAND TRUST

HAASTS BLUFF ABORIGINAL LAND TRUST

LTALALTUMA ABORIGINAL LAND TRUST

MOONIE OIL PTY LTD

MAGELLAN PETROLEUM (N.T.) PTY LTD

UNITED OIL & GAS CO (N.T.) PTY LTD

CANSO RESOURCES PTY LTD

TRANSOIL PTY LTD

PETROMIN PTY LTD

FARMOUT DRILLERS PTY LTD

SANTOS EXPLORATION PTY LTD

DEED OF ASSIGNMENT AND CONSENT - MEREENIE PIPELINE LEASE

CORRS CHAMBERS WESTGARTH
Lawyers
Level 35, Waterfront Place
1 Eagle Street
BRISBANE QLD 4000
AUSTRALIA
Tel: (07) 3228 9333
Fax: (07) 3229 2844
DX: 135 Brisbane

Ref: PCA

B/111160/1

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THIS DEED is made on 19th December 2008. 2008

BETWEEN **CENTRAL LAND COUNCIL** a body corporate established under the Aboriginal Land Rights (Northern Territory) Act 1976 and having its registered office at 33 Stuart Highway, Alice Springs, Northern Territory (**"CLC"**)

AND **URUNA ABORIGINAL LAND TRUST** being a Land Trust established pursuant to section 4(1) of the Aboriginal Land Rights (Northern Territory) Act 1976 **("Uruna")**

AND **NTARIA ABORIGINAL LAND TRUST** being a Land Trust established pursuant to section 4(1) of the Aboriginal Land Rights (Northern Territory) Act 1976 **("Ntaria")**

AND **ROULPMAULPMA ABORIGINAL LAND TRUST** being a Land Trust established pursuant to section 4(1) of the Aboriginal Land Rights (Northern Territory) Act 1976 **("Roulpmaulpma")**

AND **HAASTS BLUFF ABORIGINAL LAND TRUST** being a Land Trust established pursuant to section 4(1) of the Aboriginal Land Rights (Northern Territory) Act 1976 **("Hassts")**

AND **LTALALTUMA ABORIGINAL LAND TRUST** of being a Land Trust established pursuant to section 4(1) of the Aboriginal Land Rights (Northern Territory) Act 1976 **("Ltalaltuma")**

AND **MOONIE OIL PTY LTD** ACN 009 713 188 a company incorporated in the State of Queensland and having its registered office at Level 29, 91 King William Street, Adelaide, South Australia **("Moonie")**

AND **MAGELLAN PETROLEUM (N.T.) PTY LTD** ACN 009 718 183 a company incorporated in the State of Queensland and having its registered office at Level 17 Waterfront Place, 1 Eagle Street, Brisbane, Queensland **("Magellan")**

AND **UNITED OIL & GAS CO (N.T.) PTY LTD** ACN 009 719 126 a company incorporated in the State of Queensland and having its registered office at Level 17 Waterfront Place, 1 Eagle Street, Brisbane, Queensland **("United")**

AND **CANSO RESOURCES PTY LTD** ACN 002 133 833 a company incorporated in the State of New South Wales and having its registered office at Level 29, 91 King William Street, Adelaide, South Australia **("Canso")**

AND **TRANSOIL PTY LTD** ACN 009 729 113 a company incorporated in the State of Queensland and having its registered office at Level 29, 91 King William Street, Adelaide, South Australia **("Transoil")**

10/09/09
2119 12269201 copy duty $5.00
pursuant to instrument stamped-
2119 12269201 TFR duty $5.00

AND **PETROMIN PTY LTD** ACN 009 778 787 a company incorporated in the State of Queensland and having its registered office at Level 29, 91 King William Street, Adelaide, South Australia **("Petromin")**

AND **FARMOUT DRILLERS PTY LTD** ACN 000 393 635 a company incorporated in the Australian Capital Territory and having its registered office at Level 29, 91 King William Street, Adelaide, South Australia **("Farmout")**

AND **SANTOS EXPLORATION PTY LTD** ACN 005 784 305 a company incorporated in the State of Victoria having its registered office at Level 29, 91 King William Street, Adelaide, South Australia **("SEPL")**

RECITALS

A The parties hereto (other than the CLC) are each parties to a Memorandum of Lease entitled the Mereenie Pipeline Lease granted by the Lessors in favour of the Lessees in respect of certain portions of land in respect of which each of the Lessors is respectively the registered proprietor of an estate in fee simple.

B As part of the reconstruction of controlled entities of Magellan Petroleum Australia Limited it has been agreed that United will transfer all its rights, interests and obligations under and arising out of the Mereenie Operating Agreement relating to the Mereenie Oil and Gas Field to Magellan.

C Such rights, interests and obligations include the rights, interests and obligations of United under the Lease.

D United wishes to assign and Magellan agrees to take an assignment of all United's right, title, interests and obligations under the Lease with effect notwithstanding the date hereof on and from the Effective Time.

E The Lessors agree to consent to the transfer of United's right, title, interests and obligations under the Lease to Magellan on the terms and conditions of this Deed.

IT IS AGREED

1 DEFINITIONS AND INTERPRETATION

1.1 In this Deed, including the Recitals, unless the context otherwise requires the following words shall have the following meanings:

"Effective Time" means midnight on 31 March 1995.

"Lessors" means each of the Aboriginal Land Trusts, parties to this Deed.

"Lessees" means Moonie, Magellan, United, Canso, Transoil, Petromin, Farmout and SEPL.

"Lease" means the memorandum of lease pursuant to which the Lessors have granted to the Lessees a lease of the Land and bearing registered number 163476 under the Real Property Act (Northern Territory).

"Land" means that part of portions 2078, 2079, 2077, 1635 and 2075 being estates in fee simple in land in the Northern Territory contained respectively in Certificates of Title Volume 624 Folio 314, Volume 624 Folio 316, Volume 624 Folio 312, Volume 137 Folio 76 and Volume 137 Folio 78 subject to the Lease.

"Obligations" means all the acts, duties, liabilities, responsibilities, undertakings and obligations to be performed or discharged by United under the Lease whether arising prior to, on or after the Effective Time.

"Other Parties" means Moonie, Canso, Transoil, Petromin, Farmout and SEPL.

1.2 Unless the contrary intentions appears in this Deed a reference to:

(a) a clause is to a clause in this Deed;

(b) the singular includes the plural and vice versa;

(c) any gender includes all other genders;

(d) a person includes a corporation or an association being incorporated or not and vice versa;

(e) clause headings appearing in this Deed are inserted for convenience of reference and shall not effect the construction of this Deed;

(f) a reference to this or any other document includes the document as varied or replaced and notwithstanding any change in the identity of the parties; and

(g) an agreement, condition, representation, covenant, undertaking or warranty on the part of or in favour of two or more persons binds, or is for the benefit of them jointly and severally.

2 ASSIGNMENT OF RIGHTS, INTERESTS AND OBLIGATIONS

2.1 Subject to clause 10, United hereby transfers and assigns to Magellan absolutely as and from the Effective Time (notwithstanding the date hereof) and Magellan hereby accepts the transfer and assignment of all United's right, title, interests, benefits and Obligations in and under the Lease.

2.2 Subject to clause 10, with effect from the Effective Time, Magellan and the Other Parties will hold their respective interests as lessees under the Lease severally as tenants in common in the respective proportions set out in the Schedule.

3 COVENANT BY MAGELLAN

Magellan hereby covenants in favour of each of the Lessors and United that on and from the Effective Time it shall be bound by and shall observe and perform the Lease and shall discharge the Obligations in accordance with the Lease as if it had originally been a party to the Lease in place of United.

4 RELEASE AND DISCHARGE OF UNITED

(a) Each of the Lessors and the Other Parties hereby acknowledges and agrees that in consideration of Magellan covenanting and agreeing to be bound by the Lease and assuming the Obligations, each of the Lessors and the Other Parties hereby discharges and releases United completely from all and any Obligations under the Lease.

(b) To the extent that the Lessors and Other Parties have continued to deal with United in respect of the Lease after the Effective Time up to and including the date hereof, Magellan agrees and acknowledges that the Lessors' and Other Parties' dealings with United are effective under the Lease as if the dealings were with Magellan.

(c) Magellan hereby releases each of the Other Parties and each of the Lessors from all and any claims which Magellan might otherwise have against the Other Parties in respect of the Other Parties and the Lessors giving United or permitting United to take the benefits under the Lease for the period on and from the Effective Time up to and including the date of this Deed.

5 COVENANTS BY THE LESSORS AND THE OTHER PARTIES

5.1 Each of the Lessors and the Other Parties covenants and agrees with Magellan to be bound by and to observe and perform its obligations under the Lease as if Magellan had originally been a party to the Lease in place of United.

5.2 Each of the Lessors and the Other Parties acknowledges and agrees that all rights, benefits and entitlements of United under the Lease shall on and from the Effective Time be the rights, benefits and entitlements of Magellan.

5.3 Each of the Lessors in accordance with clause 2.7 of the Lease and Section 19(8) of the Aboriginal Land Rights (Northern Territory) Act 1976 hereby consents to the assignment by United of all its right, title, interests, benefits and Obligations under the Lease to Magellan.

5.4 In accordance with clause 2.7 of the Lease and Section 19(8) of the Aboriginal Land Rights (Northern Territory) Act the CLC hereby consents to the assignment by United of all its right, title and interests, benefits and Obligations under the Lease to Magellan.

5.5 Each of the Lessors acknowledges and agrees that United is not in breach of the Lease.

6 COSTS

6.1 Each party shall bear its own costs in relation to the negotiation, preparation and execution of this Deed.

6.2 Magellan shall pay any stamp duty which is payable on this Deed.

7 GOVERNING LAW

This Deed shall be governed by and construed in accordance with the laws of the Northern Territory.

8 COUNTERPART

This Deed may consist of a number of counterparts and if so the counterparts taken together shall constitute the one instrument.

9 FURTHER ASSURANCES

Each of the parties agrees that it will make, execute and do all such acts, assurances, agreements and things as may be reasonably required by it for the purpose of giving effect to this Deed and for completing the assignment of United's right, title, interest and Obligations under the Lease to Magellan.

10 CONDITION PRECEDENT

This Deed and the transfer of United's right, title, interests, benefits and Obligations under the Lease to Magellan is subject to and conditional upon the written consent of the Minister in accordance with section 19(8) of the Aboriginal Land Rights (Northern Territory) Act 1976. Magellan and United shall apply for such covenant and the Lessors and the Other Parties shall provide such reasonable assistance as Magellan and/or United may request, in obtaining that consent.

6

SCHEDULE

INTERESTS IN LEASE FROM EFFECTIVE TIME

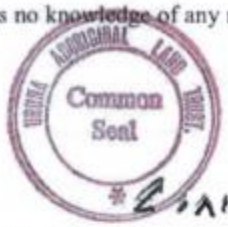
	%
Magellan	35.00
Canso	15.00
SEPL	6.25
Moonie	21.00
Farmout	6.25
Transoil	9.00
Petromin	7.50
	100.00

EXECUTION

Executed as a deed.

Each attorney executing this Deed states that he has no knowledge of any revocation or suspension of his power of attorney.

THE COMMON SEAL of)
URUNA ABORIGINAL LAND TRUST)
was hereunto affixed according to law)
in the presence of:)



LINDSAY POOKIE

.....
Chairman

.....
Name of Chairman (print)

.....
Deputy Chairman

.....
Name of Deputy Chairman (print)

THE COMMON SEAL of)
NTARIA ABORIGINAL LAND TRUST)
was hereunto affixed according to law)
in the presence of:)

LINDSAY POOKIE

.....
Chairman

.....
Name of Chairman (print)

.....
Deputy Chairman

.....
Name of Deputy Chairman (print)

THE COMMON SEAL of)
ROULPMAULPMA ABORIGINAL LAND TRUST)
was hereunto affixed according to law)
in the presence of:)

LINDSAY POOKIE

.....
Chairman

.....
Name of Chairman (print)

.....
Deputy Chairman

.....
Name of Deputy Chairman (print)

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8

THE COMMON SEAL of)
HAASTS BLUFF ABORIGINAL)
LAND TRUST)
was hereunto affixed according to law)
in the presence of:)

HAASTS BLUFF ABORIGINAL LAND TRUST
THE COMMON SEAL OF

.....

Chairman LINDSAY BOOKIE

.....

Name of Chairman (print)

.....

Deputy Chairman

.....

Name of Deputy Chairman (print)

THE COMMON SEAL of)
LTALALTUMA ABORIGINAL LAND)
TRUST)
was hereunto affixed according to law)
in the presence of:)

LTALALTUMA ABORIGINAL LAND TRUST
Common Seal

LINDSAY BOOKIE

.....

Chairman

.....

Name of Chairman (print)

.....

Deputy Chairman

.....

Name of Deputy Chairman (print)

SIGNED SEALED AND DELIVERED)
for and on behalf of)
CANSO RESOURCES PTY LTD)
MOONIE OIL PTY LTD)
TRANSOIL PTY LTD)
PETROMIN PTY LTD)
FARMOUT DRILLERS PTY LTD and)
SANTOS EXPLORATION PTY LTD)
by Bradley Andrew Mills)
their duly authorised Attorney)
who hereby states that he has no notice of)
revocation of the Powers of Attorney)
at the time of execution of this instrument)
in the presence of:)

L O'Brien JP (Qual)

.....

Witness

Lorraine Jane O'Brien

.....

Name of Witness (print)

9

THE COMMON SEAL of
MAGELLAN PETROLEUM (N.T.) PTY LTD
was hereunto affixed in accordance with its constitution in the presence of:

Common Seal: MAGELLAN PETROLEUM (N.T.) PTY. LTD. A.C.N. 009 718 183

Signature of authorised person	Signature of authorised person
Thomas Gwynn DAVIES	Bruce McINNES
Name of authorised person (Block letters)	Name of authorised person (Block letters)
Director	Director
Office held	Office held

THE COMMON SEAL of
UNITED OIL & GAS CO (N.T) PTY LTD
was hereunto affixed in accordance with its constitution in the presence of:

Common Seal: UNITED OIL & GAS CO. (N.T.) PTY. LTD. A.C.N. 009 719 126

Signature of authorised person	Signature of authorised person
Thomas Gwynn DAVIES	Bruce McINNES
Name of authorised person (Block letters)	Name of authorised person (Block letters)
Director	Director
Office held	Office held

10

THE COMMON SEAL of
CENTRAL LAND COUNCIL
was hereunto affixed according to law in the presence of:

Central Land Council Common Seal

....	Chairman LINDSAY BOOKIE
....	Name of Chairman (print)
....	Deputy Chairman
Maurie Ryan	Name of Deputy Chairman (print)

Appendix 2 EPBC Protected Matters Search Report

Australian Government
Department of the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

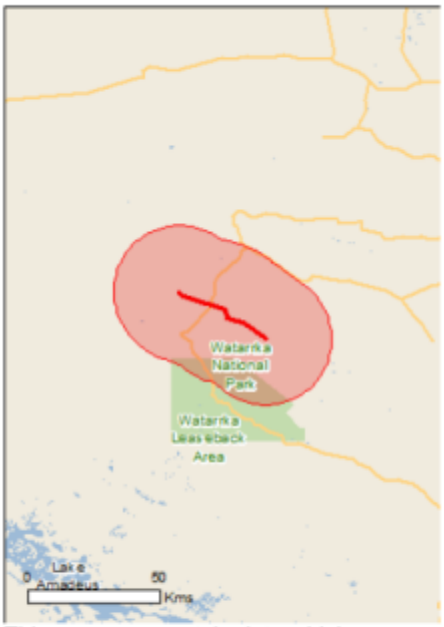
Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 23/05/16 15:21:47

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates
Buffer: 25.0Km

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	12
Listed Migratory Species:	8

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	9
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	9
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Polytelis alexandrae Princess Parrot, Alexandra's Parrot [758]	Vulnerable	Species or species habitat known to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Insects		
Croitana aestiva Desert Sand-skipper, Aestiva Skipper [26238]	Endangered	Species or species habitat may occur within area
Mammals		
Lagorchestes hirsutus Central Australian subspecies Mala, Rufous Hare-Wallaby (Central Australia) [88019]	Endangered	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat likely to occur within area
Petrogale lateralis MacDonnell Ranges race Warru, Black-footed Rock-wallaby (MacDonnell Ranges race) [66649]	Vulnerable	Species or species habitat known to occur within area
Zyzomys pedunculatus Central Rock-rat, Antina [68]	Endangered	Species or species habitat may occur within area
Other		
Macrozamia macdonnellii MacDonnell Ranges Cycad [11843]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Liopholis kintorei Great Desert Skink, Tjakura, Warrarna, Mulyamiji [83160]	Vulnerable	Species or species habitat may occur within area
Liopholis slateri slateri Slater's Skink, Floodplain Skink [83163]	Endangered	Species or species

Name	Status	Type of Presence
		habitat may occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Watarrka	NT

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Plants		
Cenchrus ciliaris		
Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-23.92882 131.39798,-23.94392 131.41248,-23.9829 131.55148,-24.01001 131.5572,-24.0246 131.61447,-24.07668 131.68962

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Parks and Wildlife Commission NT, Northern Territory Government
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

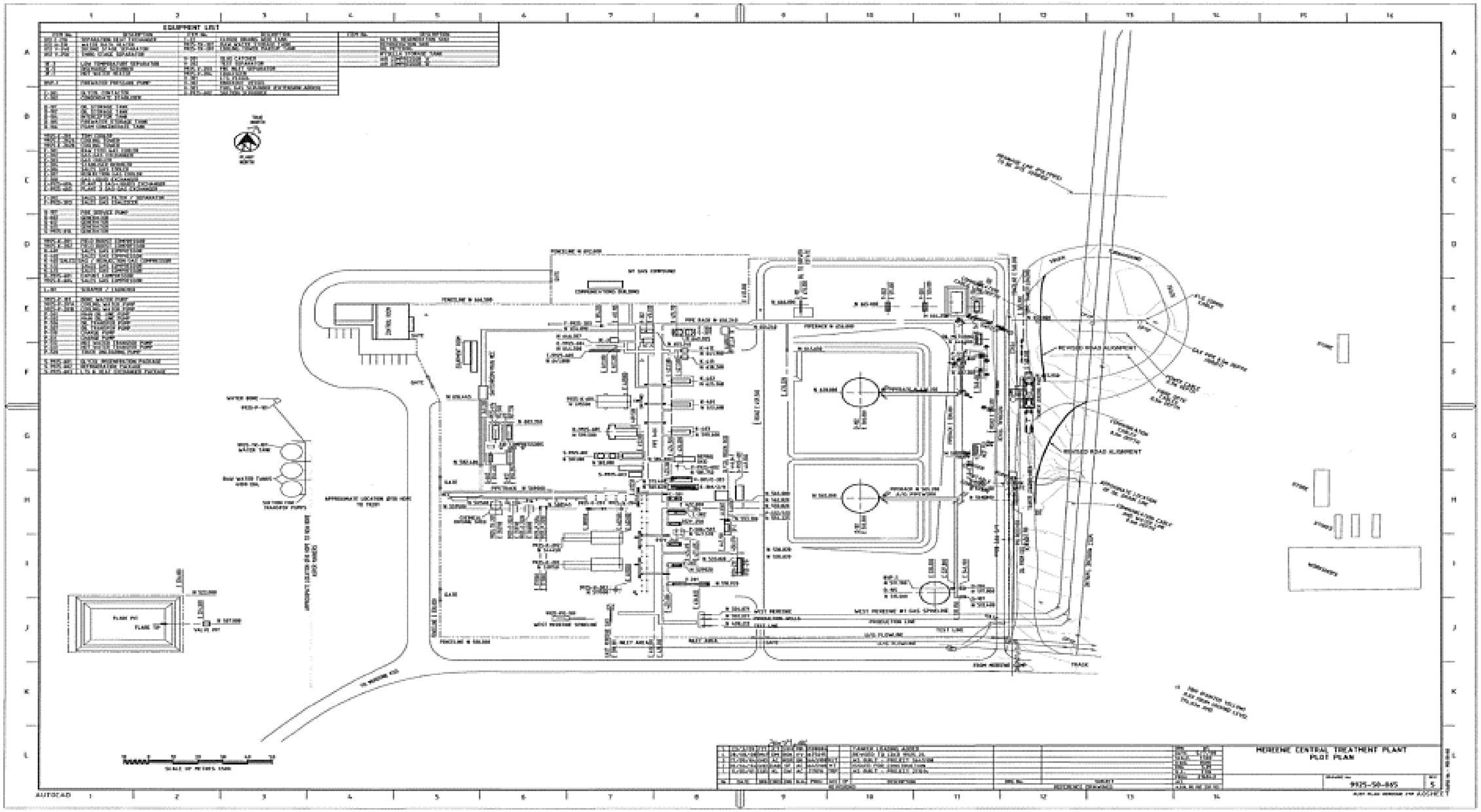
The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

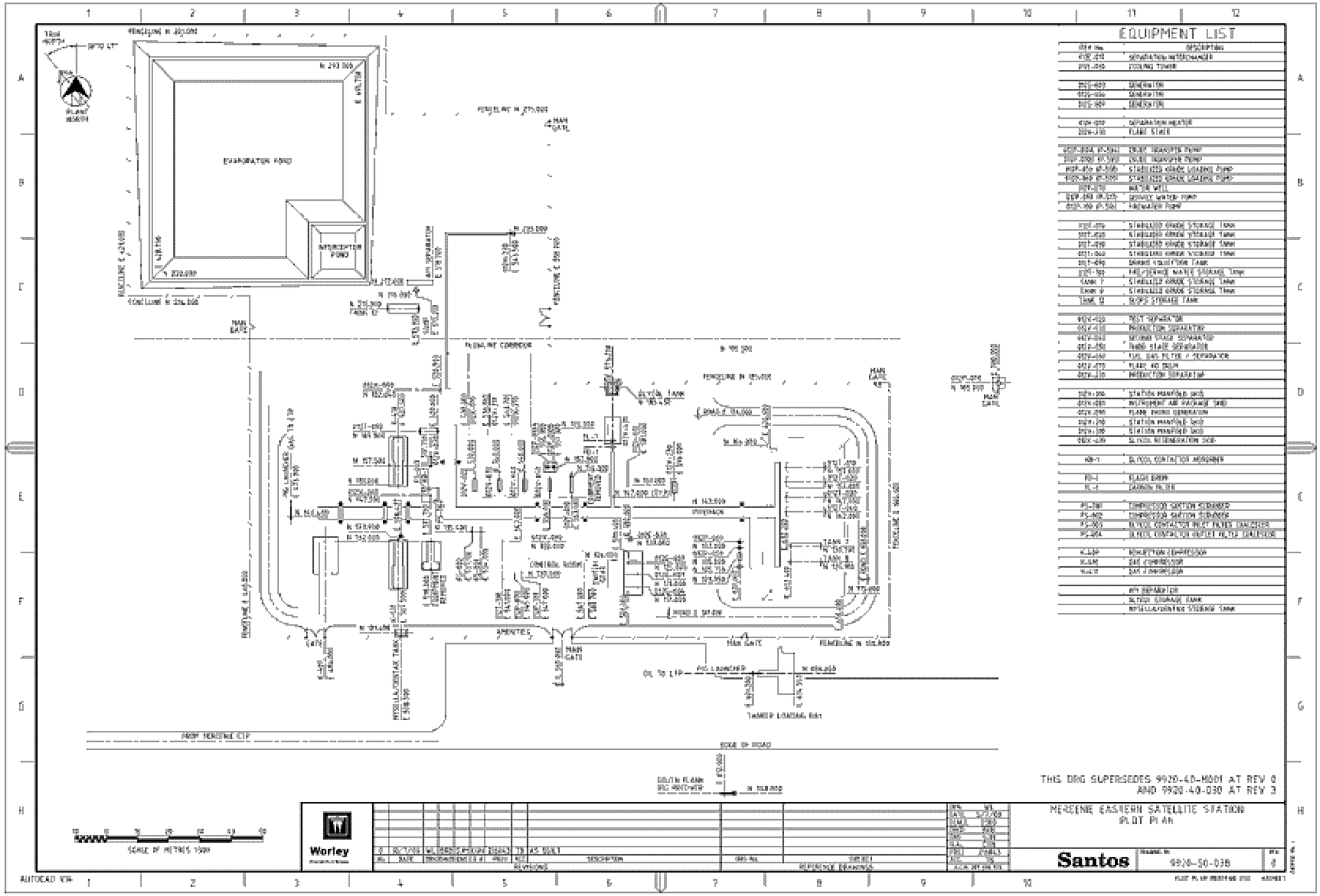
Appendix 3 Activity Specific Environmental Plan Template

Section	Details
Introduction	• Purpose of the document.
Location	• Location of the proposed activity.
Legislative Framework	• Summary of regulatory environmental management strategies and commitments including responsibility and FEMP reference. • Summary of CTP HS&E MS environmental management strategies and commitments including responsibility and FEMP reference. • Relevant standards, guidelines and codes of practice.
Project Description	• Description of the proposed activity including justification for the need of the activity. • Details of primary equipment (e.g. drilling rig specifications) and general details of support facilities/equipment/vessels. • Description of any infrastructure and services required for the activity (e.g. access roads, pipelines, power supply and water). • Number of personnel during project phases, and accommodation and fly in – fly out arrangements. • Commencement and completion dates, and timing of major activities. • Provide approximate costs of undertaking the activity. • Information on support/service companies.
Existing Environment	• Describe relevant aspects of the physical and socio-economic environment with reference back to the FEMP. • Include the key values and sensitive aspects of the environment within or immediately close to the activity area, e.g.: – Sacred and Cultural Heritage sites – Protected areas/Conservation Areas – Rare or endangered flora and fauna – Areas of significant habitat – Fire regime
Environmental Hazard and Management Measures	• Identify aspects of proposed activity not addressed or not fully addressed in the FEMP • Determine the environmental values, objectives and performance measures of the activity • Undertake assessment of the hazards, potential consequences and management measures
FEMP Implementation	• Describe how the Activity Notification will be implemented including training and awareness, communication, incident management and auditing.
Consultation	• Identify stakeholders and consultation requirements.
Approvals	• Confirm compliance with approvals and permits required for new activities.

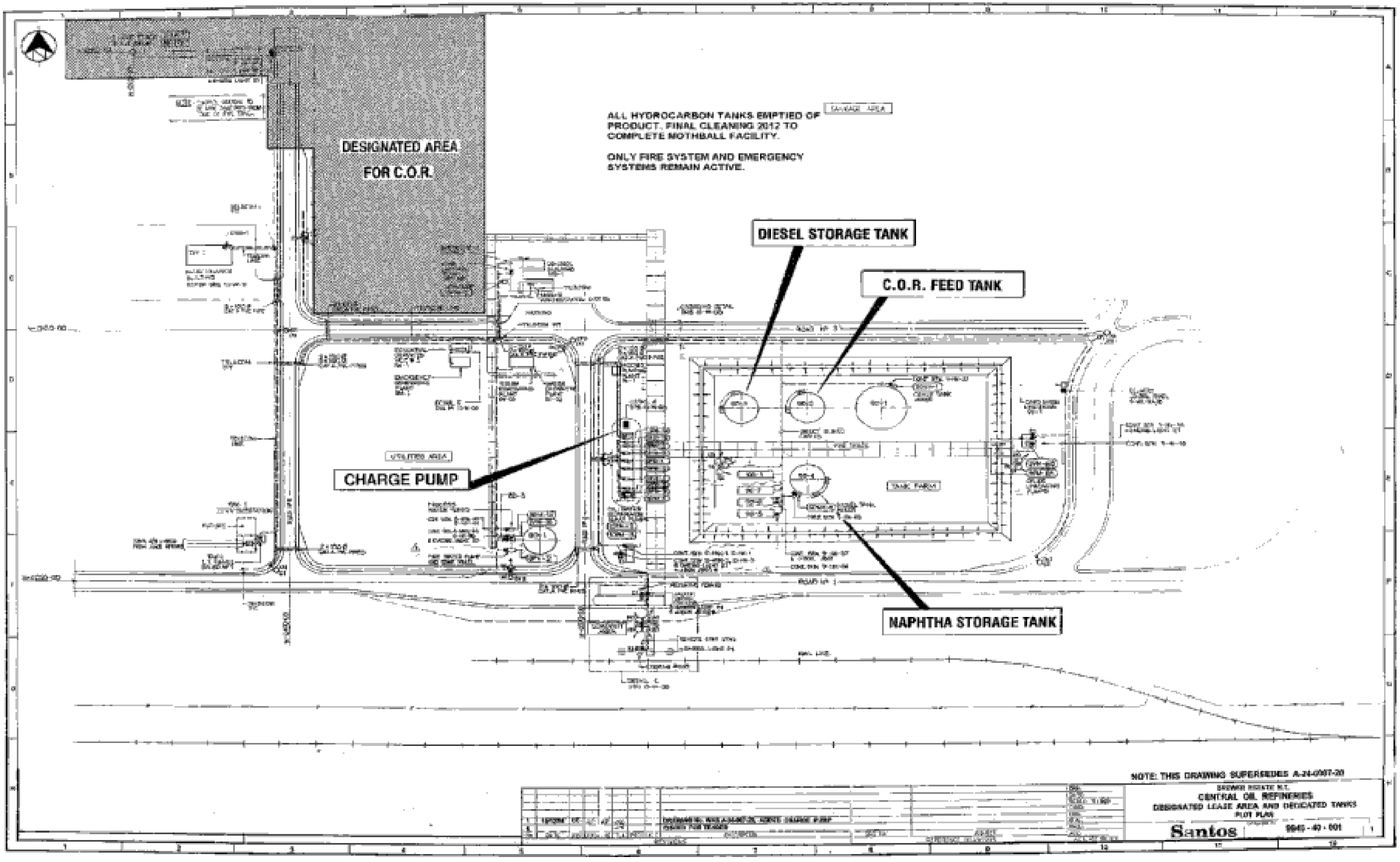
Appendix 4 CTP Layout Plans



Appendix 5 ESS Layout Plans



Appendix 6 Brewer Estate Layout Plans



Appendix 7 Road Construction and Maintenance at MRN

Erosion and Sediment Control

Any new road constructed or land clearing will have erosion and sediment control devices installed in accordance with industry best practise standards as provided in the Department of Environment and Natural Resources (DENR) and International Erosion Control Association (IECA) guidelines for erosion and sediment control. This is particularly important for road construction or land clearing within OL5 as this area contains shallow soils with high erosion risk. As a minimum, the following will be considered in the construction and maintenance of roads, access tracks and cleared surfaces (e.g. drill pads), collectively referred to in the following as 'roads', at MRN:

- No windrows to be left after final construction and any existing windrows removed;
- Off-let drains constructed with flat bottoms to encourage dispersive flow into the surrounding area;
- Drains positioned to run downhill;
- Where possible construct roads or clearings along the contour, allowing for natural sheet flow run-off perpendicular to the clearing direction;
- Trafficable whoa-boys or diversion bunds used on slopes greater than 3% to slow and divert flow;
- Whoa-boys or diversion bund spacing based on DENR guidelines, with sufficient development length to ensure water flow does not return to the road;
- Remove any concentration points to encourage, rather than inhibit, natural surface sheet flow;
- Avoid crossing creeks or drainage lines;
- Creek Crossings:
  - Developed down to natural base of creek;
  - Diversion bunds placed at top of slope to divert water around the crossing;
  - Ensure no obstruction to natural creek flow where possible; and
  - If culverts are required for all weather access, they need to be of sufficient size to handle 1 in 100-year flood events and debris.
- Grade roads to encourage surface flow across roads to down slope side;
- Ensure any fill is sourced from weed free areas;
- Avoid clearing mature trees or highly vegetated areas;
- Avoid construction or driving on roads or cleared areas flowing significant rainfall events (>10mm in 24hrs); and
- Roads and clearings to be inspected following significant rainfall events for erosion and sediment transport, and maintained as required to ensure integrity.

Construction

Access track construction methods will vary depending upon the land system and the expected level of use. For example, access tracks for exploration wells may initially be constructed on a temporary basis compared with those for a development well. This is to minimise the initial environmental impact and reduce restoration costs should the well be unsuccessful in discovering economic oil or gas reserves. As a minimal the following environmental requirements will be met:

- Trafficable whoa-boys or diversion bunds installed on slopes > 3% (see DENR guidelines for spacing);
- Remove all windrows or flow concentration points;
- Install flat bottom drains down slope;
- Slope road where required to facilitate cross surface flow;
- Install roads along the contour where possible;
- Develop any creek crossings to the natural base of the watercourse;
- Where a road must be all weather trafficable on creek crossings, ensure appropriate number of culverts installed and regularly cleaned of debris

Safety requirements define the minimum standards for road and access tracks - roads must be constructed to withstand heavy traffic volumes and vehicle weights associated with moving the drilling rig to and from the lease – this can be up to 30 semitrailer loads. If further development is planned for the area, access tracks will be upgraded according to traffic requirements.

In most cases, access tracks are cleared and graded, but in some circumstances, they are rolled (e.g. where the terrain is naturally flat or susceptible to erosion when disturbed). Following road construction, rehabilitation is undertaken to:

- Restore surface drainage to surrounding environment;
- Rip or scarify compacted road surfaces;
- Remove any unsuitable fill, i.e. gravel;
- Leave road surface rough to trap water and encourage infiltration; and
- Install erosion and sediment control structures as required.

Borrow Pits

Supplies of suitable construction material, such as gravel and soil, are usually extracted from borrow pits. Borrow pits are excavated to provide:

- Soft earth for trench backfilling;
- Rubble and earth for upgrading or constructing roads, drill pads and maintenance of satellite facilities; and
- Rubble and earth for the construction of above-ground pipeline infrastructure.

During drilling operations, borrow material may be required to stabilise the drill pad and road surface and support the heavy traffic volumes associated with well operations (e.g. movement of the drilling rig to and from the location). Generally, clay borrow material is sourced from borrow pits located in inter-dune corridors along roadsides and adjacent to well sites.

Borrow pits vary considerably in dimension depending upon the quality and quantity of material contained within them. Site selection, environmental management and restoration of borrow pits is undertaken in accordance with the CTP standard drilling lease plans. Where appropriate, existing borrow pits are used in preference to new ones. If substantial amounts of material are required, a series of smaller borrow pits is used in preference to a single large pit.

Appendix 8 Stakeholder Communication Log

COMMUNICATION LOG
MRN

Date	Topic	Type of engagement (e.g. email)	CTP contact	Stakeholder	Outcomes
1960's - 2003	Routine meetings with the effected stakeholders and Traditional owners as required	Engagement Meetings	Santos, AGL and appropriate Operators	Traditional owners and key stake-holders	Appropriate stakeholder engagement meetings as required.
2003 - 2015	Review of operations and consultation through LCM - Liaison Committee Meetings	Liaison Committee Meetings (LCM)	Santos	Traditional owners, key stake-holders and Central Lands Council (CLC)	At least annual LCM's and engagement meetings. Required annual as per the agreements with CLC and Santos. More frequent meetings were held for key activities - such as the MADD campaign.
1/09/2015	Meeting with Traditional Owners and CTP indigenous affairs managers	Face to Face Meeting	David and Bod Liddle	Anslem Impu Jnr and Senior Luritja people (TO of this land)	Informal meeting to advice of the Central Petroleum takeover of the field and an agreement to continue business as usual
19/10/2015	Handover ceremony between Santos and Central Petroleum and the traditional owners of Mereenie. Operations review for upcoming Central Petroleum Operatorship	Site visit and full LCM (Liaison Committee Meeting)	Richard Cottee, Mike Herrington and James van Rooyen	CLC and Luritja people (TO of this land)	Thanks, and acknowledgement to Santos team for all the work conducted to that date. Welcome ceremony to the lands by TO Central Petroleum team. Then full LCM meeting with the CLC and T/O's
Nov-15	Talk to Traditional Owners about Fracking. Haasts Bluff	Face to Face Meeting	David Liddle	Hubert Pararoultja and family	Talk with Traditional owners and address concerns with Fracking. Start initial planning for CTP and Central Land Council some workshops around fracking in communities in the future.
Feb-16	Meeting with Traditional Owners - Anslem Impu Snr and CTP indigenous affairs managers	Face to Face Meeting	David Liddle	Anslem Impu Senior Luritja people (TO of this land)	Meeting and Jay Creek just outside Alice. Talked about control of Animals and cattle fencing at Mereenie.
Apr-16	Meeting with Traditional Owners and CTP indigenous affairs managers	Face to Face Meeting	David Liddle	Malbunka family at Hermannsburg.	Caught up with Malbunka family living at Hermannsburg. Brief chat about ongoing sports sponsorship. Follow up for next season
May-16	Meeting with Central Lands Council and CTP indigenous affairs managers	Face to Face Meeting	David Liddle	Warren Foster - CLC.	He was interested in locking in ongoing yearly football sponsorship to bring players into Alice Springs to play for Pioneers, from 2017 season.
Jun-16	Meeting with Traditional Owners, Area Superintendent and CTP indigenous affairs managers	Face to Face Meeting	David Liddle and Mark Hensel	Anslem Impu Jnr Luritja people (TO of this land)	Meeting with respect to the employment of Aboriginal workers. Interviewed potential future workers. Also Met with Billy Raggett at Untarana. Just a social visit and informing of the latest on Central Petroleum
Aug-16	Meeting with Central Lands Council and CTP indigenous affairs managers	Face to Face Meeting	David Liddle	Warren Foster - CLC.	Another follow up meeting with regards to Sporting sponsorship
Oct-16	Annual meeting with CLC.	Face to Face Meeting	Mike Herrington, James Van Rooyen	CLC and Luritja people (TO of this land)	Informal meeting about Central's word during its first year of Operatorship of the field
Nov-16	Attended White ribbon day march at Hermannsburg	Public march	Rolf Schulte, Gary Armstrong	Hermannsburg community	Went to support the march against domestic violence

Apr-17	Organising Travel to Adelaide for Anselum Impu Snr	Phone/email	David Liddle/Mark Hensel	Impu family/Centrecorp/Ian Conway	Organised funds for Anselum Impu Snr to travel to Adelaide to support Anselum Impu Jnr in hospital.
May-17	Organise living expenses for Anselum Impu Snr in Adelaide	Phone/email	David Liddle	Impu family/Ngurratjuta/Ian Conway	Organised living expenses for Anselum Impu Snr in Adelaide.
17-10-17	Proposed 2 well program. WM 25/26	Formal application (via Email)	James van Rooyen	CLC / Traditional Owners	Proposed work scope, well locations and formal Sacred Site Clearance applied for through the CLC for the Wm 25/26 Wells.
25-10-17	Meeting with Traditional Owners and CLC (Liaison Committee meeting)	Meeting in Alice Springs	Richard Cottee, Mike Herrington and Rolf Schulte	CLC and Laritja people (TO of this land)	Formal yearly meeting held between the traditional owners, the CLC and Central Petroleum. The past years operations were discussed and the future years operations planned. Maps and details of the two new wells WM 25 and WM 26 were reviewed and discussed with them at this point.
21-11-17	New Wells - WM 25/26	Formal Letter	James van Rooyen	CLC and Laritja people (TO of this land)	Formal letter of approval indicating that the owners of the land had been consulted and the work request (two wells) had been approved.

Appendix 9 Description of Fauna of Conservation Significance for the OL Area

Central Rock Rat (*Zyzomys pedunculatus*) (Endangered – EPBC/TPWC) preferred habitat is on steep rocky slopes, usually with trees such as native pine (*Callitris glaucophylla*) and hill mulga (*Acacia macdonnellensis*), various tussock grasses and near dense spinifex, and fire sensitive plant communities may act as refuges during dry periods. Range habitat is also likely to be important for the protection of this species. There is suitable habitat for the rat within the survey area, although there are no records of this species within a 50-km radius.

Slaters Skink (*Liopholis slateri slateri*) (Endangered – EPBC/TPWC) is known to occur in the Finke and MacDonnell Ranges Bioregion and there are old records of this species within 50 km of the survey area. The species tend to favor depositional alluvial areas containing *Eremophila* sp with low soil pedestals for burrowing and are likely to be found in close association with depositional land systems rather than erosional ones. There is suitable habitat for slaters skink within the survey area.

The **Desert Sand-skipper (*Croitana aestiva*)** is a small brown and yellow butterfly with dark brown wings with pale yellow markings. The species is endemic to the Northern Territory and is known only from a small number of specimens collected in 1966 and 1972 at three locations west of Alice Springs, in the MacDonnell Ranges. There are no recovery plans for this species, although conservation advice from the Threatened Species Scientific Committee states that the Desert Sand-skipper has a very restricted area of occupancy and extent of occurrence, and is only known historically from three locations, none of which are in the survey area.

The **Black-footed Rock-wallaby (*Petrogale lateralis*)** (Vulnerable – EPBC / Near Threatened – TPWC) is known to inhabit rock piles, steep cliffs, boulder scree slopes and granite outcrops (Menkhorst & Knight, 2004). They are currently considered common in the MacDonnell Ranges. There is suitable habitat for Rock-wallabies within the survey area. As much of the MRN's rocky sandstone habitat has been designated as a prohibited area due to cultural reasons, it is unlikely that any activities at MRN are significantly impacting Black-footed Rock-wallaby populations or other species that rely on this ecosystem.

The **Common Brush-tailed Possum (*Trichosurus vulpecula vulpecula*)** (Endangered – TPWC) occupies riverine habitat that is close to rocky outcrops and moist gullies within the ranges or rocky slopes. There are old (1980's) records of this species within the survey area, but as with much of populations in southern NT, this population has likely suffered a severe decline (and possibly local extinction).

The **Great Desert Skink (*Liopholis kintorei*)** (Vulnerable – TPWC/EPBC) is known to inhabit red sandy plains and sand ridges and prefer regenerating vegetation in areas that have been burnt between 3 to 15 years with at least 50% bare ground (Cogger et al., 1993; McAlpine, 2001). There is suitable habitat for the great desert skink in the survey area, although the only record of this species within a 50-km radius is at Kings Canyon, which is approximately 30 km to the south.

Red Goshawk (*Erythrotriorchis radiates*) (Vulnerable – TPWC/EPBC) occurs sparsely across much of northern Australia. There is no record of this species within a 50-km radius of the survey area.

Emu (*Dromaius novaehollandiae*) (Vulnerable - TPWC) occurs across most of the NT, although is scarce in dry areas. This species has been recorded within a 25-km radius of the survey area.

The current distribution and range of **Princess Parrot (*Polytelis alexandrae*)** (Vulnerable – TPWC/EPBC) is not well known. In desert areas, the parrot may occur sparsely and widely spread in swales between sand dunes and occasionally on slopes and crests of dunes. This habitat consists

mostly of shrubs (*Eremophila*, *Grevillia*, and *Hakea* species) and scattered trees (Pavey, 2002). The survey area contains suitable habitat for princess parrot.

Fork-tailed Swift (*Apus pacificus*) (EPBC listed migratory species) breeds in Asia and arrives in Australia in October each year (Barrett et al., 2003). The Fork-tailed Swift is predominately an aerial species, but has been recorded roosting in reed beds, cliffs and large trees on limited occasions (Barrett et al., 2003). The survey area does not contain suitable habitat for the swift.

Great Egret (*Ardea alba*) and **Cattle Egret (*Ardea ibis*)** (EPBC listed migratory species) are cosmopolitan species, tending to inhabit wetlands, lakes, mangroves and estuaries (Prizzy & Knight, 2007). The survey area may contain scattered habitat for these species during the wet season.

Oriental Plover (*Charadrius veredus*) and **Oriental Pratincole (*Glareola maldivarum*)** (EPBC listed migratory species) are migratory wetland species. The survey area does not contain suitable habitat for these species.

Rainbow Bee-eater (*Merops ornatus*) (EPBC listed migratory species) is most often found in open forests, woodlands and shrublands, and cleared areas, near water (Prizzy & Knight, 2007) and only occurs in Central Australia in the summer. Distribution tends to be widespread throughout Australia, except in desert areas where the recorded rate of sightings is very low (< 11%) (Barrett et al., 2003), and tends to be mostly a passage migrant (Prizzy & Knight, 2007). The survey area may contain scattered habitat for this species.

Australian Painted Snipe (*Rostratula australis)* (TWPC - vulnerable and EPBC – Endangered). This species inhabits shallow inland wetlands, which are ephemeral within the OL area. This species was not recorded during any on-ground surveys, and is only likely to be present during high rainfall periods. There is a moderate likelihood that this species may be present within the OL area during times of high rainfall.

Grey Wagtail (*Motacilla cinerea*) is listed as marine and migratory under the EPBC Act. It is covered by the CAMBA and ROKAMBA (see glossary) migratory bird agreements. It has a white eyebrow stripe above a black neck, with a very long black tail edged in white. It prefers fast running waters in higher altitudes (Simpson, et al., 2004). This species is unlikely to be affected by operations within the OL area as no preferred habitat exists.

Yellow Wagtail (*Motacilla flava)* is listed as marine and migratory under the EPBC Act. It is covered by the CAMBA, JAMBA and ROKAMBA (see glossary) migratory bird agreements. Its eyebrow runs to a short point at base of bill, with an olive green back and a dull rump. Preferred habitat includes salt works, paddocks, open marshes and wetlands (Simpson, et al., 2004). No potential habitat for this species exists within the OL area and so is unlikely to be affected.

Australian Bustard (*Ardeotis australis*) (Vulnerable TPWC) occurs throughout the NT (although may be declining in the south) and is known to occur within a 50-km radius of the survey area.

The **Thick-billed Grasswren (*Amytornis textilis modestus*)** (Vulnerable – EPBC / Endangered – TPWC) is not locally common to the survey area, although it occurs along sandy watercourses strewn with flood debris, amongst Sandhill Canegrass (*Zygochloa paradoxa*) on sand dunes and in areas of tall, dense saltbush and bluebush. It also inhabits gibber plains with chenopod shrubs growing along watercourses.

Bilby (*Macrotis lagotis*) (Vulnerable TPWC/EPBC) occurs predominantly in sandy soils dominated by hummock grasslands covered predominantly by spinifex. There is potential for Bilby to occur within the survey area and the species has been recorded within a 50-km radius.

Appendix 10 Emergency Reponse Plan

Field Operations Emergency Response Plan – Spill Response. MSTD13-PL002(v1) attached to this document.