



Petroleum Exploration and Production on PL 446

Operational Environmental Management Plan (Existing PL 446 Activities)

Prepared by:

RPS AUSTRALIA EAST PTY LTD

743 Ann Street
PO Box 1559
FORTITUDE VALLEY QLD 4006

T: 617 3237 8899
F: 617 3237 8833
W: rpsgroup.com.au

Prepared for:

AGL GAS STORAGE PTY LIMITED

Level 31
12 Creek Street
BRISBANE QLD 4000

T: 07 3023 2489
F: 07 3220 1274
W: www.agl.com.au

Report Number: 105109-1
Version / Date: Rev 0 / December 2010

Important Note

Apart from fair dealing for the purposes of private study, research, criticism, or review as permitted under the Copyright Act, no part of this report, its attachments or appendices may be reproduced by any process without the written consent of RPS Australia East Pty Ltd. All enquiries should be directed to RPS Australia East Pty Ltd.

We have prepared this report for the sole purposes of AGL Gas Storage Pty Limited (“Client”) for the specific purpose only for which it is supplied. This report is strictly limited to the purpose and the facts and matters stated in it and does not apply directly or indirectly and will not be used for any other application, purpose, use or matter.

In preparing this report we have made certain assumptions. We have assumed that all information and documents provided to us by the Client or as a result of a specific request or enquiry were complete, accurate and up-to-date. Where we have obtained information from a government register or database, we have assumed that the information is accurate. Where an assumption has been made, we have not made any independent investigations with respect to the matters the subject of that assumption. We are not aware of any reason why any of the assumptions are incorrect.

This report is presented without the assumption of a duty of care to any other person (other than the Client) (“Third Party”). The report may not contain sufficient information for the purposes of a Third Party or for other uses. Without the prior written consent of RPS Australia East Pty Ltd:

This report may not be relied on by a Third Party; and

RPS Australia East Pty Ltd will not be liable to a Third Party for any loss, damage, liability or claim arising out of or incidental to a Third Party publishing, using or relying on the facts, content, opinions or subject matter contained in this report.

If a Third Party uses or relies on the facts, content, opinions or subject matter contained in this report with or without the consent of RPS Australia East Pty Ltd, RPS Australia East Pty Ltd disclaims all risk and the Third Party assumes all risk and releases and indemnifies and agrees to keep indemnified RPS Australia East Pty Ltd from any loss, damage, claim or liability arising directly or indirectly from the use of or reliance on this report.

In this note, a reference to loss and damage includes past and prospective economic loss, loss of profits, damage to property, injury to any person (including death) costs and expenses incurred in taking measures to prevent, mitigate or rectify any harm, loss of opportunity, legal costs, compensation, interest and any other direct, indirect, consequential or financial or other loss.

Document Status

<i>Version</i>	<i>Purpose of Document</i>	<i>Orig</i>	<i>Review</i>	<i>Review Date</i>	<i>QA Review</i>	<i>RPS Release Approval</i>	<i>Issue Date</i>
Rev 0	For Submission	LD	PW	16/12/10	KT	PW	16/12/10

Summary

AGL Gas Storage Pty Limited recently acquired Petroleum Lease (PL) 16, located approximately 49 km south of the town of Surat, Queensland. PL 16 has historically been used for conventional gas, oil and condensate exploration and production. AGL proposes to continue these production activities, as well as augment operations where appropriate to enhance the commercial viability of the petroleum fields on PL 16.

PL 16 is currently regulated under the *Petroleum Act 1923* and Integrated Authority 150 120 under the *Environmental Protection Act 1994*. A range of activities are carried out for the successful exploration and production of oil and gas, including seismic surveys, the drilling of wells, flowline construction and operation, oil / gas and water separation and compression. Activities are centred on the Silver Springs Processing Plant, where the saleable products are processed. This Operational Environmental Management Plan (OEMP) provides an overview of the petroleum activities historically and currently being carried out on PL 16 and the environmental management measures that will be implemented on a daily basis.

AGL propose to conduct new activities on PL 16 and has accordingly made an application to the Department of Employment, Economic Development and Innovation (DEEDI) to convert PL 16 to a petroleum lease under the *Petroleum and Gas (Production and Safety) Act 2004*. This application was made to DEEDI on 1 December 2010 and Petroleum Lease 16 was subsequently assigned a new lease number of PL 446. The activities discussed in this OEMP were conducted and authorised under PL 16. However for reasons of consistency and simplicity, the relevant tenure will be referred to as PL 446 throughout this document.

A concurrent application for a new Level 1 Environmental Authority (Chapter 5A Activities) for PL 446 is required under the *Environmental Protection Act 1994*. This authority will enable both new and existing activities to be carried out on PL 446. This OEMP in conjunction with the 'AGL Silver Springs Gas Storage Facility, Environmental Management Plan' (EMP), has been prepared to satisfy the information requirements of an application for a new Level 1 Environmental Authority (EA).

Contents

SUMMARY	ii
1.0 INTRODUCTION	1
1.1 BACKGROUND	1
1.2 SCOPE OF THIS OEMP	2
1.3 RELEVANT RESOURCE AUTHORITY	2
1.3.1 OEMP Reference Material	3
2.0 EXISTING PETROLEUM LEASE 446 ACTIVITIES.....	5
2.1 DESCRIPTION AND STATUS OF PL 446	5
2.1.1 Silver Springs / Renlim	5
2.1.2 Sirrah	5
2.1.3 Taylor	5
2.1.4 Tinker	6
2.1.5 Boggo Creek	6
2.1.6 Beechwood	6
2.2 ENVIRONMENTALLY RELEVANT ACTIVITIES	6
2.3 NOTIFIABLE ACTIVITIES	7
2.4 SEISMIC SURVEYS	7
2.5 WELLS	8
2.6 FLOWLINES	15
2.7 PROCESSING FACILITIES	16
2.7.1 Silver Springs Processing Plant (SSPP)	16
2.7.2 Taylor Satellite Processing Plant	18
2.7.3 Beechwood Satellite Plant	18
2.7.4 Sirrah Satellite Plant	18
2.8 PRODUCED WATER AND EVAPORATION PONDS	21
2.8.1 Water Production	21
2.8.2 Evaporation Ponds	21
2.8.3 Pond Management and Monitoring	24
2.8.4 Implications of CSG Water Management Policy	24
2.9 FUEL BURNING EQUIPMENT	25

2.10	FUEL AND CHEMICAL STORAGE	26
2.11	LAND FARM	27
2.11.1	Taylor	27
2.11.2	Silver Springs.....	27
2.12	CAMP AND OFFICE	28
2.13	LAND FILL REFUSE PIT	28
2.14	FUTURE OPERATIONS.....	29
3.0	EXISTING ENVIRONMENT.....	30
3.1	SOILS AND TERRAIN	30
3.2	HYDROLOGY	30
3.2.1	Watercourses.....	30
3.2.2	Groundwater.....	31
3.2.3	Wetlands.....	31
3.3	BIOREGIONS	31
3.4	GOOD QUALITY AGRICULTURAL LAND (GQAL).....	33
3.5	AIR AND NOISE	33
3.5.1	Noise.....	33
3.5.2	Air Quality	34
3.6	FAUNA AND FLORA	35
3.6.1	Flora.....	35
3.6.2	Fauna.....	40
3.7	ENVIRONMENTALLY SENSITIVE AREAS	42
3.8	CULTURAL HERITAGE.....	48
3.8.1	Aboriginal Cultural Heritage.....	48
3.8.2	State Heritage Register	48
4.0	ENVIRONMENTAL MANAGEMENT FRAMEWORK.....	49
4.1	AGL ENVIRONMENTAL MANAGEMENT SYSTEM.....	49
4.2	ROLES AND RESPONSIBILITIES	51
4.3	TRAINING AND INDUCTION	52
4.4	RISK MANAGEMENT	53
4.5	EMERGENCY RESPONSE PROCEDURES	54
4.5.1	Training and Simulations	54

5.0	LEGISLATIVE FRAMEWORK	56
5.1	COMMONWEALTH LEGISLATION	56
5.2	STATE LEGISLATION.....	56
5.3	AUSTRALIAN STANDARDS AND INDUSTRY CODES	58
5.4	LICENCE REQUIREMENTS	58
6.0	ENVIRONMENTAL MANAGEMENT POLICIES AND PROCEDURES.....	59
6.1	ACCESS	60
6.2	SOIL AND GROUND STABILITY	63
6.3	VEGETATION MANAGEMENT	66
6.4	WEED MANAGEMENT	70
6.5	DISEASE CONTROL.....	72
6.6	EARTHWORKS AND LAND USE MANAGEMENT.....	74
6.7	FIRE PREVENTION	77
6.8	AIR EMISSIONS	79
6.9	NOISE EMISSIONS.....	82
6.10	CULTURAL HERITAGE.....	85
6.11	WATER MANAGEMENT	87
6.12	FACILITIES MANAGEMENT	90
6.13	WASTE MANAGEMENT	92
	6.13.1 Produced Water Management.....	92
6.14	SPILL PREVENTION AND RESPONSE	99
6.15	FUEL AND CHEMICAL STORAGE	102
6.16	DECOMMISSIONING AND REHABILITATION.....	105
	6.16.1 Drilling.....	105
	6.16.2 Seismic	105
	6.16.3 Flowline Corridors.....	106
	6.16.4 Access Tracks	108
	6.16.5 Campsites.....	108
	6.16.6 Dams	108
	6.16.7 Processing Plants.....	108
7.0	MEASUREMENT AND EVALUATION	110
7.1	ENVIRONMENTAL AUDITS.....	110

7.2	DOCUMENT REVIEW	111
7.3	ENVIRONMENTAL REPORTING PROCEDURES	112
7.3.1	Statutory Environmental Reporting	112
7.3.2	Incident Reporting	112
7.4	COMPLAINTS MANAGEMENT	113
7.5	STAKEHOLDER MANAGEMENT	113
8.0	KEY CONTACTS.....	115
8.1	EMERGENCY SERVICES.....	115
8.2	STATE GOVERNMENT DEPARTMENTS	115
9.0	REFERENCES	116
10.0	ABBREVIATIONS AND UNITS.....	118

Tables

Table 1: BIM Blocks covered by PL 446	3
Table 2: PL 446 Environmentally Relevant Activities	6
Table 3: Seismic Lines on PL 446	7
Table 4: Petroleum Wells Located on PL 446	9
Table 5: Flowlines Located on PL 446	15
Table 6: Overview of Infrastructure Located at the Processing Plants on PL 446.....	19
Table 7: Evaporation Ponds Located on PL 446.....	23
Table 8: Fuel Burning Equipment on PL 446	25
Table 9: Stack Characteristics and Emission Rates	26
Table 10: Overview of Fuel and Chemical Storage on PL 446	27
Table 11: Description of Major Soil Types on PL 446	30
Table 12: Classes of Agricultural Land in Queensland	33
Table 13: Approximate Distances of Sensitive Receptors to the Silver Springs Processing Plant	34
Table 14: Calculated Rated Background Levels for PL 446 Sensitive Receptors located	34
Table 15: Ground-Level Concentrations of Pollutants	35
Table 16: Potential Weeds of National Significance Present on PL 446	38
Table 17: Declared Weeds Present or of Concern in PL 446 and Surrounding Areas.....	39
Table 18: Threatened EPBC Listed Fauna Species	40
Table 19: Environmentally Sensitive Areas Located on PL 446	42
Table 20: PL 446 Infrastructure Located in Environmentally Sensitive Areas	44
Table 21: Environmental Responsibilities of Key Personnel on PL 446	51

Table 22: Access	61
Table 23: Soil and Ground Stability	64
Table 24: Vegetation Management	67
Table 25: Weed Management	71
Table 26: Disease Control	73
Table 27: Earthworks and Land Use Management	75
Table 28: Fire Prevention	78
Table 29: Air Emissions Management	80
Table 30: Noise Emissions	83
Table 31: Cultural Heritage	86
Table 32: Water Management	88
Table 33: Facilities Management	91
Table 34: Waste Management	95
Table 35: Spill Prevention and Response	100
Table 36: Fuel and Chemical Storage	103
Table 37: Audit Types and Frequency	110
Table 38: Review Periods for Environmental Management Documents	111

Figures

Figure 1: PL 446 Location Overview	4
Figure 2: Petroleum Well Locations on PL 446 (Beechwood)	11
Figure 3: Petroleum Well Locations on PL 446 (Taylor)	12
Figure 4: Petroleum Well Locations on PL 446 (Silver Springs)	13
Figure 5: Diagram of the Silver Springs Production Process	20
Figure 6: Brigalow Belt Terrestrial State Significant Corridor (Bioregional Corridor)	32
Figure 7 Regional Ecosystems Present on PL 446	37
Figure 8: Environmentally Sensitive Areas on PL 446	43
Figure 9: PL 446 Infrastructure Locations and Environmentally Sensitive Areas (Map 1)	46
Figure 10: PL 446 Infrastructure and Environmentally Sensitive Areas (Map 2)	47
Figure 11: The Continual Improvement Model of the Life Guard HSE Management System	49
Figure 12: A Diagrammatic Representation of the Life Guard Management System Hierarchy of Documentation	50
Figure 13: The Structure of the Emergency Response Team for PL 446 and Surrounding AGL Tenures	55

Plates

Plate 1: Examples of different wells on PL 446 – (a) operational gas well, (b) oil well with beam pump and (c) a shut-in gas well	14
---	----

Appendices

Appendix 1:	Integrated Authority 150 120 and PL 16
Appendix 2:	Environmental Management of Seismic Activities
Appendix 3:	Environmental Management of Drilling Activities
Appendix 4:	Management Strategies for Flowlines
Appendix 5:	Proposed EA Conditions for Dams on PL 446
Appendix 6:	Soil Sampling Protocol and Methodology
Appendix 7:	DERM Wildnet Search and EPBC Search
Appendix 8:	AGL HSE Policy
Appendix 9:	Risk Management Matrix

1.0 Introduction

1.1 Background

AGL Gas Storage Pty Limited (AGL) is the holder and operator of a group of petroleum tenures located between Surat and Moonie, in south-west Queensland. AGL has recently successfully purchased 100% ownership of Mosaic Oil N.L (Mosaic) who historically owned and operated these tenures for conventional gas, oil and condensate exploration and production. AGL propose to continue these exploration and production activities, as well as augment operations where appropriate to enhance the commercial viability of these petroleum fields.

This Operational Environmental Management Plan (OEMP) relates to the operation of one of the tenures acquired in this area, namely Petroleum Lease (PL) 16. PL 16 is currently administered under the *Petroleum Act 1923* and Integrated Authority (IA) 150 120 under the *Environmental Protection Act 1994*. A copy of Integrated Authority 150 120 and Petroleum Lease 16 are attached in Appendix 1 of this document. AGL recently made an application to the Department of Employment, Economic Development and Innovation (DEEDI) to convert PL 16 to a petroleum lease under the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act). Subsequently, PL 16 has been assigned a new lease number of PL 446. Although the activities discussed in this OEMP were conducted and authorised under PL 16, for reasons of consistency and simplicity, PL 16 will be referred to as PL 446 from this point forward and throughout the remainder of this document, unless specifically referring to historical tenure holdings and documentation.

PL 446 is situated approximately 49 km south-east of Surat in both the Maranoa Regional Council and Balonne Regional Council areas (see Figure 1). PL 446 is comprised of five main fields that produce gas, oil and condensate. The main processing facility located on PL 446 is the Silver Springs Processing Plant (SSPP) which treats and compresses gas for transfer to the Wallumbilla gas hub. Other significant existing infrastructure on site includes production wells, flowlines, evaporation ponds, a camp and a landfarm.

The key objectives of the operation of activities on PL 446 are to ensure that:

- All exploration and production activities are undertaken in a safe, efficient and environmentally responsible manner;
- All employees and contractors are aware of their environmental responsibilities and are suitably trained to accomplish such responsibilities; and
- Compliance with all legislative and licence requirements relevant to PL 446 is achieved.

This OEMP has been prepared in accordance with the Australia Petroleum Production and Exploration Association (APPEA) Code of Environmental Practice and the Australian Pipeline Industry Association (APIA) Code of Environmental Practice, where these are relevant to exploration and production activities on PL 446. This OEMP also reflects licence requirements (existing IA 150 120) and ongoing management of environmental issues for the operation and maintenance of infrastructure and activities on PL 446.

1.2 Scope of this OEMP

This OEMP has been developed to provide an overview of the petroleum activities that are currently being carried out by AGL on PL 446 as well as to provide a description of the way in which AGL manage the potential environmental impacts associated with operational and maintenance related activities¹. Specifically, this OEMP includes:

- A description of the existing activities carried out on PL 446 (Section 2.0);
- A description of the existing natural environment within PL 446 (Section 3.0);
- A description of AGL's environmental management framework including objectives, systems, roles and responsibilities and control procedures, including emergency response procedures (Section 4.0);
- An overview of the key legislative requirements applicable to PL 446 (Section 5.0);
- Environmental management strategies and procedures utilised at all times by AGL to prevent and/or minimise potential impacts to the environment resulting from PL 446 activities (Section 6.0);
- A description of the monitoring, measurement and evaluation processes including incident reporting and notification (Section 7.0); and
- A list of key contacts within AGL and relevant regulatory authorities for incident and emergency notifications (Section 8.0).

This OEMP will be reviewed and updated to incorporate any new requirements from EA conditions associated with PL 446 activities.

1.3 Relevant Resource Authority

Petroleum Lease (PL) 446 activities are currently conducted in accordance with commitments made in the 'PL 16 Later Development Plan' (LDP) (April 2007 – May 2012) and under the *Petroleum Act 1923*. Activities are also administered under Integrated Authority (IA) 150 120 under the *Environmental Protection Act 1994*.

On 1 December 2010, AGL submitted an application to the DEEDI to convert PL 16 to a lease authorised under the P&G Act. Subsequent to this application, PL 16 has been assigned a new lease number, PL 446. As such, although activities discussed in this OEMP were conducted and authorised under PL 16, the relevant tenure will be referred to as PL 446, throughout this document.

PL 446 covers a large area and is comprised of 85 Block Identification Map (BIM) sub-blocks. These blocks are listed in Table 1 and the location of PL 446 is shown in Figure 1.

¹ The information contained within this document is based on information made available to RPS by AGL and is accurate to the best of our knowledge.

Table 1: BIM Blocks covered by PL 446

BIM Block	Sub-Block
CHAR2944	V,W, X, Y
CHAR3016	A, B, C, D, F, G, H, J, L, M, N, O, Q, R, S, T, V, W, X, Y
CHAR3086	R, S, T, U, V, W, X, Y, Z
CHAR3087	G, H, J, K, N, O, P, T, U, V, W, X, Y, Z
CHAR3088	A, B, C, F, G, L, M
CHAR3158	A, B, C, D, E, F, G, H, J, K, L, M, N, O, P, Q, R, S, T, U, Z
CHAR3159	A, B, C, D, E, F, L, Q, R, V

I.3.1 OEMP Reference Material

The information used to develop this document, in particular Section 2.0 to Section 4.0 (inclusive) and Section 7.0, has been sourced from the draft *'Mosaic Oil NL Environmental Management Plan for Silver Springs-Waggamba, Churchie-Downlands and Fairymount'*, prepared by RLMS in September 2009 and *'Mosaic Oil NL Environmental Assessment, for Silver Springs-Waggamba, Churchie-Downlands and Fairymount'*, prepared by RLMS in November 2009. Unless otherwise referenced throughout Sections 2.0, 3.0, 4.0 and 7.0, the appropriate references for the information are RLMS, 2009a and RLMS 2009b.

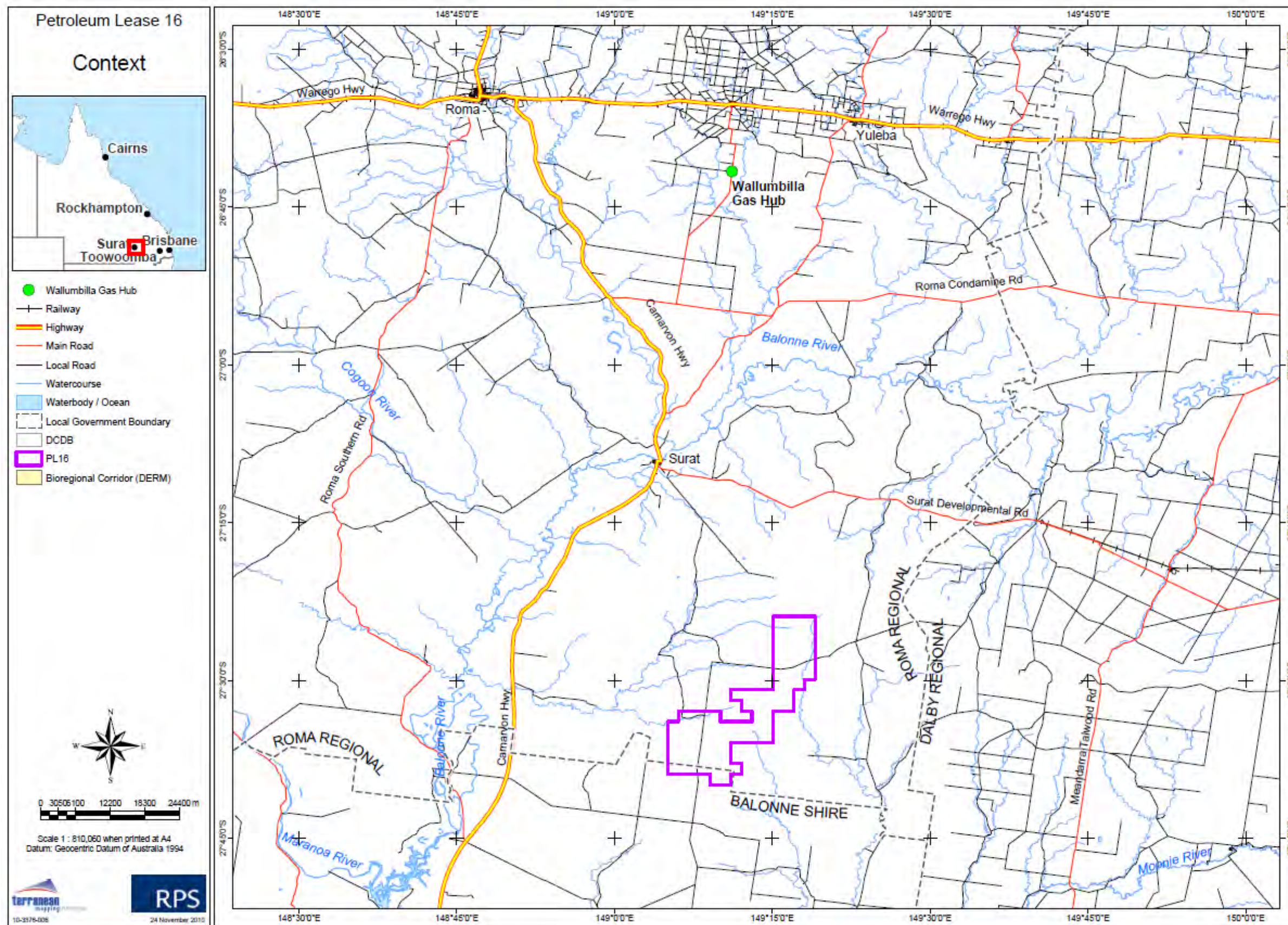


Figure 1: PL 446 Location Overview

2.0 Existing Petroleum Lease 446 Activities

2.1 Description and Status of PL 446

PL 16 (now PL 446) was originally awarded to Bridge Oil Limited in 1977. Mosaic Oil (now owned by AGL) has held this tenure since May 2000. PL 16 was renewed on April 1998 for a period of 21 years, until 29 April 2019. As part of the current DEEDI application, AGL will be awarded the tenure and a term of 30 years will be granted on PL 446 if the application is successful. The petroleum lease is located approximately 49 km south of the township of Surat is and is comprised of a number of petroleum fields, including Silver Springs, Taylor, Sirrah, Renlim, Boggo Creek, Beechwood and Tinker.

Commercial gas reserves were first discovered at Silver Springs, and in October 1978, this gas was made available to the Brisbane market via the Silver Springs Pipeline linking to the main Roma to Brisbane pipeline at Wallumbilla. A vapour recovery plant was constructed at Silver Springs in 1984 to improve downstream LPG and condensate production from the gas flow. During this time a number of discoveries were made including Renlim and Sirrah gas / condensate fields and Taylor gas / oil fields.

Today, production of gas, oil and condensate continues from existing well sites, with only a limited number of new wells planned to be drilled. The projected production rate of hydrocarbons from PL 446 between 2011 and 2015 is two billion standard cubic feet (Bscf) of sales gas and 106,508 barrels of oil / condensate. The production fields are now mature and into their decline phase, nearing the end of their production life. The following sub-sections briefly describe the remaining significant features of the individual fields, as per the AGL Later Development Plan, 2010.

2.1.1 Silver Springs / Renlim

The Silver Springs and Renlim gas fields are in pressure communication through a “joining area”, and are, therefore, treated as a single gas field. The Silver Springs / Renlim field is situated in the southern region of PL 446. All production from this field has been directed to the SSPP. These fields had produced almost all of their remaining reserves of gas by the year 2000. Only two wells remain (sporadically) active in the Silver Springs and Renlim fields, with gas production being negligible and dominated by water. The remaining wells have been shut-in, suspended or permanently plugged and abandoned (P&A).

2.1.2 Sirrah

The Sirrah Field is situated in the southern region of PL 446 approximately 5 km southeast of the SSPP. Almost all expected reserves have been recovered from this field, with only two wells flowing for a short period in 2010. All wells are currently shut-in.

2.1.3 Taylor

The Taylor Field lies approximately 15 km east of the SSPP. The field produces both gas and oil/condensate. Taylor has been developed with twelve wells within PL 446, and is currently producing

1 - 2 million standard cubic feet of gas per day (MMscfd). AGL has identified opportunities to further develop this field.

2.1.4 Tinker

The Tinker area lies in the northern region of PL 446. Production continues from the Tinker area and includes contributions from the Tinker, East Glen and Link Fields.

2.1.5 Boggo Creek

Boggo Creek is approximately 10 km north of the SSPP. Low levels of production are expected to continue through one well.

2.1.6 Beechwood

The Beechwood field last produced gas and condensate in 2002. There are no current plans for any further development activity.

2.2 Environmentally Relevant Activities

Current exploration and production activities on PL 446 involve carrying out a number of Environmentally Relevant Activities (ERA's) in accordance with Schedule 5 of the *Environmental Protection Regulation 2008* and are shown in Table 2.

Table 2: PL 446 Environmentally Relevant Activities

ERA	Description	AES
Schedule 5, Activity No. 6	A petroleum activity carried out on a site containing a high hazard dam or a significant hazard dam.	165
Schedule 5, Activity No. 8	A petroleum activity other than a petroleum activity mentioned in Items 1 to 7, that includes 1 or more Chapter 4 Activities for which an Aggregate Environmental Score is stated:	126
ERA 8 Chemical Storage	Storing more than 500 m ³ of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods Class 3.	85
ERA 9 Hydrocarbon Gas Refining	Refining 200,000,000 m ³ or more of natural gas in a year.	19
ERA 15 Fuel Burning	Using fuel burning equipment that is capable of burning at least 500 kg of fuel in an hour.	35
ERA 58 Regulated Waste Treatment	Operating a facility for receiving and treating regulated waste or contaminated soil to render the waste or soil non-hazardous or less hazardous.	90
ERA 60 Waste Disposal	Operating a facility for disposing of, in a year, 50,000 t to 100,000 t of general and regulated waste.	82
ERA 63 Sewage Treatment	Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of 21 to 100 EP.	27

2.3 Notifiable Activities

As part of the recent acquisition of PL 446, AGL are currently reviewing existing operations. In the event that it is determined that notifiable activities, as per Schedule 3 of the *Environmental Protection Act 1994* (EP Act), are being undertaken on PL 446, the appropriate notifications under Chapter 7, Part 8 of the EP Act will be made by AGL to the DERM Contaminated Land Unit.

2.4 Seismic Surveys

Over 800 km of seismic surveys have been conducted across PL 446 during the life of the production project and during earlier exploration on ATP145P. Existing seismic lines that remain the responsibility of AGL are presented in Table 3.

Table 3: Seismic Lines on PL 446

Survey Name	Survey ID	Year Completed	Length (km)
Echo Hills	86CE	1986	0.08
Winsor	90B	1990	92.24
Yoorooga	87B	1988	64.62
Taylor	86B	1986	66.79
Silver Springs	76B	1976	14.97
Sirrah Detail	85B	1985	5.86
Rocky Creek & Extension	81B	1982	12.76
Rocky Glen	87B	1987	3.40
North Taylor	87B	1987	4.94
Namarah	HSI	1981	0.02
Merroombil	85B	1985	28.04
Kyeen-Teelba	HSI	1980	0.59
Glenearn	78B	1979	81.05
Glenmore	88B	1988	44.25
Boxleigh	77B	1977	3.19
Bridge 1981	83B	1983	101.78
Boggo Creek	78B	1978	6.96
Bendiboi	HSI	1984	0.19
Bidgel	85B	1985	81.59
Beechwood	89B	1989	128.87
Wunger	74B	1974	50.33
Kareenah	91B	1991	7.26
Boxleigh Detail	85B	1985	1.59
Noorindoo & Extension	80B	1980	17.13
Total for PL 446			818.5

Source: Modified from RLMS 2009a

Further seismic surveys are programmed to occur across PL 446, predominantly within the Taylor field, to identify any additional target areas for development in the existing Taylor field reservoir. Additional seismic acquisitions may also occur across the Silver Springs, Renlim and Tinker fields.

Seismic field operations are conducted by experienced seismic survey companies who are required to submit an EMP or procedures to AGL for their operation to ensure the proposed activities are compliant with the conditions of the relevant EA and with AGL's environmental standards. AGL has adopted an environmental standard for seismic works in accordance with the Environmental Manual for Worldwide Geophysical Operations 2001 as prepared by the International Association of Geophysical Contractors.

Modern seismic activities are considered low impact. GPS locators have replaced the historical requirement for line-of-sight surveys. Some vegetation removal may still be necessary to enable vehicle access, but this will be on a case-by-case basis and clearing will be selective.

Due to the depth of the target reservoirs, either vibroseis or dynamite charges may be used to generate the waves or vibrations essential for the survey to be conducted. If dynamite is used, typically, relatively small amounts of explosives are buried in 15 – 30 m deep 'shot holes' along a seismic line, which once detonated creates a small pulse on the surface up to approximately 100 m away (Milligan 2004). Environmental sensitivities such as dams, watercourses, pipelines, wells and bores and third party infrastructure such as tanks and residences are considered when determining the placement of shot holes (RLMS 2009a).

At the completion of seismic surveys, seismic lines are rehabilitated through the removal of all temporary markers, wires and the like, and where necessary the natural drainage and topsoil are reinstated and shot holes are backfilled. At the completion of rehabilitation activities, landholders are requested to sign agreements / release to indicate their satisfaction with the rehabilitation efforts.

Environmental management of disturbances caused by seismic activities is outlined in Appendix 2 of this document.

2.5 Wells

There are 57 wells present on PL 446 that are the responsibility of AGL. Of these 10 are producing, 1 is suspended, 26 are shut-in and 9 have been plugged and abandoned. The remaining wells are being used as water wells, or are abandoned water wells. One well (Tinker 5) has been converted to a water bore and transferred to the landowner in accordance with the provisions of the *Petroleum Act 1923*.

A full list of the wells and their respective production status is provided in Table 4. The well locations on PL 446 are illustrated in Figure 2, Figure 3 and Figure 4. The well production status in Table 4 was accurate at the time this report was prepared, however this is subject to change based on operational needs. Plate 1 illustrates examples of the different well types described in Table 4.

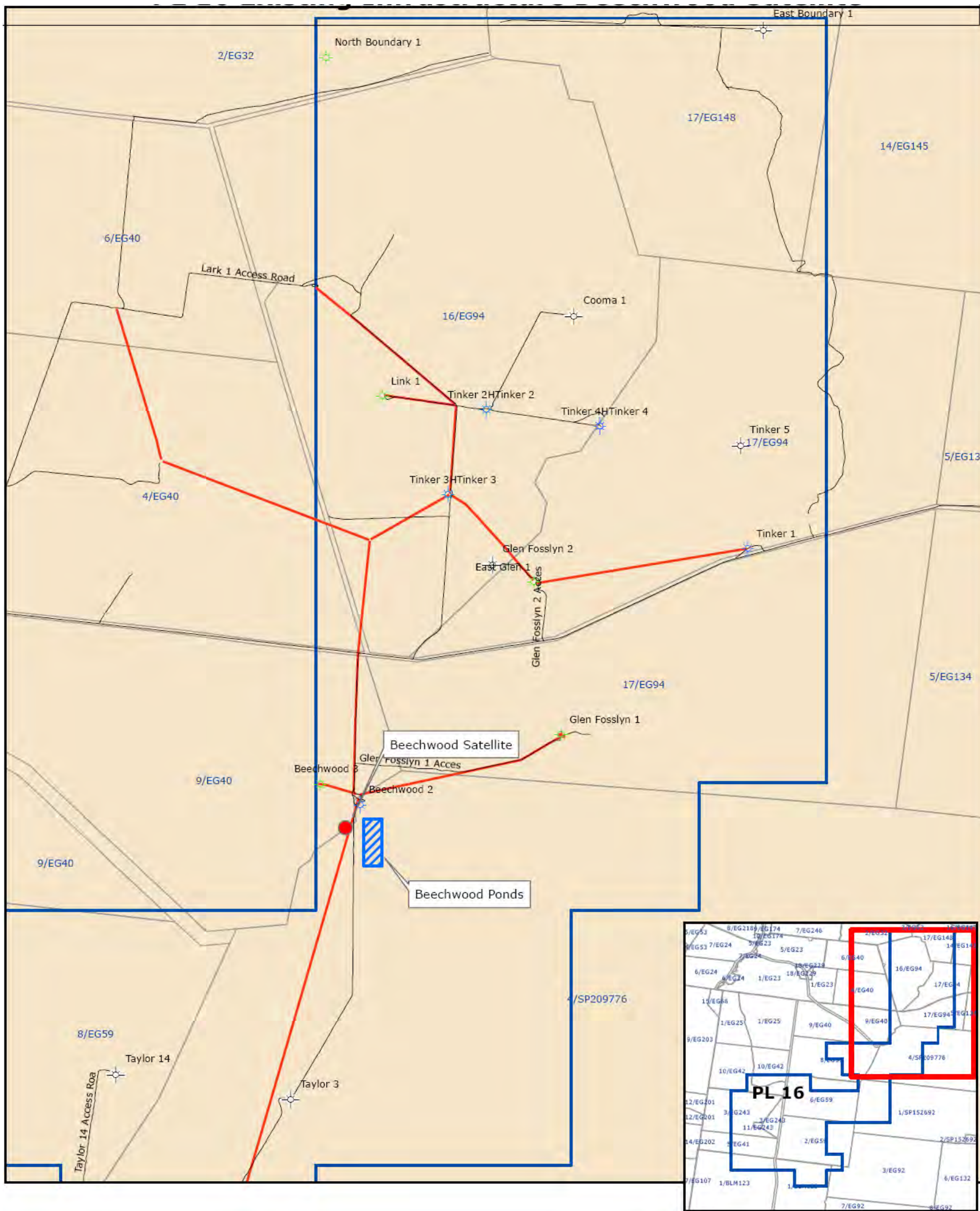
Table 4: Petroleum Wells Located on PL 446

Well	Status	Additional information
Lark 1	Shut-in	
Silver Springs 1	Shut-in	New tubing installed for UGS monitoring well
Silver Springs 2	Producing	Proposed P & A workover
Silver Springs 3	Suspended	Proposed new completion
Silver Springs 4	Plugged & abandoned	
Silver Springs 5	Shut-in	Planned P & A workover
Silver Springs 6	Shut-in	Proposed new completion
Silver Springs 7	Water well	<i>Petroleum Act</i> Water Licence 327
Silver Springs 8	Water well	<i>Petroleum Act</i> Water Licence 328
Silver Springs 9	Water well	<i>Petroleum Act</i> Water Licence 373
Silver Springs 10	Water well	<i>Petroleum Act</i> Water Licence 573
Silver Springs 11	Shut-in	Proposed new completion
Renlim1	Shut-in	Proposed new completion
Renlim 2	Shut-in	Installed new tubing for UGS monitoring well
Renlim 3	Shut-in	Proposed new completion
Renlim 4	Shut-in	Proposed new completion
Renlim 5A	Producing	Producing new completion
Sirrah 2	Shut-in	
Sirrah 3	Shut-in	
Sirrah 4	Shut-in	
Sirrah 5	Shut-in	
Taylor 1	Producing	Free-flowing gas
Taylor 2A	Plugged back	Plugged back (concreted) to above the Showgrounds reservoir, to isolate the petroleum reservoir, however is not plugged to the surface.
Taylor 3	Plugged & abandoned well	
Taylor 6A	Water well	<i>Petroleum Act</i> Water Licence 587
Taylor 7	Shut-in	
Taylor 8	Shut-in	
Taylor 9	Shut-in	
Taylor 10	Shut-in	
Taylor 11	Shut-in	
Taylor 13A	Water well	<i>Petroleum Act</i> Water Licence 604
Taylor 14	Water well	<i>Petroleum Act</i> Water Licence 603
Taylor 16	Shut-in	
Taylor 19	Producing	Future Beam Pump
Taylor 20	Producing	
Taylor 22	Producing	

Well	Status	Additional information
Bidgel 1	Plugged & abandoned	
Beechwood 2	Shut-in	
Beechwood 3	Shut-in	
Tinker 1	Producing	<i>Petroleum Act Water Licence 598</i>
Tinker 2H	Shut-in	
Tinker 3H	Shut-in	Beam Pump
Tinker 4H	Shut-in	
East Glen 1	Producing	Beam Pump
Glen Fosslyn 1	Shut-in	
Glen Fosslyn 2	Plugged & abandoned	Not in use
Glenmore 1	Plugged & abandoned	
Link 1	Producing	Beam pump
East Boundary 1	Plugged & abandoned	
North Boundary 1	Shut-in	
Noona 1	Plugged & abandoned	
Boggo Creek 2	Producing	Beam Pump
Boggo Creek 3	Water well	<i>Petroleum Act Water Licence 239</i>
Boggo Creek 4	Water well	<i>Petroleum Act Water Licence 246</i>
Cooma 1	Water well	<i>Petroleum Act Water Licence 249</i>
Lacombe 1	Plugged & abandoned	
West Boggo Creek 1	Plugged & abandoned	

Source: Modified from RLMS 2009a

Hydrocarbon production continues from both free-flowing and gas lift gas wells and beam pump driven oil wells. The average footprint of a well lease (total cleared area) is approximately 1 ha, whilst the occupied operational area is approximately 0.04 ha. The well lease contains the well head, pipeline connections and well head telemetry. Size can vary dependent on individual locations and the infrastructure required (e.g. oil wells require a beam pump and associated storages). The well head facilities are fully fenced where the well is co-located with stock. Both gas and oil well leases also have a flare line and flare pit associated with them.

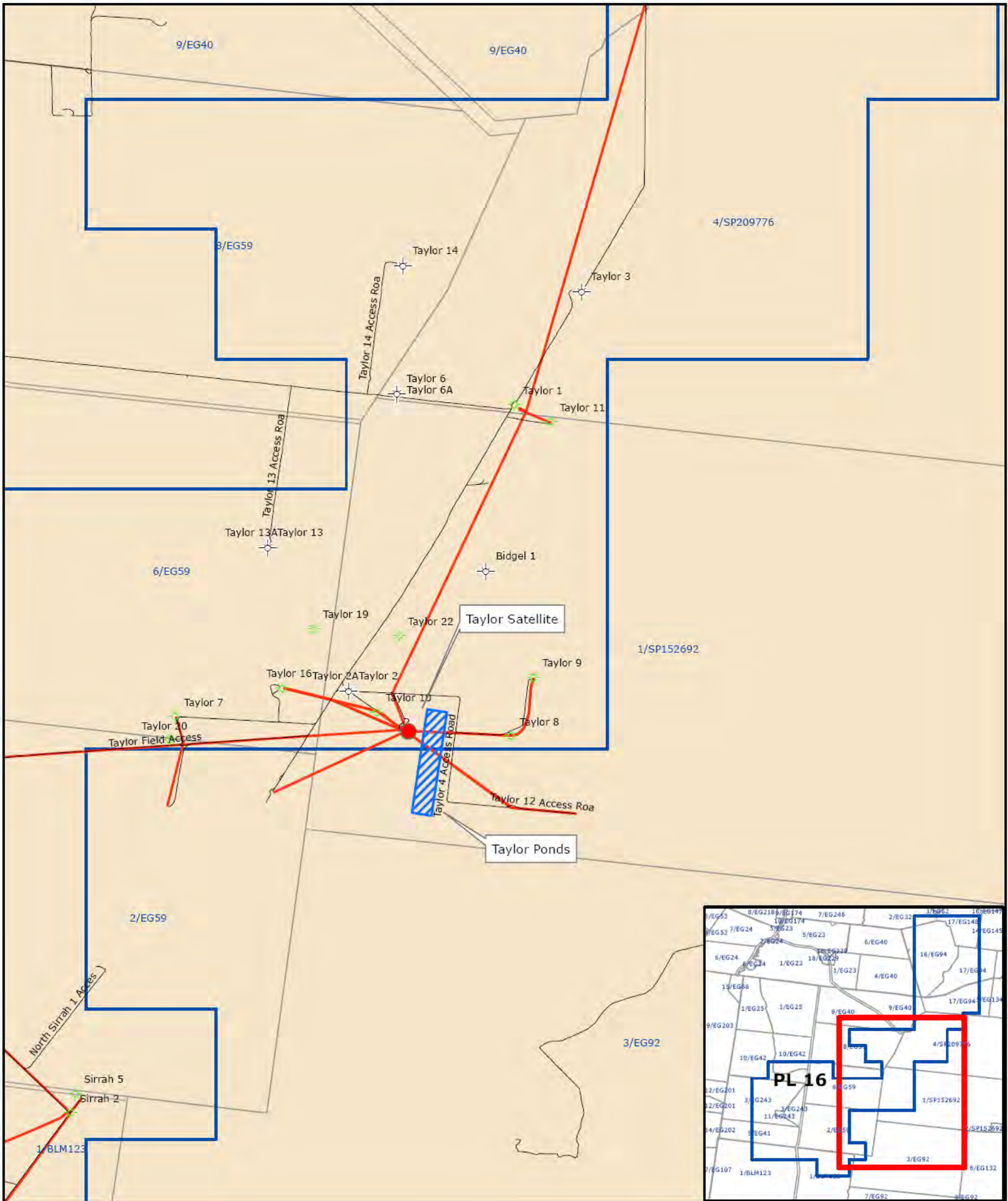




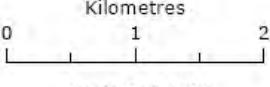










	Author: Upstream Gas	<p>Scale 1:50,000</p> <p>Geocentric Datum of Australia 1994</p>	<p>Legend</p> <p>Wells</p> <ul style="list-style-type: none"> Cased & Susp. Comp.as Prod. J&A P&A Plug. & Susp. Suspended Access Roads Flowlines PL 16 Cadastre 	
	Date: 08/12/2010			
	Ref: 2613R2			

Disclaimer: While AGL has taken great care and attention to ensure the accuracy of the data represented on this map, no liability shall be accepted for any errors or omissions. No part of this map may be reproduced without prior permission of AGL.

Sources: AGL Energy Limited, MapData Sciences, GPIInfo

Figure 2: Petroleum Well Locations on PL 446 (Beechwood)

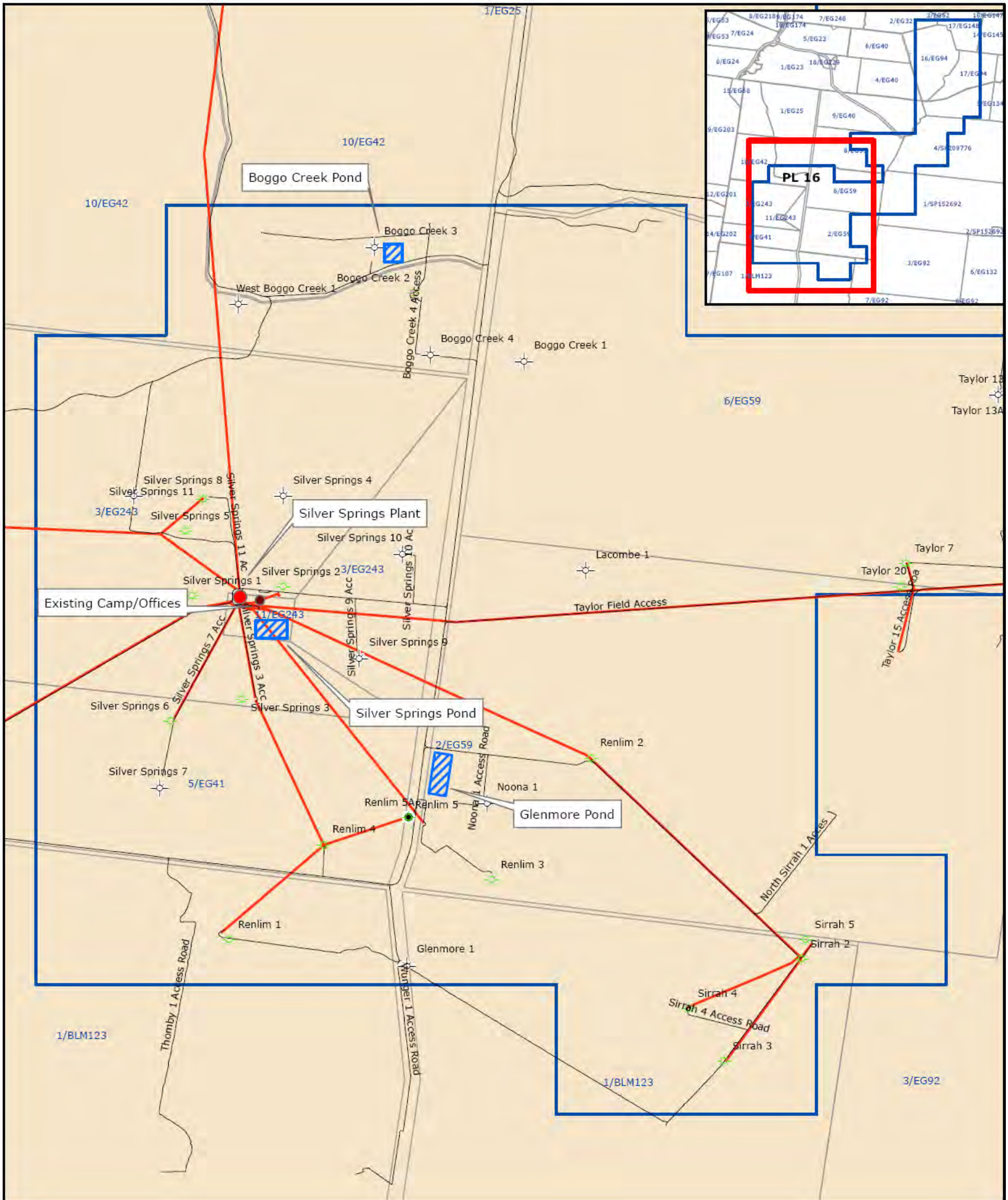


 	Author: Upstream Gas	 Scale 1:50,000 Geocentric Datum of Australia 1994	Legend Wells  Cased & Susp.  Plug & Susp.  Comp as Prod.  Suspended  J&A  Access Roads  Flowlines  PL 16  Cadastre	
	Date: 08/12/2010			
	Ref: 2612R2			

Disclaimer: While AGL has taken great care and attention to ensure the accuracy of the data represented on this map, no liability shall be accepted for any errors or omissions. No part of this map may be reproduced without prior permission of AGL.

Sources: AGL Energy Limited, MapData Sciences, GPInfo

Figure 3: Petroleum Well Locations on PL 446 (Taylor)



	Author: Upstream Gas	<p>Scale 1:50,000</p> <p>Geocentric Datum of Australia 1994</p>	<p>Legend</p> <p>Wells</p> <ul style="list-style-type: none"> Cased & Susp. Comp.as Prod. J&A P&A Plug. & Susp. Suspended Access Roads Flowlines PL 16 Cadastre 	
	Date: 14/12/2010			
	Ref: 2611R3			

Disclaimer: While AGL has taken great care and attention to ensure the accuracy of the data represented on this map, no liability shall be accepted for any errors or omissions. No part of this map may be reproduced without prior permission of AGL.

Sources: AGL Energy Limited, MapData Sciences, GPIInfo

Figure 4: Petroleum Well Locations on PL 446 (Silver Springs)



Source: RLMS 2007

Plate 1: Examples of different wells on PL 446 – (a) operational gas well, (b) oil well with beam pump and (c) a shut-in gas well

Limited drilling activities are planned to continue on PL 446, predominantly in the Taylor field, as part of ongoing production activities. AGL do not propose to use hydrocarbon or synthetic based drilling fluid formulations when drilling nor does AGL anticipate that hydraulic fracturing will be required on PL 446. Drilling is conducted by experienced drilling companies, who are required to submit for review either an EMP for their operations or environmental procedures; so that AGL can ensure that the activities will be compliant with the conditions of the relevant EA and with AGL's Environmental Policy and OEMP.

The environmental management of drilling activities is outlined in Appendix 3 of this document. Drilling methodologies for future wells associated with the proposed gas storage project are discussed in Sections 1 and 3.5 of the PL 446 EMP, submitted to DERM for assessment as part of the EA application.

2.6 Flowlines

There are 58.64 km of gathering system / flowlines across PL 446 enabling extracted gas / oil to be transported from individual wellheads to the processing facilities located at Silver Springs. PL 446 has 56.22 km of buried flowlines located in maintained cleared easements of approximately 20 m in width. The remaining 2.42 km of flowlines are aboveground. Due to the large number of wells that are currently shut-in, 20.77 km of buried flowlines are presently not in use; however these have not been decommissioned. A full description of the flowlines located on PL 446 is presented in Table 5.

Table 5: Flowlines Located on PL 446

Well	Flow Line Status	Nominal Diameter (mm)	Length (km)
Silver Springs 1	Buried – to be decommissioned	80	0.56
Silver Springs 2	Buried	80	0.55
Silver Springs 3	Buried – not in use	150	1.42
Silver Springs 5	Buried – not in use	80	1.54
Silver Springs 6	Buried – not in use	80	1.8
Silver Springs 11	Buried – not in use	80	0.76
Renlim 1	Buried – not in use	90	2.0
Renlim 4	Buried	100	3.7
Renlim 5A	Buried	80	1.11
Sirrah 2	Buried	100	8.87
Sirrah 3	Buried – not in use	80	1.76
Sirrah 4	Buried	80	1.62
Sirrah 5	Above-ground	80	1.12
Taylor 1	Above-ground	80	0.1
Taylor 7	Buried – not in use	80	0.41
Taylor 8	Buried – not in use	80	1.34
Taylor 8 Gas Lift	Buried – not in use	50	1.34
Taylor 9 Gas Lift	Buried-not in use	50	0.92

Well	Flow Line Status	Nominal Diameter (mm)	Length (km)
Taylor 10	Buried	50	0.52
Taylor 11	Buried	50	0.5
Taylor 16	Buried	80	1.64
Taylor 16 gas lift	Buried	80	1.23
Taylor 19	Above-ground	60	0.8
Taylor 20	Above-ground	80	0.4
Taylor 22	Buried	100	1.6
Beechwood 2	Buried – not in use	80	0.1
Beechwood 3	Buried – not in use	80	0.7
Tinker 1	Buried	80	2.82
Tinker 3H	Buried	150	4.97
Tinker Manifold	Buried	150	3.72
East Glen 1	Buried	50	1.66
Glen Fosslyn 1	Buried – not in use	80	3.28
Link 1	Buried	80	0.94
Lark 1	Buried – not in use	80	2.84

Source: Modified from RLMS 2009a

Approximately seven of the flowlines presented in Table 5 have aboveground 'pig' launching facilities associated with them. These facilities are where a pipeline 'pig' is placed into the line to clean the pipe. The pig travels inside the pipe before being removed at a pig receiving facility. Removal of a pig from the pipeline results in minor venting of gas to atmosphere and the collection of some oil sludge and debris. This is handled as a regulated waste and disposed of as described in Section 6.13. Pigging programs are typically carried out once a month to reduce pipe corrosion.

A small number of flowlines may be constructed in future if more production wells are drilled. The construction of flowlines will be subject to standard pipeline construction practices as set in the APIA Code of Environmental Practice, the PL 446 EM Plan and the AGL management strategies outlined in Appendix 4 of this document.

2.7 Processing Facilities

There is one major operational processing facility, one partially operating satellite plant and two abandoned satellite processing facilities located on PL 446 (see Figure 2, Figure 3 and Figure 4) as described in the following Sections.

2.7.1 Silver Springs Processing Plant (SSPP)

The SSPP is the central processing facility on PL 446 and is located on approximately 51 ha of land owned by AGL at Silver Springs field (Lot 11 on Plan EG243). This facility is operational and has a current capacity to process up to 12 MMscfd which is supplied from the PL 446 fields and other

surrounding production tenures owned by AGL, Santos and Origin Energy (Beck 2002). A brief description of the gas and oil / condensate production process is provided below.

There is a range of infrastructure associated with the SSPP including evaporation ponds, compressor units, storage tanks, a landfarm, a camp and a landfill. These facilities are discussed in greater detail in Section 2.8 to Section 2.13 of this OEMP. An overview of the facilities and equipment located at Silver Springs is presented in Table 6.

2.7.1.1 Gas Production

The full well stream composed of gas, oil / condensate and production water from the fields is transported via the gathering systems to the SSPP. Here, the well stream is passed through two closed pressure vessels or production separators which remove the fluid components from the gas stream. During winter there are two water-bath heaters for heating the gas entering the plant.

The separated gas is then sent through three compressor units to be compressed. Water is further removed within a Triethylene Glycol (TEG) dehydrator. The dehydrated gas is injected into the Silver Springs Pipeline (PPL 4) and transmitted to the Wallumbilla LPG plant, operated by Santos and situated approximately 100 km north of the project. The TEG unit used to dehydrate the gas is a closed system which allows the TEG to be recovered and recycled. The water saturated TEG is passed through a gas-fired reboiler which separates the TEG and the water. The TEG is then returned to the dehydration process for reuse (Beck 2002).

2.7.1.2 Oil / Condensate Production

The oil / condensate that is initially separated from the gas upon entry to the SSPP flows into a large condensate storage tank. Some water will carry over with the oil / condensate, which will settle to the bottom of the storage tank. The oil and condensate is periodically emptied from the tank, loaded into tankers and is transported by road to Brisbane.

Produced water from the production separators and the remaining water in the oil / condensate storage tank is drained and diverted to twin oil-water wash tanks designed to skim off free oil. The water is then drained to an interceptor pond where further oil is regularly skimmed off. Oil that is skimmed is collected and stored in an oil storage tank. Finally, the separated water flows to a series of evaporation ponds for disposal (see Section 2.8 for further details on evaporation ponds) (Beck 2002).

The Silver Springs production process is shown diagrammatically in Figure 5.

To minimise safety or environmental risks, the following protective systems have been installed at the SSPP and on the flowlines:

- Bunding of tanks;
- Overpressure protection;
 - » High pressure switches to shut off the inlet flow;
 - » Emergency shutdown on inlets and outlets;

- » Pressure relief valves;
- Fusible loop systems which activate alarms or cause emergency shutdown of the plant; and
- Permanent flare for emergency vapour releases.

2.7.2 Taylor Satellite Processing Plant

A satellite processing plant is located at the Taylor field. This plant is largely abandoned, but still operates in a minor capacity for well testing activities. Oil / water mixtures are sent to an oil processing tank to separate. The very small amount of water produced is manually conveyed to an on-site evaporation pond whilst the oil is pumped into a storage tank, from where it is periodically emptied and trucked away for sale.

There is a range of infrastructure associated with the Taylor Plant including evaporation ponds, a decommissioned compressor unit, above ground oil / condensate storage, power generators, compressed air facilities and a production separator. The majority of this infrastructure is no longer used and is discussed further in Section 2.8 to Section 2.12 of this OEMP.

To minimise any safety or environmental risks, protective systems are installed at the Taylor plant, and on the flowlines. These systems include:

- Bunding of tanks;
- High level alarm on storage tank;
- Pressure relief valves; and
- Fusible loop systems which alarms.

An overview of the facilities and equipment located at Taylor is presented in Table 6.

2.7.3 Beechwood Satellite Plant

The Beechwood Satellite Plant is no longer operational and has been abandoned, however, infrastructure remains on-site. This infrastructure includes a pig receiver and launcher, decommissioned water bath heater, a gravel pad and a fenced pond.

An overview of the facilities and equipment located at Beechwood is presented in Table 6.

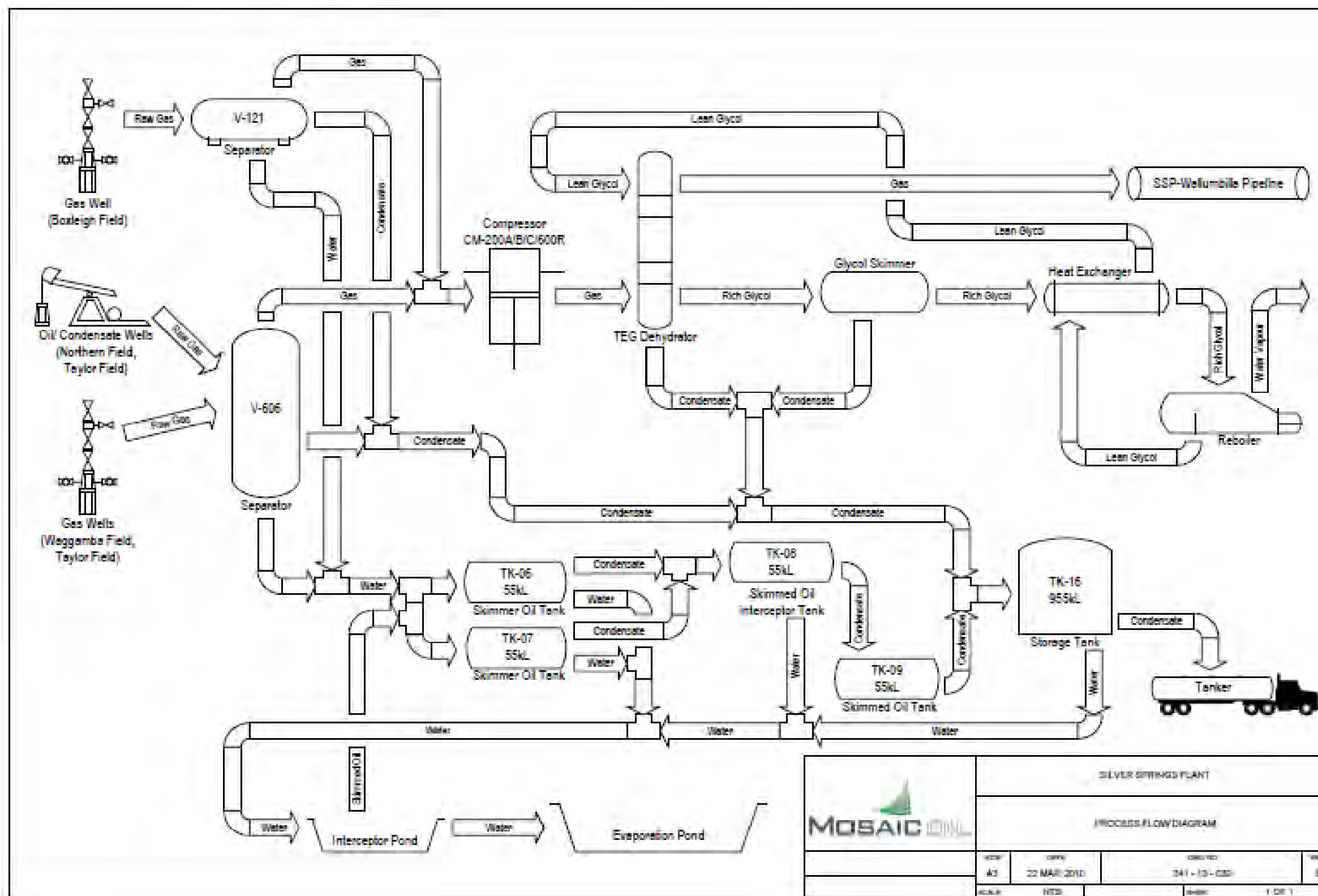
2.7.4 Sirrah Satellite Plant

The Sirrah Satellite Plant is present on PL 446. This plant is no longer operational and has been abandoned, however, infrastructure remains on-site. This infrastructure is comprised of a pig launcher.

Table 6: Overview of Infrastructure Located at the Processing Plants on PL 446

	Silver Springs Processing Plant	Taylor Satellite	Beechwood Satellite
Processing Plant Status	Producing	Operational in minor capacity	Abandoned
Number of Separators	2	2	
Number of TEG Dehydration Units	1	-	
Number of Pressure Vessels (inc separators, dehydrators etc)	23	10	
Number of Fired Heater Vessels (heaters, reboiler etc)	3	-	1 – decommissioned
Number of Compressors	6	1-decommissioned	
Condensate Tank Storage Capacity (kL)	1,060	60	
Water Tank Skimming Capacity (kL)	112	60	
Number of Water Skimming Tanks	2	1	
Interceptor Pond Surface Area (m ²)	1,400	-	
Interceptor Pond Capacity (kL)	2,100	-	
Water Evaporation Pond Surface Area (m ²)	113,300	17,600	2,286
Water Evaporation Pond Capacity (kL)	169,950	29,520	4,877
Liquid Fuel Storage Capacity (kL)	74	-	
Power Generation Capacity (kVA)	140	-	
Camp Capacity (maximum/typical)	20/8		
Landfarm Surface Area (m ²)	10,000	600	

Source: Modified from RLMS 2009a



Source: AGL 2010

Figure 5: Diagram of the Silver Springs Production Process

2.8 Produced Water and Evaporation Ponds

2.8.1 Water Production

Produced water on PL 446 is generated as part of the dewatering of the oil and gas reservoir as part of the traditional oil and gas extraction process. Water is produced from both free flowing and artificially lifted petroleum wells that extract the oil / condensate, water and gas. Water can either be separated at the well head to improve wellhead gas metering using a simple three phase liquid / gas separator, or the full well stream is transferred back to the SSPP where the water is separated as per the process described in Section 2.7.1.

Water production rates across PL 446 are variable. In the last two years at the SSPP, between approximately 0.24 ML and 0.31 ML of water per day has been generated. The variability in water production is a result of the variability in oil and gas production observed across PL 446 in recent years. Water production rates increase as the oil and gas reserves are depleted. If a well begins to produce too much water, it is no longer economically viable to continue producing from that well. Given that a large number of PL 446 wells have now been shut-in and the remaining production fields are in decline, inevitably resulting in more wells being shut-in, water production rates for existing activities should not vary significantly into the future.

The average water quality from the existing evaporation ponds located at Silver Springs is shown below:

- Total Oil and Grease - <10mg/L;
- Electrical Conductivity – 5 - 50 mS/cm;
- Total Dissolved Solids – ranges from between 3200 - 32500 mg/L; and
- pH – 6 – 10.

In addition to these measured parameters it is anticipated that waters will contain levels of anions, cations and metals consistent from the aquifer that water is drawn from.

AGL will obtain a full characterisation of the waters produced on PL 446 as part of a review process of PL 446 water management operations (as discussed in Sections 2.8.2.6, 2.8.4 and 6.13).

2.8.2 Evaporation Ponds

Currently, produced waters are disposed of via evaporation. There are 13 evaporation ponds located on PL 446, however only 8 of these ponds are operational and used for the produced water treatment and disposal (including interceptor ponds). All existing ponds on PL 446 were constructed, and have been operated, to be in compliance with conditions of Integrated Authority 150 120. Since the acquisition of PL 446, AGL has undertaken a visual inspection of the operational pond facilities only. This inspection identified no significant integrity issues with pond walls and there was no evidence of leaks or breaches. Some minor erosion on the outside of pond walls was evident. All ponds are maintained with an operational freeboard of 0.5 m in accordance with the conditions of Integrated Authority 150 120.

The following Sections provide details of the ponds at each location.

2.8.2.1 Silver Springs

The Silver Springs ponds system, situated at the SSPP, is currently used for the disposal of produced waters from conventional oil and gas production activities. The system is comprised of four large clay lined evaporation ponds and one interceptor pit and has a combined storage capacity of approximately 172 ML. The size and capacity of the individual storages is shown in Table 7.

The interceptor pit is an unlined pond and is where water from the condensate tanks and the oil-water wash tanks is diverted (as described in Section 2.7.1.2). This water still possesses some oil content and is often emulsified. Over time the oil and water settles out. The oil is regularly skimmed off the pond, whilst the water moves via an underflow system to a series of evaporation ponds (Stage 1 to Stage 4). The Stage 3 pond is abandoned and is not in use. The pond site is fully fenced within the Silver Springs boundary. Pond levels are monitored daily

A second interceptor pit is present at Silver Springs; however this is not part of the primary water treatment pond system. This pit also acts as a settling pond for oily water to separate. Oil is regularly skimmed off the pond and stored in an oil storage tank.

There are no environmental features of significance within the vicinity of the ponds, with no remnant vegetation, watercourses or drainage lines present.

2.8.2.2 Glenmore

The Glenmore evaporation ponds are comprised of one interceptor pit and one large evaporation pond. The size and capacity of these ponds is shown in Table 7. The Glenmore ponds are located approximately 5 km to the south-east of the SSPP (Figure 4). The interceptor pit is lined with High Density Poly Ethylene (HDPE) and the main evaporation pond is clay lined. The ponds are fully fenced. These ponds have never been used for gas and oil production,

2.8.2.3 Taylor

The Taylor Satellite Plant contains three evaporation ponds. Pond No.1 has been decommissioned and has been converted to a landfarm to bio-remediate the remaining contamination (refer Section 2.11.1). Pond No.2 is abandoned and is no longer utilised. Pond No.3 is still used intermittently in the production process for the disposal of well test water (AGL 2010). The flow of water to Pond No.3 is limited and sporadic and therefore the pond is monitored irregularly, as it will only reach high levels during heavy periods of rainfall.

2.8.2.4 Boggo Creek

A small evaporation pond is present at Boggo Creek. This pond is utilised irregularly for the disposal of small quantities of water from the sporadically producing Boggo Creek Well No. 2. Water levels in the pond remain low and the pond is monitored only when the well is on-line and is producing water.

2.8.2.5 Beechwood Satellite

A small evaporation pond is present at Beechwood. This pond is not currently used.

Table 7: Evaporation Ponds Located on PL 446

Pond Name	Area (m ²)	Volume (m ³)	Average Depth (mm)	Additional Information
Silver Springs Interceptor Pit	2 000	2 000	700	
Silver Springs Stage 1 Evaporation Pond	10 450	15,675	700	
Silver Springs Stage 2 Evaporation Pond	61 550	92,325	700	
Silver Springs Stage 3 Evaporation Pond	23 800	35 700	600	Not in use
Silver Springs Stage 4 Evaporation Pond	17 500	26 250	800	
Silver Springs Interceptor Pit (2)	2 000	2 000		Oil skimming pit – not attached to the Silver Springs pond system
Taylor Satellite Interceptor Pit	-	-	-	Decommissioned. Now a landfarm.
Taylor Satellite Stage 2 Evaporation Pond	7 200	10 800	N/A	Abandoned
Taylor Satellite Stage 3 Evaporation Pond	10 400	18 720	600	Used intermittently to evaporate well test water
Glenmore Interceptor Pit	100	100	N/A	HDPE lined – not in use
Glenmore Stage 1 Evaporation Pond	145 000	330 000 (approx)	N/A	Clay lined - not in use
Boggo Creek 2 Evaporation Pond	900	2700	1000	Used intermittently to evaporate well test water
Beechwood Satellite	2 286	4 877	N/A	Not in use

2.8.2.6 Hazard Assessment

The pond systems present on PL 446, were constructed in accordance with the relevant regulatory requirements at the time of construction. At the time that this OEMP was prepared, a determination as to whether the PL 446 evaporation ponds are significant or high hazard rated regulated dams had not been made by a suitably qualified engineer.

A formal hazard assessment of evaporation dams is to be undertaken as a matter of priority by AGL to accurately determine the hazard rating of PL 446 evaporation ponds, so as to ensure that the relevant conditions of the EA and the Queensland DERM *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams* are being met. This assessment will include the identification of

residences, workplaces and stock holding areas that have the potential to be impacted in the event of dam failure. Where dams are identified as a high or significant hazard regulated dam, the appropriate certification will be obtained and lodged with DERM.

For the purposes of the current EA application and as a conservative measure, AGL has assumed that the evaporation dams at Silver Springs are regulated dams, presenting either a high or significant hazard. In the event that the hazard assessment demonstrates otherwise, AGL will apply for an amendment of the EA to reflect this.

2.8.3 Pond Management and Monitoring

Currently, monitoring of the evaporation ponds and the interceptor ponds is completed daily. This includes visually checking storage levels, oil contamination and pond wall integrity. Inspections for potential leaks, seepage or issues with bund walls are conducted twice a year. AGL are proposing to increase the monitoring for evaporation ponds into the future as described further in Section 6.13.1.

2.8.4 Implications of CSG Water Management Policy

Recent developments in CSG regulation by DERM has resulted in the introduction of a range of new legislation, policy, guidelines and model conditions relating to the management and disposal of water produced from CSG activities and minimum construction standards for CSG water storages. Impacts associated with conventional oil and gas production do not correlate to the environmental impacts, industry practices and challenges of the CSG industry. These pond systems do not, and will not into the future, hold the same large volumes of water of very high salt concentrations associated with typical CSG water and CSG water storages. The extremely high standards of leakage detection and collection systems prescribed in the CSG policies are therefore not necessarily warranted to prevent the level of potential environmental harm posed by the operation of conventional oil and gas ponds.

Given that the existing ponds have been operating in compliance with the conditions of the Integrated Authority 150 120 for a substantial period of time, AGL do not propose to decommission the existing ponds in order to meet the new construction standards stipulated in the DERM CSG Water Management Policy. To decommission and construct new ponds to meet the new standards would not be financially nor logistically viable for AGL given the current options for water storage and location of suitable alternative ponds.

Assessing the viability of upgrading existing ponds / dams at the Silver Springs facility requires an understanding of the forecast planned life of the oil and gas reserves (based on current oil/condensate activities), an understanding of the costs to rehabilitate the existing ponds and an understanding of the cost to upgrade water storage facilities to current DERM standards as proposed in the DERM CSG Water Management Policy.

Based on currently available financial information for the producing areas, the forecast financial revenue for oil/condensate reserves is estimated at between \$4-\$6M(AUD) over the next five years. AGL has recently completed similar dam constructions on CSG activities in the Galilee Basin and based on these costs it is anticipated that the cost for upgrading existing ponds to lined ponds is between \$5M-\$7M(AUD). Coupled with the potential costs of disposing produced water during

upgrade works and the extended time period required to upgrade the ponds, AGL does not consider this option to be either economically or environmentally viable.

To demonstrate that the existing ponds are operating satisfactorily and are providing for the effective containment of contaminants, AGL will, within the next six months, engage a suitably qualified and experienced engineer to conduct a formal review of the pond systems and their operation. This will involve a hazard appraisal, as discussed in Section 2.8.2.6 and an assessment of the hydraulic, geotechnical and structural integrity of the ponds, to ensure that ponds are fit for purpose, are not causing environmental harm and do not have significant potential to cause environmental harm. Once the review has been completed, AGL will assess the outcomes and where appropriate develop new management and remediation techniques as recommended. A report summarising these actions will be submitted to DERM.

In recognition of the new regulatory developments and the transition away from evaporation being an acceptable means of water disposal, AGL is committed to investigating alternative water disposal / management strategies including (but not limited to) identifying local beneficial uses for water and re-injection. AGL consider this a viable alternative moving into the future rather than upgrading existing facilities for water management across the entire operation.

Proposed EA conditions for the governing of dams on PL 446 have been compiled based on DERM's draft conditions for dams and are included as Appendix 5 of this report

2.9 Fuel Burning Equipment

During the gas production process, the gas is compressed and dehydrated. This occurs via compressor units, capable of burning 500 kg or more of fuel in an hour. At the SSPP, there are four operational gas fired compressors. Only three of these units will typically operate at any one time, with the fourth compressor utilised for back-up purposes. The compressors are designed to compress the gas from 500 kPa to approximately 5,500 kPa prior to entering the Silver Springs to Wallumbilla Pipeline.

Other fuel burning equipment located at SSPP includes: two gas fired water-bath heaters, three gas fired generators and one diesel backup generator. An overview of the fuel burning equipment present on PL 446 is shown in Table 8.

Table 8: Fuel Burning Equipment on PL 446

Fuel Burning Equipment	Type	Fuel Type
Silver Springs Central Processing Facility		
TEG Dehydration Unit		
Compressor Unit	CM-200A (Ajax DPC-360-H-1)	Gas
Compressor Unit	CM-200B (Ajax DPC-360-H-1)	Gas
Compressor Unit	CM-200C (Ajax DPC-600)	Gas
Compressor Unit (back-up)	CM-600R (Ariel J-GD5R)	Gas
Generator	60Kva	Gas
Generator (back-up)	-	Gas

Fuel Burning Equipment	Type	Fuel Type
Generator (back-up)	-	Gas
Generator (back-up)	-	Diesel
Water-Bath Heater	-	Gas
Water-Bath Heater	-	Gas
Taylor Satellite Plant		
Compressor	-	Abandoned
Beechwood Satellite Plant		
Water-Bath Heater	-	Abandoned

The key characteristics and emission rates of the different models of operational compressor units at the SSPP are presented in Table 9.

Table 9: Stack Characteristics and Emission Rates

Parameter	Units	Silver Springs Processing Plant Compressor Units		
		CM200A	CM200B	CM200C
Compressor		CM200A	CM200B	CM200C
Stack Height	m	6.6	6.7	7.3
Stack Diameter	m	0.35	0.35	0.4
Temperature	°C	248.85	248.85	267.85
Exit Velocity	m/s	12.9	12.9	15.4
NOx Emission Rate	g/s	0.91	0.91	1.37
NOx Concentration	mg/Nm ³	1,400	1,400	1,400
CO Emission Rate	g/s	0.07	0.07	0.11
CO Concentration	mg/Nm ³	110	110	110
Oxygen Content	%	16.2	16.2	16.2

Source: Modified from Katestone 2010

A full description and assessment of the air and noise emissions from the operation of the compressor units at Silver Springs is provided in the accompanying “*Silver Springs Underground Gas Storage Facility, Environmental Noise Assessment, November 2010*” by Sonus Pty Ltd and “*Silver Springs Gas Storage Facility – Air Quality Impact Assessment, December 2010*” by Katestone Environmental Pty Ltd.

The compressor located at Taylor Satellite is abandoned and no longer in use. There are no future plans to operate this unit and steps will be taken in the future to decommission and remove it from site.

2.10 Fuel and Chemical Storage

PL 446 has multiple fuel and chemical storages on site. The principal fuels stored on site are produced oil / condensate and diesel. These storages are predominantly associated with the SSPP, and with beam pumps located on well sites. The remaining storages are scattered amongst various other locations on PL 446.

AGL is currently conducting an audit of the storage of fuels and chemicals on PL 446. This process will ensure that the materials are appropriately bunded and that the integrity and suitability of the bunding present is compliant with the conditions of the EA. Where it is identified that a storage is not appropriate, steps will be taken to upgrade the storage.

A summary of chemicals and volumes stored is presented in Table 10.

Table 10: Overview of Fuel and Chemical Storage on PL 446

Chemical Storage Type	Dangerous Goods Class	Total Storage Capacity (L)
Unleaded Fuel	Class 3 Flammable Liquid	2,400
Diesel	C1 Combustible Liquid	21,400
Condensate	Class 3 Flammable Liquid	955,000
Oil	Class 3 Flammable Liquid	115,000

All fuels and chemicals are handled and stored in accordance with the relevant standards and codes of practice and Material Data Safety Sheets (MSDS). Relevant staff are informed through inductions and training about the appropriate handling of dangerous and flammable substances and all staff are trained in spill response procedures and the use of spill containment equipment.

2.11 Land Farm

There are two landfarms located on PL 446. One is located at the SSPP and the other is at the Taylor Satellite Plant. Historically the Silver Springs landfarm has been the primary facility used to treat hydrocarbon contaminated sludges and soils generated by PL 446 activities.

2.11.1 Taylor

The Taylor Satellite landfarm was previously the interceptor pit in the Taylor Satellite Plant pond system. These ponds are no longer used as part of the production process and therefore to remove residual hydrocarbon contamination in the floor and walls of the interceptor pit, it was converted to a landfarm. This facility is used only to remediate the on-site contamination. The Taylor landfarm is approximately 600 m² in area and is fully bunded to contain the contaminated material.

2.11.2 Silver Springs

The Silver Springs landfarm covers an area of approximately 10,000 m². The landfarm is fully bunded and fenced, with the floor of the landfarm being a hardstand area. Prior to the transfer of sludges to the Silver Springs landfarm, as much hydrocarbon as possible is recovered from the material. Contaminated soils and sludges are well mixed and spread out within the landfarm. Management of the contaminated soils treated in the landfarm is undertaken in accordance with the DERM "*Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland*" (1998) and the "*Draft National Environment Protection (Assessment of Site Contamination) Measure*".

Hydrocarbon and nutrient levels of soils in the landfarm will be investigated every six months using a sampling program, developed in accordance with AS 4482 – *Guide to the Sampling and Investigation of Contaminated Soils*. Soil samples are to be analysed as a minimum for moisture, total petroleum

hydrocarbons, phenols, total nitrogen, total phosphorous and various trace elements. Additional parameters may be required dependent on the contaminants present in the landfarm. The soils will continue to be treated and monitored until sampling demonstrates that the soils are remediated and meet health and ecological investigation/screening levels. If the soils are heavily contaminated, site specific clean-up criteria may be developed. The sampling protocol and methodology is provided in Appendix 6 of this document.

The landfarm bund walls are regularly visually inspected to ensure that there are no releases from the landfarm.

An electronic landfarm register will be maintained that records the source and volumes of all soils and sludge transported to the landfarm. The register will also record details of landfarm management including:

- A description of the material being deposited, including the type of contaminant;
- A physical description of the soils within the landfarm;
- Dates monitoring and sampling was carried out;
- Dates the soil was aerated; and
- Results of monitoring and sampling.

2.12 Camp and Office

A small permanent camp (maximum capacity 20 people) is located at the SSPP. Typically there are only eight people residing in the camp facilities at any one time. The camp is comprised of a kitchen and dining room, a recreation room, a number of accommodation units, office unit and several sheds for maintenance of equipment and vehicles and storage of equipment and spare parts. Used oil (including cooking oils), grease and oil filters are recycled or disposed of at approved waste transfer stations.

A septic tank operates at the camp with a peak design capacity of 28 equivalent persons (EP). Overflow is diverted to a 10,700 L greywater tank.

A septic tank with a peak design capacity of six equivalent persons is located at the Taylor Satellite Plant. This facility is abandoned.

2.13 Land Fill Refuse Pit

A small refuse pit is located at the SSPP for general domestic waste material such as food and other putrescible waste that is generated on site. Less than 10 kg of putrescible waste (predominantly food scraps from the camp kitchen) is disposed of into the pit per day. The pit is approximately 160 m³ (40 m x 2 m x 2 m) with a slope of 1:80 m to allow for drainage and pumping out of fluids. A drain has been constructed around the disposal pit to prevent the entry of stormwater run-off into the pit. The pit is monitored by visual inspection at regular intervals, and after significant rainfall events. Burning is prohibited. The area is fenced and signposted.

2.14 Future Operations

An overview of the future production activities on the petroleum lease (outside of the Gas Storage Project) involving environmental disturbances and or infrastructure, for the period of AGL's Later Development Plan (December 2010 to November 2015) includes:

- 3D seismic surveys of the Taylor, Tinker and Silver Springs / Renlim fields;
- Drilling of up to 10 new wells, targeted predominantly in the Taylor field;
- Identifying, plugging and abandoning wells that are no longer suitable for production;
- Decommissioning of the Beechwood Satellite Plant (removal of separator);
- Shut-in of Taylor Satellite Plant gas lift operations; and
- Installation of beam pumps on four wells, primarily in the Taylor field.

3.0 Existing Environment

This Section provides details of the key environmental features and issues identified on PL 446. This information is largely based on desktop assessments from publicly assessable databases.

3.1 Soils and Terrain

Topography in the region is varied, ranging from low hills and plateaus to plains and formed on shales and weak silicstones. The area is drained to the south-west by the Maranoa River which rises in the north and by the Balonne River which enters from the east. SSPP is located on flat to gently undulating rocky countryside with poor soils, whilst the Taylor Field is located on the major feature of the area, the Thomby Range. This is a low rocky group of hills trending approximately northeast-southwest (Beck 2002).

A desktop assessment has identified PL 446 to be comprised of three main soil types – loams, massive earths and red duplex. The characteristics of these soil types are presented in Table 11 as described by the Digital Atlas of Australian Soils. There are no acid sulphate soils or likely potential acid sulphate soils in the area.

Table 11: Description of Major Soil Types on PL 446

Soil Group	Soil Type	Description
Ferrosols	Loams	Hills, ranges of hills, low hilly ridges, or dissected tableland remnants: chief soils are shallow loams usually containing or covered by siliceous gravel, with many rock outcrops and boulders of siliceous or ferruginous materials. Associated soils include shallow sands and red earths.
	Massive Earths	Gently undulating plains with occasional high ridges and cuesta-like scarps: chief soils of the gently sloping to flat areas are red earths with some yellow earths, all often with surface scattering of ironstone gravel; on the higher ridges and scarps shallow loams occur with some ferruginous rock outcrops, while in the lower-lying situations soils occur along with small areas of soils or adjacent units.
	Red Duplex	Very undulating plains or occasional low flat terraces fringing drainage lines: chief soils are hard alkaline red soils. Associated soils are red earths on the more elevated areas, and cracking clays and also hard alkaline brown soils in the lower lying sites.

Source: NRIC 1991

3.2 Hydrology

3.2.1 Watercourses

PL 446 falls within both the Balonne-Condamine River Catchment and the Moonie River Catchment. Both of these catchments form part of the larger Murray Darling River Basin. Noona Creek intersects the top corner of the southern section of the tenure and is the only major watercourse within the tenure. This flows west to the Balonne River. Minor watercourses are present on the eastern side of the tenure which generally flow via Christmas and Rocky Creeks to the south-east to the Bidgel and Teelba Creeks and ultimately to the Moonie River. The watercourses are typically ephemeral, slow

flowing and meandering. Due to their seasonal nature, watercourses are often restricted to a series of waterholes.

3.2.2 Groundwater

PL 446 is located within the ground water province of the Great Artesian Basin. The principal aquifers in the region include the Precipice, Hutton and Gubberamunda Sandstones of the Surat Basin. Petroleum reservoirs targeted by PL 446 activities are typically not associated with these aquifers, but instead target regions at much greater depth..

AGL remain responsible for a number of wells, that have been converted to water bores within PL 16. One well (Tinker 5) has been transferred to a landholder in accordance with the requirements of the *Petroleum Act 1923*.

3.2.3 Wetlands

A search of EPBC Protected Matters Database indicates that PL 446 occurs within the catchment of the Ramsar wetland - Narran Lake Nature Reserve, NSW (DEWHA 2010). The Narran Lake Nature Reserve covers part of a large terminal wetland of the Narran River in New South Wales at the end of the Condamine River system flowing from Queensland. It covers over 5,500 ha in north west New South Wales, approximately 75 km north west of Walgett. The area is internationally significant for waterbird breeding and as habitat for a number of species listed under the JAMBA and CAMBA conventions.

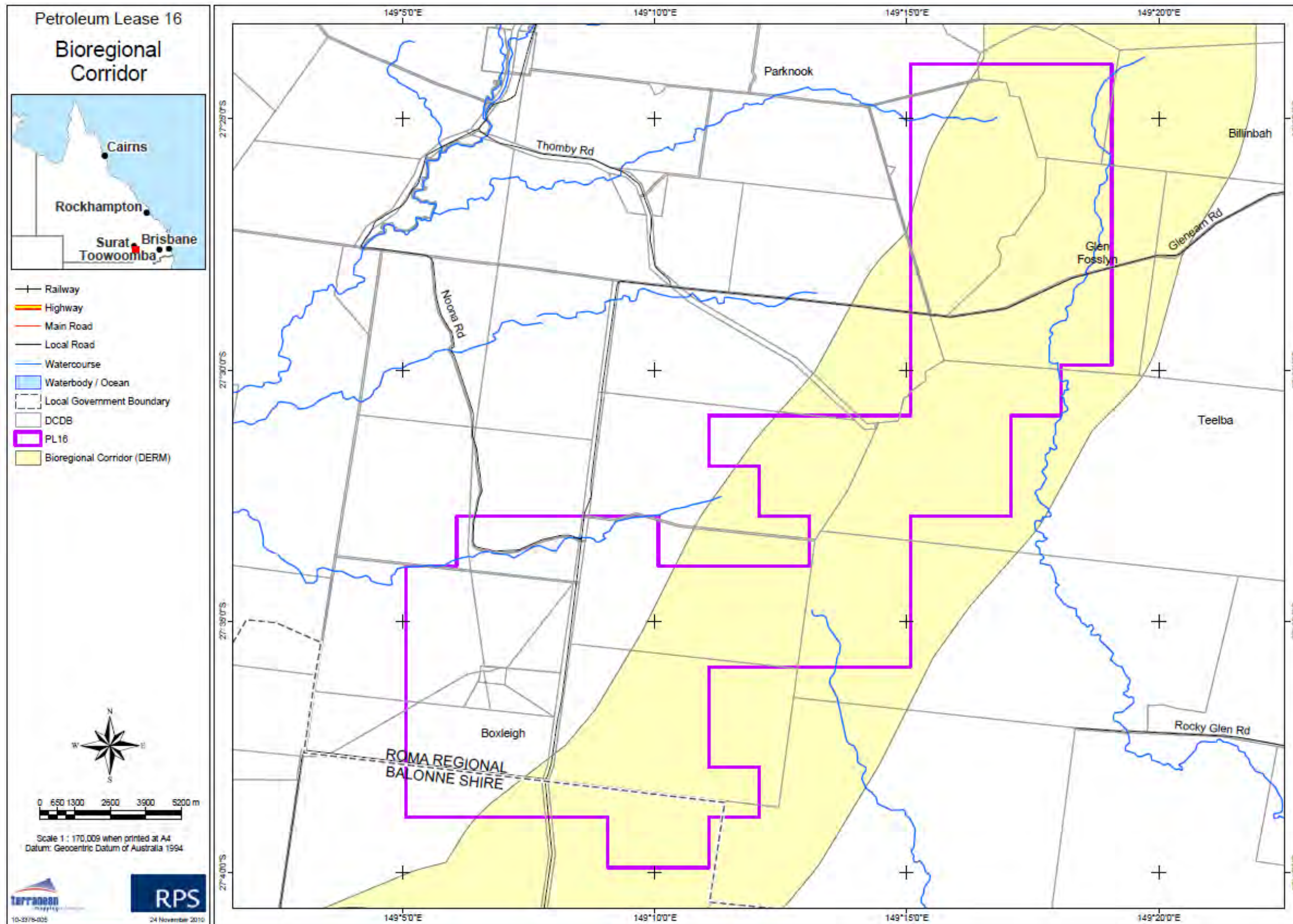
PL 446 is remote from this reserve, being located approximately 280 km to the north-east of Narran Lake. PL 446 activities are therefore unlikely to have any direct or indirect impacts on the wetland.

3.3 Bioregions

PL 446 is located within the Brigalow Belt South Bioregion. The Brigalow Belt Bioregion is a large and complex area, characterised by the leguminous tree *Acacia harpophylla* (brigalow) which forms forest and woodland on clay soils. The project area is also located within the Weribone High sub-region.

Weribone High contains downs and low ridges on the Cretaceous Grimman Creek Formation lithic sandstones, fine-grained sediments and areas of floodout. Soils include earths, texture contrast soils and cracking clays. The vegetation of downs and plains is predominately belah (*Casuarina cristata*), brigalow (*Acacia harpophylla*) and poplar box (*Eucalyptus populnea*) communities with narrow-leaved ironbark (*E.creba*) and bendee (*Acacia catenulate*) on ridges and residuals. Mulga (*Acacia aneura*) occurs in the south-west of the province (Sattler and Williams 1999).

PL 446 is also located within the vicinity of a mapped Brigalow Belt Terrestrial State Significant Corridor. Large patches of remnant vegetation within the vicinity of Silver Springs directly link to the mapped corridor (Figure 6). Remaining vegetated areas on PL 446 have high landscape connectivity and at a local level of scale, vegetated drainage lines, shadelines and regenerating cleared paddocks also provide high value linkages between on and off site vegetated areas (RPS 2010).



Source: DERM 2010a

Figure 6: Brigalow Belt Terrestrial State Significant Corridor (Bioregional Corridor)

3.4 Good Quality Agricultural Land (GQAL)

In conjunction with State Planning Policy 1/92: Development and Conservation of Agricultural Land (SPP1/92), the Planning Guidelines for the Identification of Good Quality Agricultural Land (The Planning Guidelines) defines Good Quality Agricultural Land (GQAL) as '*land which is capable of sustainable use for agriculture, with a reasonable level of inputs, and without causing degradation of land or other natural resources*' (DPI & DHLGP 1993, pg 1). The Planning Guidelines define four classes of GQAL, as outlined in Table 12.

Table 12: Classes of Agricultural Land in Queensland

Class	Description
A	Crop Land - Land that is suitable for current and potential crops with limitations to production which range from none to moderate levels.
B	Limited crop land - Land that is marginal for current and potential crops due to severe limitations; and suitable for pastures. Engineering and/or agronomic improvements may be required before the land is considered suitable for cropping.
C	Pasture land - Land that is suitable only for improved or native pastures due to limitations which preclude continuous cultivation for crop production; but some areas may tolerate a short period of ground disturbance for pasture establishment.
D	Non-agricultural land - Land not suitable for agricultural uses due to extreme limitations. This may be undisturbed land with significant habitat, conservation and/or catchment values or land that may be unsuitable because of very steep slopes, shallow soils, rock outcrop or poor drainage.

Source: DPI & DHLGP 1993

PL 446 is predominantly comprised of Class C agricultural land, with a small section of Class B agricultural land located in the north-eastern corner of the tenure. Current primary land uses in the area are sheep or cattle breeding, grazing and fattening, with the production of wool, beef and grains. These activities are primarily carried out in relatively natural environments, with a very small area dedicated to dry-land agriculture and plantations. Oil and gas production is also very prevalent in the area. There is no Class A agricultural land on PL 446 and accordingly there are no areas of irrigation located within the petroleum lease boundaries.

3.5 Air and Noise

3.5.1 Noise

PL 446 is located in a rural environment and has an acoustic environment characterised by natural sounds such as birds and wind in trees, except for those areas in close proximity to the operational plant (Sonus 2010). The SSPP is the predominant noise source on PL 446 that has the potential to influence the acoustic environment. Eleven sensitive receptors (dwellings) have been identified in the vicinity of PL 446. Table 13 shows the approximate distances of the identified sensitive receptors relative to the SSPP. The topography between the plant and the sensitive receptors is relatively flat and therefore it is expected that the topography will have negligible influence on the noise levels experienced at the closest sensitive receptor (Sonus 2010). Historically, there have been no complaints from landholders regarding noise generated from PL 446 activities.

Table 13: Approximate Distances of Sensitive Receptors to the Silver Springs Processing Plant

Sensitive Receptor Name	Approximate Distance from the Silver Springs Processing Plant (km)
The Little Homestead	1.8
Boxleigh	2.9
Noona	4.6
Glenmore	7.4
Glenearn	13.9
Cooma	17.8
Wanganui	24.1
Glen Fosslyn	25.1
Doonba	26.6
Beechwood	28.7
Billinbah	32.2

Source: Modified from Sonus 2010

Rated background noise levels (RBL) for the identified sensitive receptors are shown in Table 14. These were determined using noise measurement data obtained and the DERM "Planning for Noise Control" Guideline (DERM 2004). The RBL is the overall single-figure background level representing each assessment period (day / evening / night) over the whole of a monitoring period (DERM 2004). These levels are representative of sensitive receptor location where the environment is dominated by noise from wind in trees, birds and other natural sounds.

Table 14: Calculated Rated Background Levels for PL 446 Sensitive Receptors located

Rated Background Levels (dB(A))		
Day	Evening	Night
29	33	28

Source: Sonus 2010

A full description of the noise environment is provided in the accompanying "*Silver Springs Underground Gas Storage Facility, Environmental Noise Assessment, November 2010*" by Sonus Pty Ltd (Appendix 7 of EM Plan).

3.5.2 Air Quality

Air quality across PL 446 is representative of a rural area with a low population density and is therefore likely to be influenced by a number of activities including (but not limited to) the following:

- Dust from pastoral and gas exploration and production activities including, stock and vehicle movements;
- Environmental factors (including wind-borne dust, seed, pollen and smoke); and
- Limited vehicle and equipment exhaust fumes from roads and operating industries and towns.

The SSPP is the main source of emissions influencing local air quality in PL 446, with no other large combustion sources located within 40 km of the SSPP. The existing ground level concentrations of NO₂ and CO are expected to be significantly below the air quality objectives set in the EPP (Air) at the closest sensitive receptors, as shown in Table 15.

Table 15: Ground-Level Concentrations of Pollutants

Pollutant	Averaging Period	EPP (Air) Objective	Boxleigh	Noona	The Little Homestead**
Nitrogen Dioxide	1-hour	250	33.6	28.9	46.5
	Annual	62 (33*)	0.2	0.1	0.4
Carbon Monoxide	8-hour	11,000	3.6	2.6	5.8

* EPP (Air) Objectives for the protection of ecosystems

** Location of Receptor 3 was provided after dispersion modelling was completed and as a result the predicted ground level concentrations are only indicative and have not been explicitly modelled.

Source: Katestone 2010

A full description of the air environment is provided in the accompanying “*Silver Springs Gas Storage Facility – Air Quality Impact Assessment, December 2010*” by Katestone Environmental Pty Ltd (Appendix 5 of EM Plan).

3.6 Fauna and Flora

3.6.1 Flora

PL 446 is located within an area of mixed agricultural land uses as described in Section 3.4 and vegetated areas. The region has very high rates of vegetation clearance for pastoral activities so that many ecosystems survive as fragments only. The vegetation of the region surrounding PL 16 consists predominantly of:

- **Grassland** – dominated by Mitchell grass on rich sediments and fine textured alluvial flats;
- **Low open woodland** – a relatively minor formation of leopard wood, whitewood and some brigalow;
- **Open woodland** – comprising coolibah on alluvial clays and Silver-leaved Iron-bark on basalts and shale areas;
- **Woodland** – the dominant vegetation formation comprised of Poplar Box with understoreys of cypress pine, bull oak, mulga, belah, brigalow and sandalwood; and
- **Open forest** – comprised of cypress pine, belah and mulga (Beck 2002).

Results of desktop searches of the protected matters of national environmental significance and regional ecosystem mapping under the *Vegetation Management Act 1999* are presented below.

3.6.1.1 Threatened Ecological Communities

Two threatened ecological communities have been identified as likely to occur within the project area:

- Brigalow (*Acacia harpophylla* dominant and co-dominant); and
- Weeping Myall Woodlands (DEWHA 2010).

The Brigalow (*Acacia harpophylla* dominant and co-dominant) community is listed as Endangered under the EPBC Act. In Queensland this ecological community is defined to include 16 Regional Ecosystems (RE) of which RE11.4.3, RE11.4.7 and RE11.9.5 are mapped within PL 446.

The Weeping Myall Woodlands community is listed as Endangered under the EPBC Act. The Weeping Myall Woodlands occur in a range from open woodlands to woodlands, generally 4 – 12 m high, in which Weeping Myall (*Acacia pendula*) is the sole or dominant over-storey species (DEWHA 2008a). In Queensland, the Weeping Myall Woodlands ecological community is restricted to small patches that occur within two regional ecosystems; RE 11.3.2 and RE 11.3.28. Both of these ecosystems have an 'of concern' status with respect to both *Vegetation Management Act 1999* and biodiversity. RE 11.3.2 is mapped as a subdominant RE in the vicinity of the Silver Springs gas fields of PL 446. The mapped extent of the Regional Ecosystems corresponding to these threatened communities is shown on Figure 7.

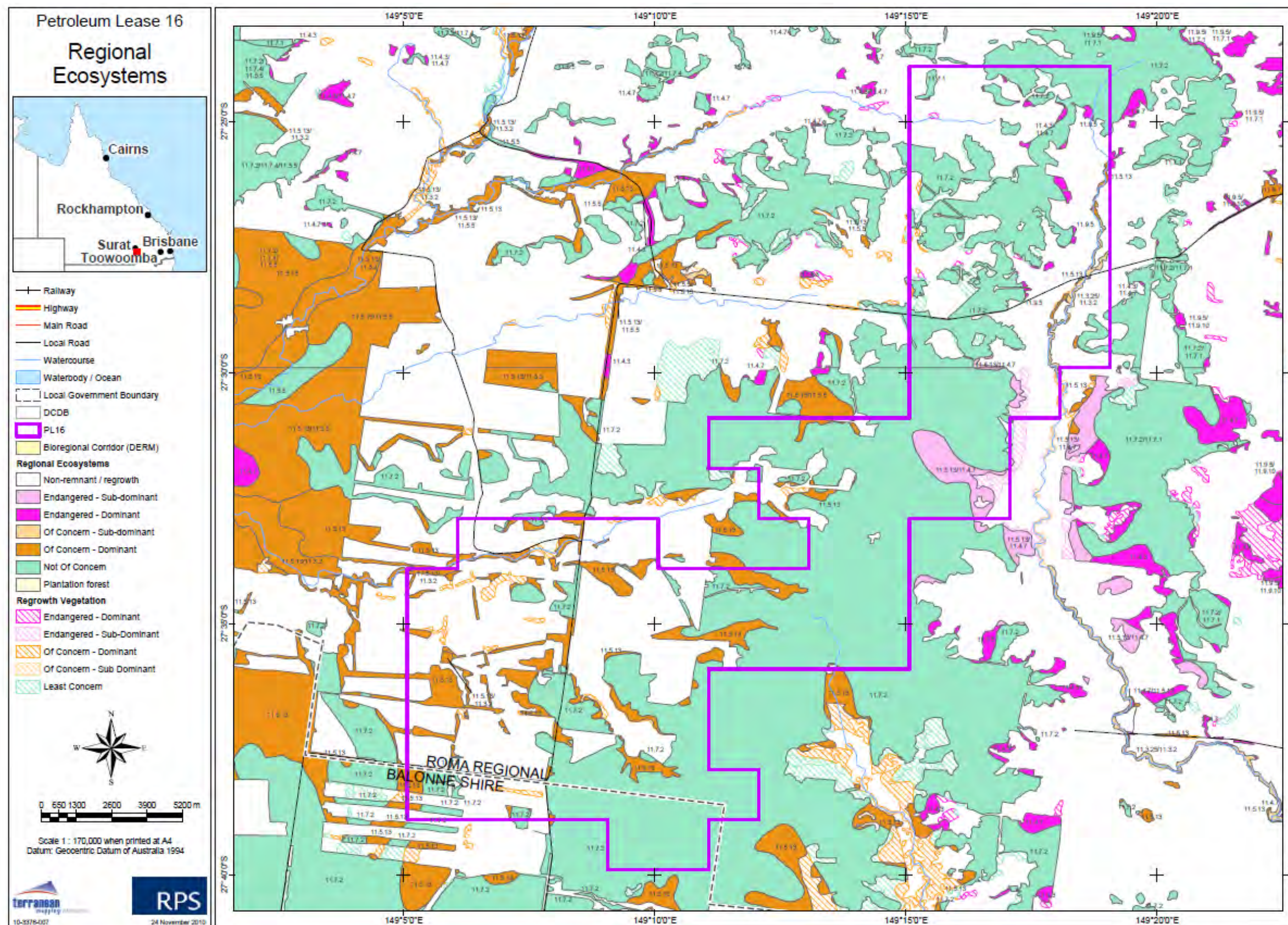
3.6.1.2 Threatened Species

Four threatened plant species or species habitat were identified with the potential to occur within the PL 446 area:

- *Acacia wardellii* (vulnerable);
- *Cadellia pentastylis* (vulnerable);
- *Homopholis belsonii* (vulnerable); and
- *Tylophora linearis* (endangered) (DERM 2010a).

3.6.1.3 Queensland Regional Ecosystems

A map of regional ecosystems located within PL 446 is shown in Figure 7. Three remnants of both endangered and of concern regional ecosystems were identified. These are described in further detail in Section 3.7.



Source: DERM 2009

Figure 7 Regional Ecosystems Present on PL 446

3.6.1.4 Weeds

Two Weeds of National Significance (WoNS) were identified as potentially occurring within PL 446 as shown in Table 16.

Table 16: Potential Weeds of National Significance Present on PL 446

Scientific Name	Common Name	Weeds of National Significance Class	Occurrence
<i>Alternanthera philoxeroides</i>	Alligator Weed	1	Species or species habitat may occur within area
<i>Parthenium hysterophorus</i>	Parthenium	2	Species or species habitat likely to occur within area
<i>Opuntia spp</i>	Prickly Pear	2	Species or species habitat may occur within area

Source: RLMS 2009b

Opportunistic sightings of weeds during other field assessments conducted in 2007 identified a number of weeds as occurring within the general vicinity of PL 446. These included: Bathurst burr, Crownbeard (*Verbesina encelioides*); Mayne's pest (*Verbena tenuisecta* aka *Verbena aristigera*); blue heliotrope (*Heliotropium amplexicaule*); prickly pear (*Opuntia spp.*) *Pimelea sp.* and Scotch thistle (*Onopordum acnathium*). None of these weeds are WoNS and with the exception of Prickly Pear, these weeds are not declared under the *Land Protection (Pest & Stock Route Management) Act 2002*.

Site operators regularly monitor and control the following weeds onsite:

- Scotch thistle (*Onopordum acnathium*);
- Apple thorn or thornapple (*Datura stramonium*);
- Bathurst burr (*Xanthium spinosum*);
- Noogoora burr (*Xanthium pungens*); and
- Chinese burr (*Triufetta rhomboidea*).

Predictive weed mapping and weed distribution maps available from DEEDI were used to compile a further list of weed species that are most likely to cause environmental concern in the project area (Table 17). This list is not intended to present a complete list of all weeds which may be present and does not replace the need for regular weed surveys and active weed management activities in the field.

Table 17: Declared Weeds Present or of Concern in PL 446 and Surrounding Areas

Common name	Scientific name	WONS	Class under LP(P&SRM)Act 2002	Locally declared	Predictive map	Mapped distribution 2005 compared to project area ²⁸
African boxthorn	<i>Lycium ferocissimum</i>	No	Class 2	Tara LGA	Marginal to suitable	Localised, occasional
Athel pine	<i>Tamarix aphylla</i>	Yes	Class 3	No	Marginal	Localised, occasional
Common prickly pear	<i>Opuntia spp.</i>	No	Class 2	Specific <i>Opuntia</i> species listed Tara LGA Waggamba LGA	Marginal to suitable	Widespread, occasional
Harrisia cactus	<i>Eriocereus spp.</i>	No	Class 2	Tara LGA	Unsuitable	Localised, occasional
Mother of millions	<i>Bryophyllum spp.</i>	No	Class 2	Tara LGA, Waggamba LGA	Marginal to suitable	Localised, common to abundant
Parkinsonia	<i>Parkinsonia aculeata</i>	Yes	Class 2	No	Marginal to unsuitable	Localised, occasional (east of St George)
Parthenium	<i>Parthenium hysterophorus</i>	Yes	Class 2	Tara LGA	Marginal	Localised, occasional
Tree pear	<i>Opuntia monacantha</i>	No	Class 2	Tara LGA	n/a	Widespread, common
Noogoora burr	<i>Xanthium pungens</i>	No	Not declared	Tara LGA	n/a	n/a
Bathurst burr	<i>Xanthium spinosum</i>	No	Not declared but control recommended	Tara LGA	n/a	n/a
Buffalo Burr	<i>Solanum rostratum</i>	No	Not declared	Tara LGA	n/a	n/a
Lantana	<i>Lantana spp</i>	Yes	Class 3	Tara LGA	Unsuitable	**Localised, occasional in Surat area
Giant Rats Tail Grass	<i>Sporobolus pyramidalis</i>	No	Class 2	Tara LGA	Marginal to unsuitable	n/a
Mexican Poppy	<i>Argemone mexicana</i>	No	Not declared	Waggamba LGA	n/a	n/a
Yellow flowered devil's claw	<i>Ibicella lutea</i>	No	Not declared	Waggamba LGA	n/a	n/a
Purple flowered devil's claw	<i>Proboscidea jussieui</i>	No	Not declared	Waggamba LGA	n/a	n/a
African Lovegrass	<i>Eragrostis curvula</i>	No	Not declared	Tara LGA	n/a	**Widespread, common in east of project area

Common name	Scientific name	WONS	Class under LP(P&SRM)Act 2002	Locally declared	Predictive map	Mapped distribution 2005 compared to project area ²⁸
Saffron thistle	<i>Carthamus lanatus</i>	No	Not declared	Tara LGA	n/a	n/a
Variiegated thistle	<i>Silybum marianum</i>	No	Not declared	Tara LGA	n/a	n/a
Stramonium (common thornapple)	<i>Datura stramonium</i>	No	Not declared	Tara LGA	n/a	n/a

Source: RLMS 2009b

3.6.2 Fauna

The EPBC database search identified 28 threatened species or threatened species habitat as likely to occur within PL 446 and surrounding areas (DEWHA 2010). The results of the search are presented in Table 18. At a state level, DERM wildlife online records identified a large species list for the PL 446 area, of which only one species, Grey Snake (*Hemiaspis damelii*) in addition to those in the EPBC search, was identified as a threatened species (endangered) under the *Nature Conservation Act 1992* (DERM 2010a):

The complete DERM Wildnet search results and EPBC results are located in Appendix 7.

Table 18: Threatened EPBC Listed Fauna Species

Scientific Name	Common Name	Status	Occurrence
Birds			
<i>Geophaps scripta scripta</i>	Squatter pigeon	Vulnerable	Species or species habitat likely to occur within area
<i>Neochima ruficauda ruficauda</i>	Star finch (eastern), Star finch (southern)	Endangered	Species or species habitat likely to occur within area
<i>Polytelis swainsonii</i>	Superb parrot	Vulnerable	Species or species habitat may occur within area
<i>Rostratula australis</i>	Australian painted snipe	Vulnerable	Species or species habitat may occur within area
Mammals			
<i>Chalinolobus dwyeri</i>	Large-eared pied bat, large pied bat	Vulnerable	Species or species habitat may occur within area
<i>Nyctophilus timoriensis (south-eastern form)</i>	Eastern long-eared bat	Vulnerable	Species or species habitat may occur within area
Ray-Finned Fishes			
<i>Maccullochella peelii peelii</i>	Murray cod, cod, goodoo	Vulnerable	Species or species habitat may occur within area
Reptiles			
<i>Anomalopus mackayi</i>	Five-clawed worm-skink, Long-legged worm-skink	Vulnerable	Species or species habitat may occur within area
<i>Egernia rugosa</i>	Yakka skink	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Common Name	Status	Occurrence
<i>Furina dunmalli</i>	Dunmall's snake	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species			
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	Migratory CAMBA	Species or species habitat likely to occur within area
<i>Hirandapus caudacutus</i>	White-throated Needletail	Migratory CAMBA JAMBA ROKAMBA	Species or species habitat may occur within area
<i>Merops ornatus</i>	Rainbow bee-eater	Migratory JAMBA	Species or species habitat may occur within area
Migratory Wetland Species			
<i>Ardea alba</i>	Great Egret, White Egret	Migratory CAMBA JAMBA	Species or species habitat may occur within area
<i>Ardea ibis</i>	Cattle Egret	Migratory CAMBA JAMBA	Species or species habitat may occur within area
<i>Gallinago hardwickii</i>	Latham's snipe, Japanese snipe	Migratory CAMBA JAMBA ROKAMBA	Species or species habitat may occur within area
<i>Rostratula benghalensis s.lat</i>	Painted snipe	Migratory CAMBA	Species or species habitat may occur within area
Migratory Marine Birds			
<i>Apus pacificus</i>	Fork-tailed swift	Migratory CAMBA JAMBA ROKAMBA	Species or species habitat may occur within area
<i>Ardea alba</i>	Great Egret, White Egret	Migratory CAMBA JAMBA	Species or species habitat may occur within area
<i>Ardea ibis</i>	Cattle Egret	Migratory CAMBA JAMBA	Species or species habitat may occur within area
Listed Marine Species			
<i>Apus pacificus</i>	Fork-tailed swift	Listed - overfly marine area	Species or species habitat may occur within area
<i>Ardea alba</i>	Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
<i>Ardea ibis</i>	Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
<i>Gallinago hardwickii</i>	Latham's snipe, Japanese snipe	Listed - overfly marine area	Species or species habitat may occur within area

Scientific Name	Common Name	Status	Occurrence
<i>Rostratula benghalensis s.lat</i>	Painted snipe	Listed - overfly marine area	Species or species habitat may occur within area
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	Listed	Species or species habitat likely to occur within area
<i>Hirandapus caudacutus</i>	White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
<i>Merops ornatus</i>	Rainbow bee-eater	Listed - overfly marine area	Species or species habitat may occur within area

Source: DEWHA 2010; RLMS 2009b

Operators have also sighted the Woma Python (*Aspidites ramsayi*) on PL446. The Woma Python is listed as a near threatened species under the *Nature Conservation Act 1992*.

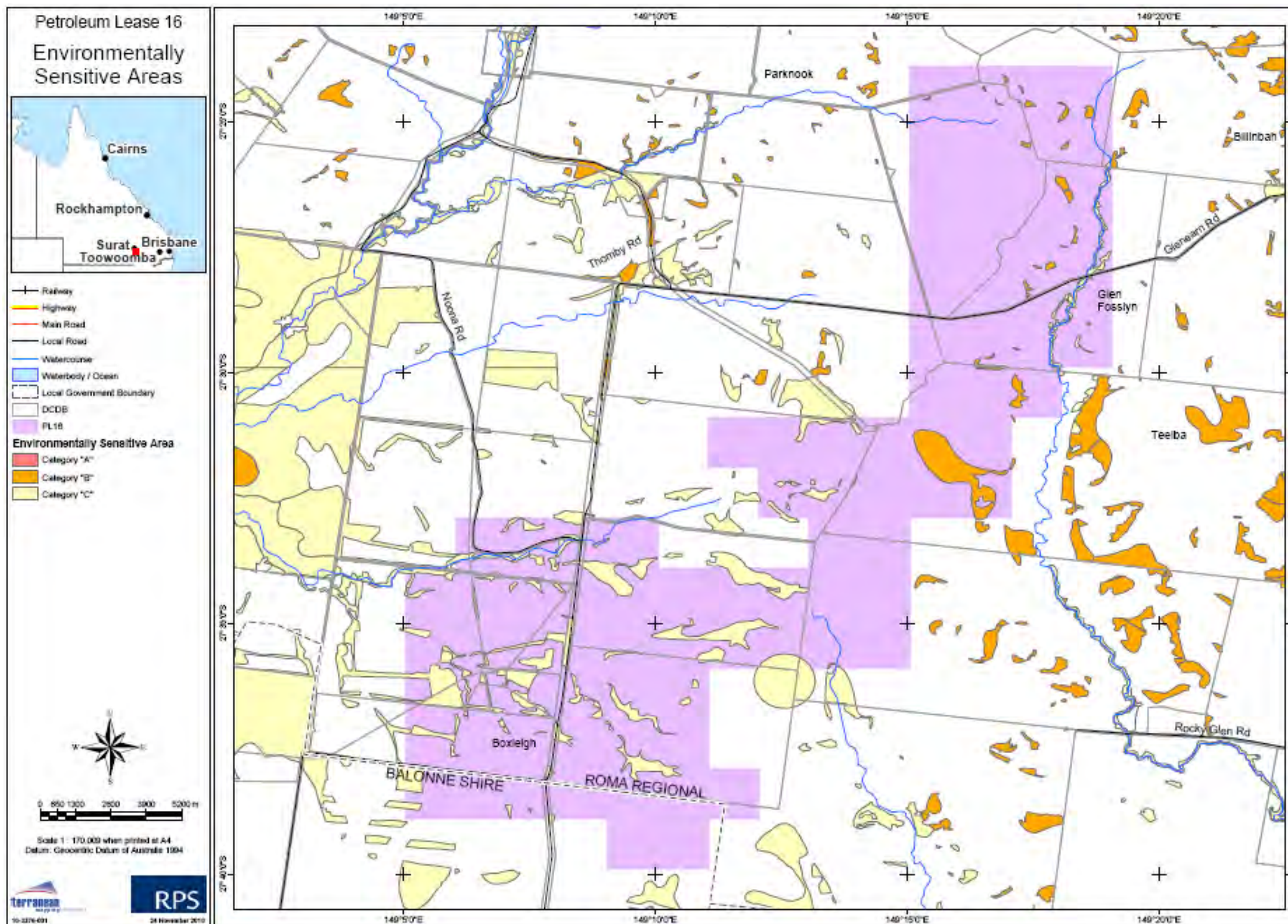
3.7 Environmentally Sensitive Areas

Category B and Category C environmentally sensitive areas (ESA) are present on PL 446 as illustrated in Figure 8 (DERM 2010b) and are summarised in Table 19.

Table 19: Environmentally Sensitive Areas Located on PL 446

Environmentally Sensitive Area	Regional Ecosystem	Status	Description
Category B			
Endangered Regional Ecosystem	11.4.7	Endangered – <i>Vegetation Management Act 1999</i> Endangered – biodiversity status	Open forest to woodland of <i>Eucalyptus populnea</i> with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> on Cainozoic clay plains
	11.4.3	Endangered – <i>Vegetation Management Act 1999</i> Endangered – biodiversity status	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> shrubby open forest on Cainozoic clay plains
	11.9.5	Endangered – <i>Vegetation Management Act 1999</i> Endangered – biodiversity status	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on fine-grained sedimentary rocks
Category C			
Of Concern Regional Ecosystem	11.5.13	Of concern – <i>Vegetation Management Act 1999</i> Of concern – biodiversity status	<i>Eucalyptus populnea</i> ± <i>Acacia aneura</i> ± <i>E. melanophloia</i> woodland on Cainozoic sand plains/remnant surfaces
	11.3.25	Least concern – <i>Vegetation Management Act 1999</i> Of concern – biodiversity status	<i>Eucalyptus tereticornis</i> or <i>E.camaldulensis</i> woodland fringing drainage lines
	11.3.2	Of concern – <i>Vegetation Management Act 1999</i> Of concern – biodiversity status	<i>Eucalyptus populnea</i> woodland on alluvial plains
Essential Habitat		Vulnerable – <i>Nature Conservation Act 1994</i> Vulnerable – <i>EPBC Act 1999</i>	<i>Acacia wardellii</i> (Thomby Range Wattle)

Source: DERM 2010c; RLMSb



Source: DERM 2010b

Figure 8: Environmentally Sensitive Areas on PL 446

A small area of identified essential habitat for *Acacia wardellii* (Thomby Range Wattle) overlaps PL 446 (Figure 9). This plant is listed as vulnerable under both the *Nature Conservation Act 1992* and the EPBC Act. This species is known to exist in RE 11.7.2 – which is present in the PL 446 essential habitat area. The major threats identified to *A. wardellii* are clearing for agriculture and grazing, although frequent burning may also be detrimental (DEWHA 2008b). Specimens of *A. wardellii* have been collected near the Rocky Glen homestead, Glenmore in the Silver Springs Gas Field and in an area 15 km east of Condamine. It appears to readily colonise disturbed areas such as seismic lines, pipeline easements and well locations.

Exploration and production activities on PL 446 were predominantly carried out prior to the classification of ESA's and as such some PL 446 infrastructure is located in these areas. An assessment of the location of current infrastructure relative to mapped ESA's indicates that wells, flowlines and access tracks are located in Category B and C ESA's (Table 20, Figure 9 and Figure 10). Where the mapping has indicated well locations to be very close to the ESA, the well has been included in Table 20 as a precautionary measure. However groundtruthing would be required to determine the actual proximity of the well to the ESA and to ensure that the mapped ESA's are accurate. A large proportion of all existing infrastructure on PL 446 also has the potential to be located within the 200 m protection zone that is now commonly prescribed for ESA's as a condition of EA's.

AGL will still be required to access and operate the existing infrastructure located in the ESA's for production related activities on PL 446. Existing infrastructure should therefore be exempt from the current restrictions and exclusions placed on petroleum activities for works in an ESA where DERM are seeking to introduce new EA conditions for ESA's. For the placement of all future infrastructure, AGL will undertake to avoid these areas wherever practicable and ensure compliance with the conditions of the environmental authority. Where ESA's can't be avoided, AGL will seek permission from the relevant regulatory authority to conduct works in the ESA.

Table 20: PL 446 Infrastructure Located in Environmentally Sensitive Areas

Infrastructure Name	Infrastructure Type	Environmentally Sensitive Area Category	Environmentally Sensitive Area Type
Tinker 5	Well	Category B	Endangered Regional Ecosystem
Tinker 1	Well	Category C	Of Concern Regional Ecosystem
Taylor 13A	Well	Category C	Of Concern Regional Ecosystem
West Boggo Creek 1	Well	Category C	Of Concern Regional Ecosystem
Boggo Creek 2	Well	Category C	Of Concern Regional Ecosystem
Silver Springs 1	Well	Category C	Of Concern Regional Ecosystem
Silver Springs 3	Well	Category C	Of Concern Regional Ecosystem
Silver Springs 6	Well	Category C	Of Concern Regional Ecosystem
Silver Springs 7	Well	Category C	Of Concern Regional Ecosystem
Silver Springs 10	Well	Category C	Of Concern Regional Ecosystem
Glen Fosslyn 1	Flowline	Category C	Of Concern Regional Ecosystem
Taylor to Silver Springs	Flowline	Category C	Of Concern Regional Ecosystem
Sirrah 2	Flowline	Category C	Of Concern Regional Ecosystem
Silver Springs 3	Flowline	Category C	Of Concern Regional Ecosystem

Infrastructure Name	Infrastructure Type	Environmentally Sensitive Area Category	Environmentally Sensitive Area Type
Silver Springs 6	Flowline	Category C	Of Concern Regional Ecosystem
Boxleigh Spine Line	Flowline	Category C	Of Concern Regional Ecosystem
Silver Springs to Waggamba	Flowline	Category C	Of Concern Regional Ecosystem
3 Tracks	Access Tracks	Category B	Endangered Regional Ecosystem
Multiple Tracks	Access tracks	Category C	Of Concern Regional Ecosystem

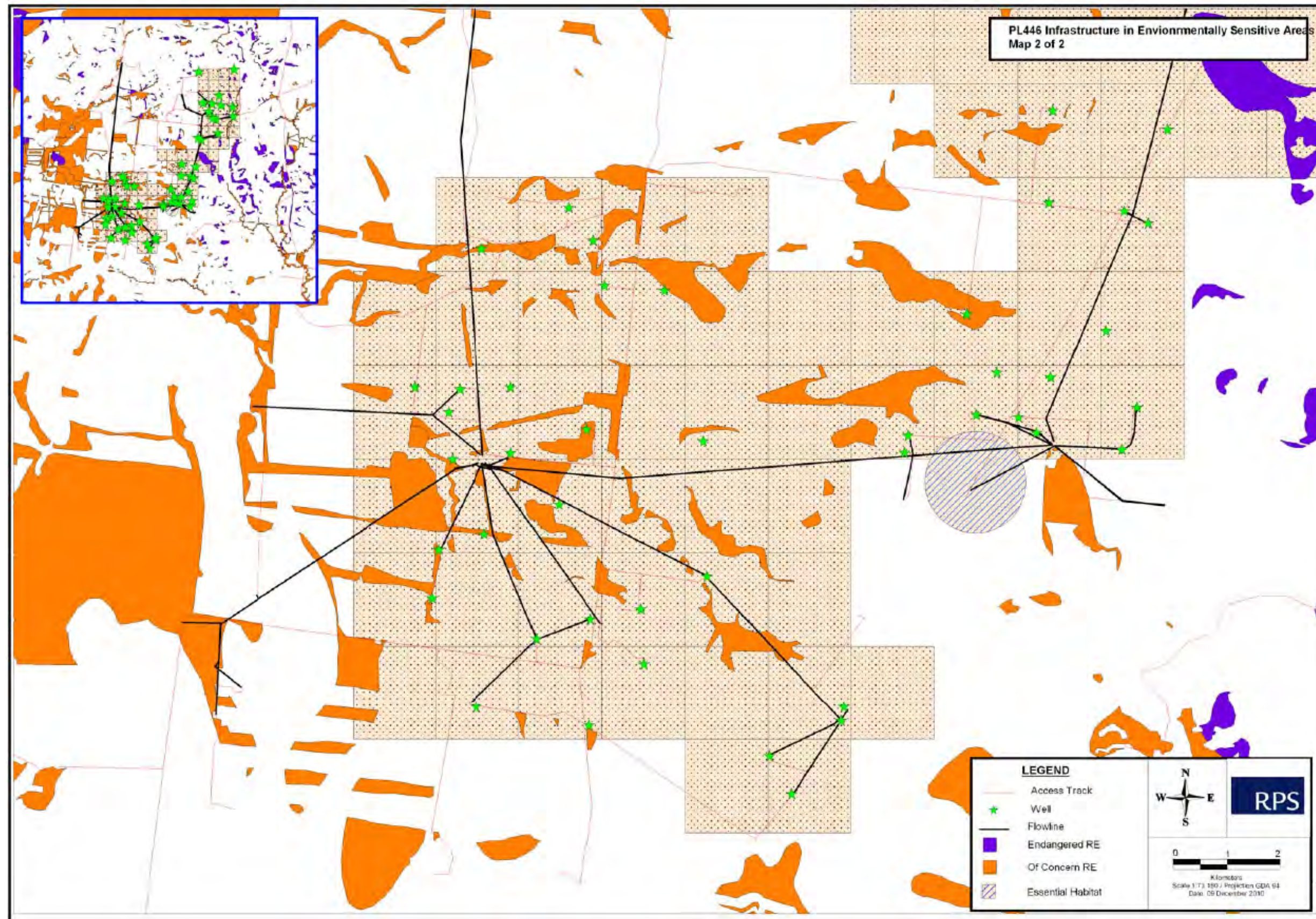


Figure 9: PL 446 Infrastructure Locations and Environmentally Sensitive Areas (Map 1)

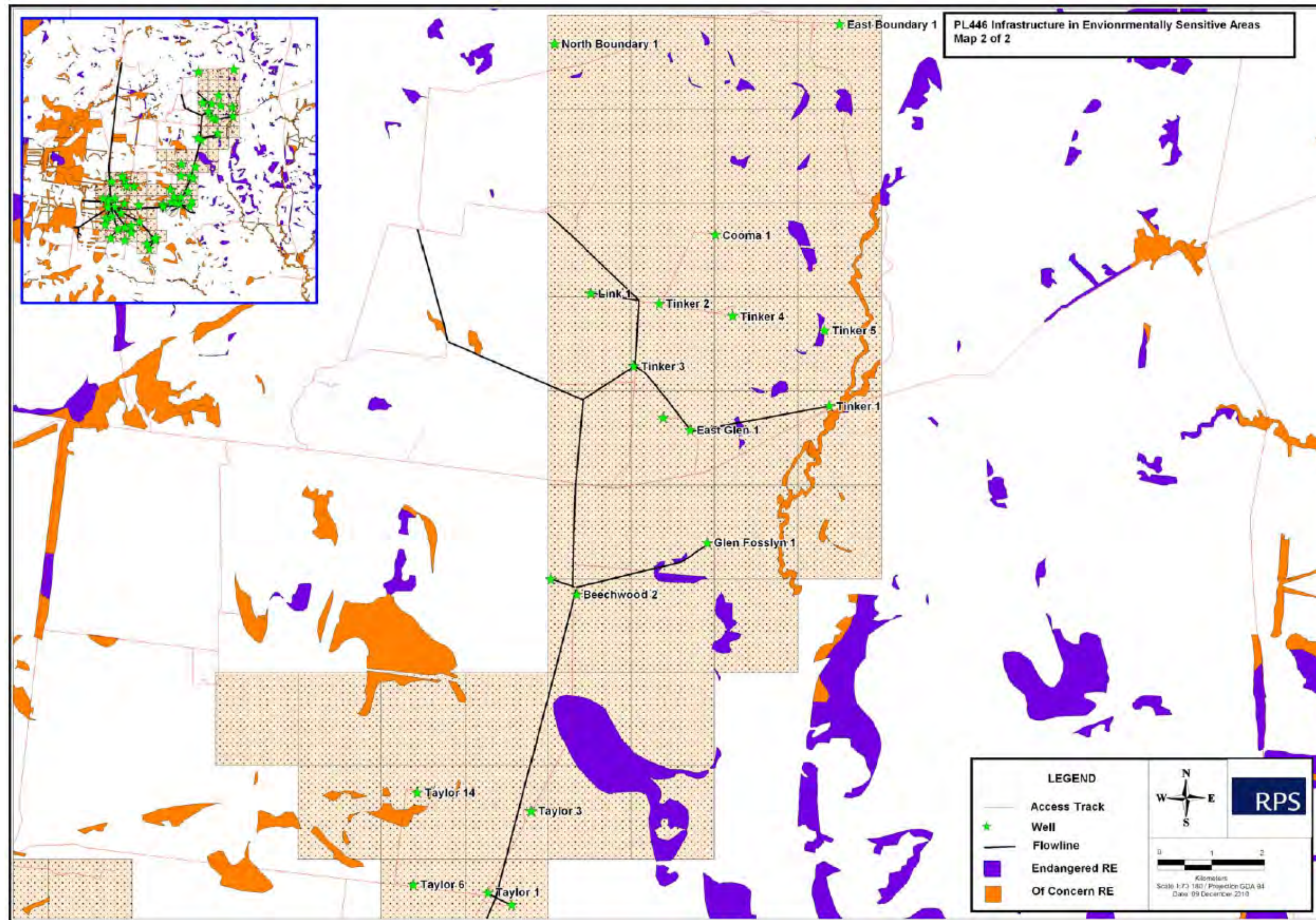


Figure 10: PL 446 Infrastructure and Environmentally Sensitive Areas (Map 2)

3.8 Cultural Heritage

3.8.1 Aboriginal Cultural Heritage

The *Aboriginal Cultural Heritage Act 2003* commenced on 16 April 2004 and is intended to provide effective recognition, protection and conservation of Aboriginal cultural heritage. The Act establishes a Duty of Care for ensuring any person who carries out an activity must take all reasonable and practicable measures to ensure the activity does not harm Aboriginal cultural heritage.

Previous cultural heritage surveys have been undertaken on pipeline routes in the vicinity of PL 446. These surveys identified a small number of artefacts which is indicative of the likelihood that cultural heritage items exist on PL 446.

AGL recognises that there is a cultural heritage Duty of Care to avoid harm to Aboriginal cultural heritage, pursuant to Section 23 of the *Aboriginal Cultural Heritage Act 2003*. The preparation of a site management plan will ensure that this Duty of Care is met, and that any harm to cultural heritage is avoided, or managed appropriately (e.g. relocation of artefacts where necessary). Should any additional values of indigenous cultural significance be identified prior to (or during) any future activities, these will be handled in accordance with the environmental protection objectives and control strategies contained in the Cultural Heritage Management Plan (CHMP) in place with agreement of the Mandandanji people.

3.8.2 State Heritage Register

The Queensland Heritage Register was established under the *Queensland Heritage Act 1992* and includes places or buildings of cultural heritage significance in Queensland. An online search of the register for the relevant local government area yielded no relevant results for PL 446, with all locations occurring well outside the tenure boundaries (DERM 2010d).

4.0 Environmental Management Framework

4.1 AGL Environmental Management System

The AGL Health, Safety and Environment (HSE) Policy is presented in Appendix 8 of this document. This policy governs the development of AGL's HSE Management System 'Life Guard' (AGL 2004) which together are the key tools used to manage environmental responsibilities, issues and risks. The HSE management system is designed to direct the establishment and implementation of a framework of requirements, policies, standards, compliance guides and management practices for consistent and continuous improvement in AGL's HSE performance. The main objectives of the Life Guard HSE management system are:

- To ensure the environment is protected from activities;
- To keep people well and safe, and
- To continuously improve performance in these areas.

The HSE continuous management improvement approach (see Figure 11) ensures that the level of HSE performance continuously improves and that best practice is regularly incorporated into the system and shared by all users.

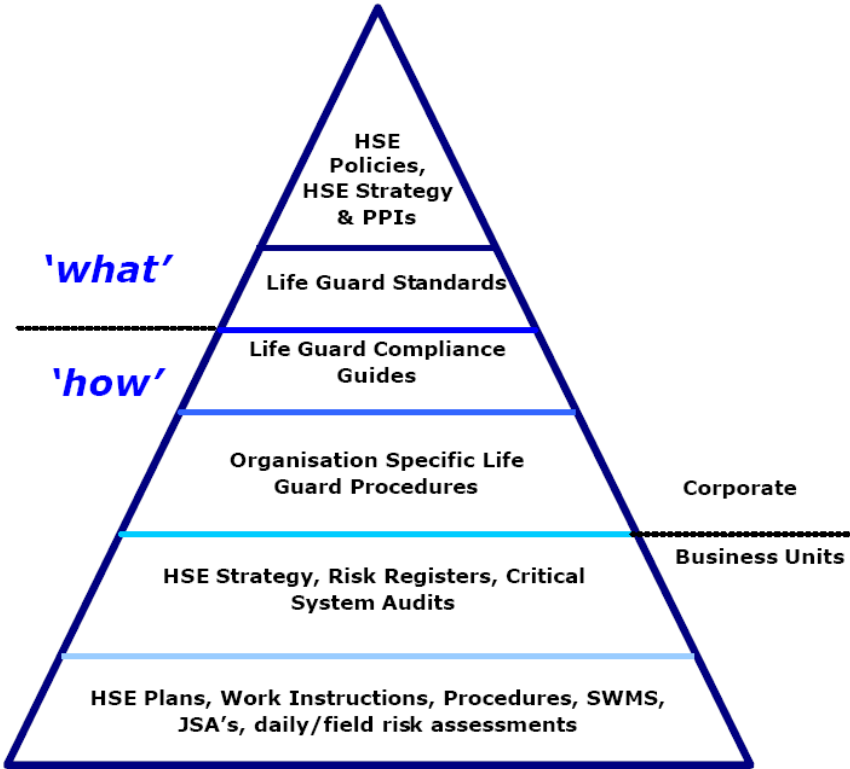


Source: AGL 2004

Figure 11: The Continual Improvement Model of the Life Guard HSE Management System

The principles of the HSE management framework are implemented through a hierarchical documented system as shown in Figure 12 which includes documentation such as corporate policies, strategies and standards as well as operational compliance guides, procedures, plans, audits and risk assessments.

The environmental standards and processes within the HSE Management System are aligned with the international standard AS/NZS ISO14001:2004. The HSE Management System has been established to ensure that each business unit within AGL identify environmental risks and implement controls throughout all stages of every activity. This OEMP forms part of this environmental management framework.



Source: AGL 2004

Figure 12: A Diagrammatic Representation of the Life Guard Management System Hierarchy of Documentation

Detailed information on how to implement HSE strategies to identify risks and manage issues is included in specific guidelines, procedures and standard operating procedures. These include, but are not limited to:

- *Health Safety & Environmental Inductions (GEN-01)*
- *Permit to Work System (GEN-02)*
- *Audits – Safety & Environment (GEN-03)*
- *Sampling and Analysis of Produced Water for Iron (SS-W-01)*
- *Wellhead VR Plug Removal and Annulus Valve Installation (SS-W-05)*
- *Taylor No. 1 – Well Start Up (SS-W-16)*
- *Launching of Pigs at the Silver Springs Plant (SS-PL-06)*
- *Pipeline Emergency Repair – Excavation and Reinstatement (SS-PL-10)*
- *Draining Water from the Taylor or PL 16 Storage Tank (SS-OP-11)*
- *Silver Springs Flare System (SS-OP-20)*
- *Transfer of Oil from TK-620 to the Silver Springs Pipeline (SS-OP-15)*
- *General Pipeline Excavation (PL-08_0)*
- *Handling of Minor Oil Spills (HSE-10_2)*
- *HSE Incident Reporting Procedure (HSE-02_1)*
- *HSE RT Audit Program (HSE-01_4)*
- *Operation and Management of Land Farm (HSE-07_4)*
- *Operation of SSP Refuse Pit (HSE-12_4)*
- *Boggo Creek #2 Well Operations (SS_W-01_1)*
- *SSP – Fire System Operating Manual*
- *HAZOP Procedure (HSE-03_1)*
- *Waste Management Procedure (HSE-09_2)*

4.2 Roles and Responsibilities

AGL is responsible for overall environmental management of PL 446 activities through the implementation of this EMS and the leadership of the Head of Gas Operations and the Production Manager. However, all personnel and contractors are accountable through conditions of employment or contracts. Each individual is responsible for ensuring that their work complies with all regulatory requirements, AGL commitments and the appropriate procedures.

Some positions within AGL have specific responsibilities and obligations in terms of managing HSE matters associated with PL446 operations. These key personnel and their responsibilities are outlined in Table 21.

Table 21: Environmental Responsibilities of Key Personnel on PL 446

Role	Accountabilities
Head of Gas Operations	Directly responsible for the management of the field development and production activities, including implementation of environmental management. Reports to the Group General Manager Upstream Gas
Drilling Completions Manager	Directly responsible for the overseeing and fulfilment of commitments contained in this EMP.

Role	Accountabilities
Drilling Specialist	Directly responsible for the fulfilment of commitments contained in this EMP. Reports to the Completion / Drilling Engineer regarding the drilling operations environmental performance and due diligence.
Land and Approvals Manager	Directly responsible for the overseeing and fulfilment of commitments contained in this EMP. Responsible for landowner consultation and notification. Reports to the Head of Land and Approvals with a dotted line to the Head of Gas Operations regarding compliance with the Project's environmental and other requirements.
Environment Manager	Provides advice to the workforce, through the Head of Gas Operations, regarding the implementation of the EMP. Coordinates the monitoring and audit program.
Production Manager	Directly responsible for the fulfilment of commitments contained in this EMP and for ensuring Construction and Rehabilitation contractors comply with the environmental objectives and the EMP.
Health and Safety Manager	Directly responsible for health and safety of staff and contractors working on site are responsible to ensure compliance with AGL's HSE Contractor Management System. Responsible to ensure a safe work culture is being adhered to on site in order to achieve zero LTI's.
Construction Contractors	Responsible for ensuring that works are in compliance with the EMP, meeting regulatory requirements, and ensuring that all environmental objectives contained in the contracts are attained. Report to the Senior Project Engineer.
Drilling Contractors	Responsible for ensuring that works are in compliance with the EMP, meeting regulatory requirements, and ensuring that all environmental objectives contained in the contracts are attained. Report to the Drilling Specialist and the Completion / Drilling Engineer.
Petroleum Engineer/Operations Supervisors and Field Engineers	Field based personnel responsible for ensuring Production Operations comply with the environmental objectives and the EMP.
Environmental Auditors	External to AGL and contracted to conduct periodic audits according to the principles of this EMP and relevant environmental legislative compliance

4.3 Training and Induction

All construction and operations personnel, including contractors, must attend a HSE induction. All personnel will be made aware during the induction of relevant environmental obligations and the need to perform all activities in an environmentally responsible manner.

Inductions and training will aim to outline a range of HSE issues including:

- Every person's general duty of environmental care in accordance with Section 319 of the *Environmental Protection Act 1994*;
- AGL's Environmental Policy and regulatory requirements;
- The significance and potential environmental effects associated with their work requirements;

- Personnel roles and responsibilities for environmental performance;
- The relevant objectives and requirements of the Environmental Management Plan; and
- Emergency response system and incident reporting protocols.

Job specific training will also be undertaken where applicable and will cover general environmental management issues such as:

- Terrain and vegetation management;
- Fauna management;
- Watercourse management;
- Erosion prevention and control;
- Spill prevention, containment and equipment;
- Corrective actions;
- Environmental monitoring;
- Landowner management; and
- Management of hazardous substances.

It is the responsibility of each contractor to prepare and implement an induction and job specific training program appropriate to their methods of work. Approval from AGL shall be obtained prior to implementation as per the EMS and all training will be recorded in a register to ensure that all personnel are trained prior to commencing work.

4.4 Risk Management

An integrated risk management framework has been developed so that the risks associated with the conduct of activities can be evaluated. Risk assessments provide a better understanding of financial, environmental, community and health and safety hazards. Furthermore, the process is an integral component of the site production operations safety management plan (SMP) to ensure compliance with legislative requirements under the *Petroleum and Gas (Production and Safety) Act 2004*.

For activities carried out on PL 446, an assessment of the risk of potential environmental impacts and issues has been carried out using a standard risk management approach consistent with the AS/NZS 4360:1999 *Risk Management* and ISO 31000:2009 *Risk management – Principles and process*.

A risk management assessment involves the following steps:

- Identifying the environmental aspects;
- Describing the potential environmental impacts;
- Identifying management strategies;
- Assigning a consequence severity rating;

- Assessing the likelihood / frequency; and
- Determine the level of risk for each potential impact.

Management practices are designed to keep risk as low as reasonably practicable and economically feasible. A residual risk is calculated based on these considerations and is assigned to each specific activity conducted (Beck 2002). A copy of the risk management matrix is presented in Appendix 9.

4.5 Emergency Response Procedures

AGL recognise that emergencies arising from PL 446 activities could have serious and long term HSE impacts. Environmental emergencies could include:

- Fire/explosion;
- Gas leaks;
- Chemical spills, including oil;
- Dam break;
- Well blowout;
- Bushfire; and
- Third party property damage.

An Emergency Response Plan (ERP) is currently in place. This plan is detailed within the site production operations safety management plan (SMP) in accordance with legislative requirements under the *Petroleum and Gas (Production and Safety) Act 2004*.

An emergency is any incident involving the SSPP, PL 446 infrastructure and all associated equipment, plant, personnel and vehicles that has caused, or has the potential to cause injury or damage and requires immediate corrective action. The ERP is designed to address emergency situations such as those listed above. The plan details the immediate corrective actions to be implemented in response to an emergency situation that may occur. It is the responsibility of the Production Manager and the Site Operations Supervisor to develop, implement and monitor the ERP and ensure that operators and visitors are aware of their responsibilities in case of an emergency.

4.5.1 Training and Simulations

Rehearsals and training drills are critical to test and practice crews in effective emergency response and are detailed in the site production operations safety management plan (SMP). AGL ensures that:

- Desktop exercises are conducted at least every three months to test and validate emergency response procedures; and
- Fire / emergency response drills are completed once per month per shift.

Training drills should challenge crews and put them under pressure to respond to real life situations that involve multiple events. The structure of the emergency response team for PL 446 and surrounding AGL tenures (e.g. PL119, PL192 and PL46) is shown in Figure 13.

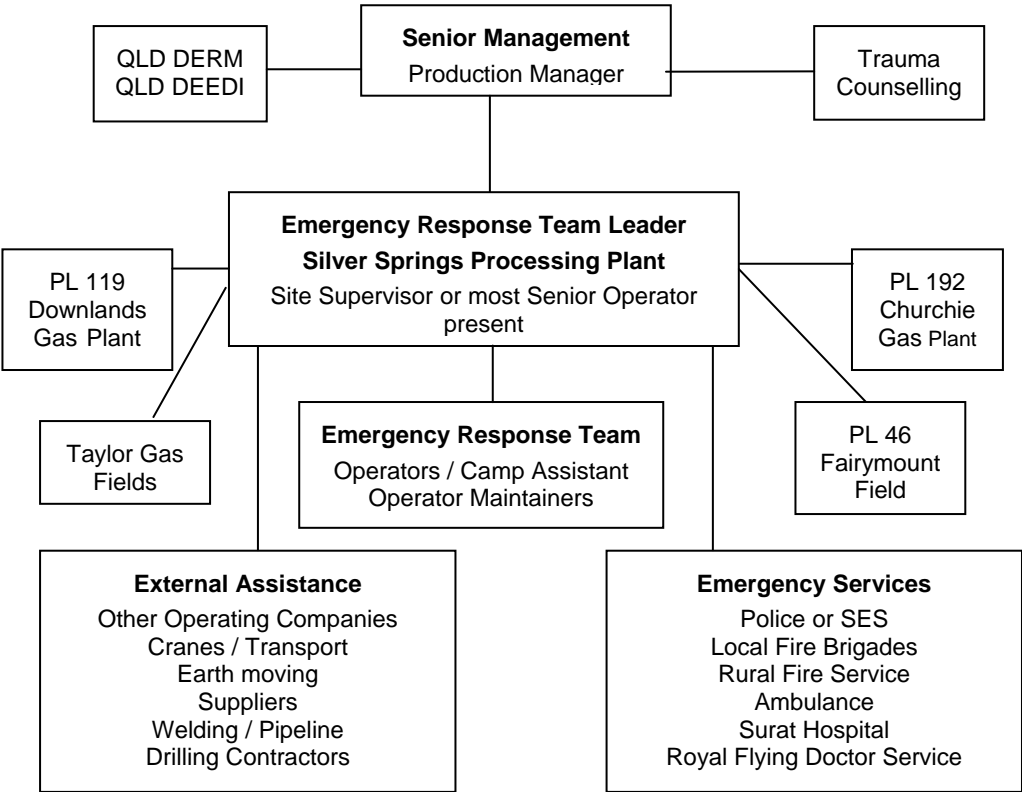


Figure 13: The Structure of the Emergency Response Team for PL 446 and Surrounding AGL Tenures

5.0 Legislative Framework

This OEMP aims to ensure that all operation and maintenance activities are performed in a manner consistent with applicable legislation, regulations and codes of industry practice. The following Sections outline the key Acts and codes relevant to petroleum operations within the Commonwealth (Section 5.1), Queensland (Section 5.2) and Australian Standards and Industry Codes (Section 5.3) as well as the specific licence requirements for the PL 446 activities (Section 5.4).

5.1 Commonwealth Legislation

The relevant Commonwealth legislation includes, but is not limited to the following:

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984;*
- *Australian Heritage Council Act 2003;*
- *Native Title Act 1993*
- *Environmental Protection and Biodiversity Conservation Act 1999; and*
- *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989.*

5.2 State Legislation

The relevant Queensland legislation includes, but is not limited to the following:

- *Aboriginal Cultural Heritage Act 2003;*
- *Aboriginal Lands Act 1991;*
- *Agricultural and Veterinary Chemicals (Queensland) Act 1994;*
- *Agricultural Chemicals Distribution Control Act 1966;*
- *Dangerous Goods Safety Management Act 2001;*
- *Dangerous Goods Safety Management Regulation 2001;*
- *Environmental Protection Act 1994;*
- *Environmental Protection Regulation 2008;*
- *Environmental Protection Policies for Air 2008, Noise 2008, Water 2009 and Waste Management 2000;*
- *Fire and Rescue Service Act 1990;*
- *Fisheries Act 1994;*
- *Forestry Act 1959;*
- *Land Act 1994;*
- *Land Protection (Pest and Stock Route Management) Act 2003;*
- *Nature Conservation Act 1992;*
- *Water Act 2000;*
- *Petroleum Act 1923*
- *Petroleum and Gas (Production and Safety) Regulation 2004;*
- *Plant Protection Act 1989;*
- *Queensland Heritage Act 1992;*
- *Queensland Workplace Health and Safety Act 1995;*
- *Soil Conservation Act 1986;*
- *Sustainable Planning Act 2009;*

- *Transport Infrastructure Act 1994;*
- *Vegetation Management Act 1999.*

5.3 Australian Standards and Industry Codes

In addition to legislative requirements, this OEMP has given consideration to relevant Australian and Industry standards, including:

- AS 2885.0 – 2008: Pipelines – Gas and Liquid Petroleum Part 0: General Requirements;
- AS 2885.1 – 2007: Pipelines – Gas and Liquid Petroleum Part 1: Design and Construction;
- AS 2885.3 – 2001: Pipelines – Gas and Liquid Petroleum Part 3: Operation and Maintenance;
- AS 2885.5 – 2002: Pipelines – Gas and Liquid Petroleum Part 5: Field Pressure Testing;
- AS 1678: Emergency Procedure Guides;
- AS 2809: Road Tank Vehicles for Dangerous Goods;
- AS 2931: Selection and Use of Emergency Procedure Guides for the Transport of Dangerous Goods;
- AS 1940: Storage and Handling of Hazardous Substances;
- ANZECC/ARMCANZ 2000: Australian and New Zealand Guidelines for Fresh and Marine Water Quality;
- Australian Code for the Transport of Dangerous Goods by Road and Rail;
- Australian Petroleum Production and Exploration Association (APPEA) Code of Environmental Practice, 1996;
- Australian Pipeline Industry Association (APIA) Code of Environmental Practice Onshore Pipelines 2009;
- National Code of for the Control of Workplace Hazardous Substances [NOHSC: 2007(1994)];
- National Code of Practice for the Labelling of Workplace Substances [NOHSC: 2012(1994)];
- National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC: 2011(1994)]; and
- National Environment Protection Measures – National Pollutant Inventory.

5.4 Licence Requirements

Petroleum activities subject to the EMP are operated under Petroleum Lease (PL) 16 granted by DEEDI under the *Petroleum Act 1923*. Activities have also been conducted in accordance with the conditions of the corresponding Integrated Authority No. 150 120, granted in 2004 under the *Environmental Protection Act 1994*. This document however is in support of an application for a new Level 1 Environmental Authority (Chapter 5A Activities) to DERM for PL446 (converted from PL16 under the P & G Act)..

6.0 Environmental Management Policies and Procedures

This Section discusses the potential impacts posed to the environment by the operation and maintenance of activities on PL 446 and outlines a series of management strategies implemented to reduce environmental risks and hazards and minimise potential impacts.

The key activities with potential to impact on the environmental, and the associated environmental aspects to be managed, have been categorised into the following areas:

- Access;
- Soil and Ground Stability;
- Vegetation Management;
- Weed Management;
- Disease Control;
- Earthworks;
- Land use;
- Fire Prevention;
- Air Emissions;
- Noise Emissions;
- Cultural Heritage;
- Water Management;
- Facilities Management;
- Waste Management (including produced water management);
- Spill Prevention and Response;
- Fuel and Chemical Storage; and
- Decommissioning and Rehabilitation.

These activities and environmental aspects are represented in the Australian Petroleum Production and Exploration Association's Code of Environmental Practice has been used as a basis to develop the management measures presented in this OEMP. The Australian Pipeline Industry Association's Code of Environmental Practice – Onshore Pipelines (APIA) was also used, and has been modified and augmented to reflect the issues and management measures associated with activities relevant to conventional oil and gas exploration and production.

The following Sections consider the activities listed above in more detail by outlining key activity specific management measures, as well as identifying those responsible for ensuring the measures are successfully implemented. The perceived level of risk presented for each activity is reflective of the likelihood / frequency and severity of identified impacts.

6.1 Access

Physical access to pipeline and flowline easements, well heads and facility grounds is required to carry out construction, operational and monitoring activities, routine surveillance and maintenance activities. Trucks collecting and/or delivering fuel and oil / condensate using access tracks may also present a potential environmental impact in the event of a tanker rollover or broken or leaking couplings during fuel transfer operations.

The key potential environmental impacts resulting from access and transport requirements are:

- Disturbance to native vegetation, wildlife and heritage areas;
- Disturbance to landholders, agricultural production or other land uses;
- Soil compaction, erosion or release of sediment to land and water;
- Introduction and spread of weed species; and
- Contamination of land and water through loss of containment.

Table 22 outlines the key management measures employed to mitigate environmental impacts related to easement and facility access activities. A risk assessment identified that the risk of soil erosion, compaction and sedimentation impacts and the introduction and spread of weeds associated with access is Moderate. Disturbance to native vegetation, wildlife and heritage areas, disturbance to landholders from vehicle access and loss of containment of transport through rollovers and damaged couplings and manifolds was classed as possessing a low risk. Spill prevention and containment measures are discussed further in Section 6.14.

Table 22: Access

Related Documents: APPEA Code of Environmental Practice; APIA Code of Environmental Practice

Targets and Objectives of Management:

- No complaints from landholders related to access to properties.
- No exacerbated erosion from access or sedimentation to land or waters.
- No evidence of introduction of weed species.
- No incidents involving tanker rollover or loss of containment.

Environmental Aspects	Potential Impact	Mitigation	Responsibility
<ul style="list-style-type: none"> ▪ Maintaining permanent access to easements, well sites and facilities ▪ Creation of new access roads / tracks where required; 	<ul style="list-style-type: none"> ▪ Disturbance to native vegetation, wildlife and heritage areas. ▪ Disturbance to landholders, agricultural production or other land uses. ▪ Soil compaction, erosion or release of sediment to land and water. ▪ Introduction and spread of weed species or diseases. 	Limit access to activities essential for the construction, operation, maintenance and surveillance of the infrastructure.	Field Supervisor
		Do not allow public access along petroleum access roads and flowline easements unless that right already exists. Public access shall be controlled by measures such as physical barriers and signs.	Field Supervisor
		Use permanent access tracks to access above ground facilities.	Field Supervisor
		Maintain permanent access tracks to the minimum navigable width.	Field Supervisor
		Use existing farm tracks and public roads wherever possible. Obtain landowner permission to use private tracks on a property basis before access is required or by ongoing arrangement.	Field Supervisor
		Erect barrier fencing around any excavations when unattended.	Field Supervisor
		Ensure that all gates on private and public land will be left as found or as required by the landholder.	All
		Install erosion control structures where necessary.	Field Supervisor & Environment Manager
		Avoid and /or minimise vegetation clearance. Avoid creating tracks through vegetation fragments where practicable.	All
		Section 6.2 – Soil and ground stability measures to be implemented.	Land & Approval Environment Manager
Section 6.4 – Weed management measures to be implemented.	Land & Approval Environment Manager		

Table 22: Access			
		Section 726.5 – Disease control measures to be implemented.	Land & Approval Environment Manager
Transport related vehicle movements along access roads to operational facilities	<ul style="list-style-type: none"> ▪ Contamination of land and water through loss of containment. ▪ Disturbance to landholders, agricultural production or other land uses. ▪ Localised dust nuisance to sensitive receptors associated with access via unsealed roads. 	Ensure speed limits for access roads and other warnings are signed appropriately for heavy vehicles giving considerations road conditions, cambre and cornering safety.	Health & Safety Manager Environment Manager
		Maintain all access roads in good condition to improve road safety.	Field Supervisor Environment Manager
		Operator and driver in attendance during tanker filling procedure.	Field Supervisor
		Use dry break couplings.	Field Supervisor
		Ensure that all tanker drivers are trained in the transport of dangerous goods, the use of spill prevention and cleanup methods and the emergency response procedure as per Section 6.14	Health & Safety Manager Environment Manager
		Implement load out procedures to prevent spillage.	Field Supervisor

6.2 Soil and Ground Stability

Disturbances to land and soils from carrying out new activities or the operation, maintenance and surveillance of existing activities, creates the potential for land stability issues, such as erosion and soil compaction to occur. The most appropriate way to control land stability and compaction impacts is to limit access to facility grounds as far as possible and to minimise disturbance to vegetation, particularly in erosion prone areas such as slopes, on dispersible soils and in proximity to watercourses and drainage lines.

The key potential environmental impacts to soil and ground stability are:

- Damage to agricultural production or other land uses;
- Damage to native vegetation and wildlife habitat; and
- Soil erosion, sedimentation (land and water) and land subsidence.

Table 23 outlines the key management measures employed to mitigate environmental impacts associated with soil and ground stability. The risk associated with erosion, sedimentation and land subsidence impacts and damage to agricultural production and land use has been identified as moderate, whilst the risk of damage to native flora and fauna is low.

Table 23: Soil and Ground Stability

Related Documents: “Soil Erosion and Sediment Control Engineering Guidelines for Queensland Construction Sites”; local council erosion and sediment control guidelines; IECA (2008) guidelines; APPEA Code of Environmental Practice; APIA Code of Environmental Practice for Onshore Pipelines,

Targets and Objectives of Management:

- No significant erosion impacting access tracks, seismic lines, pipeline easements, well sites or facility grounds
- Appropriate sediment and erosion controls in place and maintained to adequately prevent or control sediment release to land and water;
- Any identified areas of erosion are remediated within 3 months.
- No complaints from stakeholders concerning soils and land stability that are left unresolved or not remedied.

Environmental Aspects	Potential Impacts	Mitigation	Responsibility
<ul style="list-style-type: none"> ▪ Excavation works ▪ Patrols and inspections. ▪ Vegetation control activities. ▪ Management of storm water runoff and soil protection measures at facilities. <p>Creation, construction and maintenance of:</p> <ul style="list-style-type: none"> ▪ Seismic lines ▪ Flowlines ▪ Roads <ul style="list-style-type: none"> ▪ Facility management 	<ul style="list-style-type: none"> ▪ Soil erosion, sediment release to land and water and land subsidence. ▪ Damage to agricultural production or other land uses. ▪ Damage to native vegetation and wildlife. ▪ Contamination of land or water from run-off 	Identify and monitor potential soil and ground stability problems such as erosion and subsidence during surveillance activities.	Field Supervisor Environment Manager
		Use and install appropriate erosion controls and ground stability measures in areas that have been stabilised or rehabilitated	Construction Contractors Environment Manager
		Implement erosion control strategies and remedial action for ground instability in accordance with relevant codes and guidelines.	Construction Contractors Environment Manager
		Use routine surveillance to monitor the stability of surfaces that have been restored and rehabilitated for a minimum of 12 months.	Construction Contractors Environment Manager
		Revegetate areas of poor ground cover, eroded / unstable areas, and disturbed areas to promote ground stability, where practicable and as soon as possible.	Environment Manager
		Restrict access to areas to the minimum required and comply with measures in Section 6.1.	Field Supervisor
		Inspect and maintain all installed erosion control structures as part of ongoing surveillance.	Field Supervisor
		Avoid the disturbance of erosion prone soil types or slopes.	All
		Minimise vegetation clearing where practicable.	All
		Only disturb riparian areas where necessary for the construction and/or maintenance of roads, tracks and pipelines that are essential for carrying out the authorised petroleum activities and where no	Construction Contractors Environment Manager

Table 23: Soil and Ground Stability			
		reasonable alternative location is feasible.	
		Ensure that where land is significantly disturbed by the petroleum activities, that the top layer of the soil profile is removed, stockpiled and used for rehabilitation purposes.	Construction Contractors Environment Manager
		Section 6.3 – Vegetation management measures to be implemented.	Production Manager Construction Contractors Environment Manager
		Section 6.6 – Earthworks and land use management measures to be implemented.	Production Manager Construction Contractors Environment Manager
		Section 6.11 – Water management measures to be implemented.	Production Manager Construction Contractors Environment Manager

6.3 Vegetation Management

Clearing of vegetation is often required for activities such as flowline and well construction and carrying out seismic surveys. Vegetation clearing is also required as part of operational activities, for example to maintain firebreaks, for flowline maintenance (dig-ups) or to remove trees and tall shrubs along flowline easements. Pipeline integrity should be protected from damage by roots.

The key potential environmental impacts relating to vegetation clearing include:

- Introduction of declared pests arising from activities in the project area;
- Weed spread due to soil disturbance;
- Competition from weed species leading to displacement of agricultural crops or native flora;
- Erosion, land degradation and sedimentation;
- Disturbance of ecological processes through the loss of habitat connectivity and creation of fragments;
- Loss of endangered, vulnerable and rare flora species;
- Loss of fauna habitat; and
- Direct and indirect impacts to environmentally sensitive areas (ESA's)(listed in Table 19)

Table 24 outlines the key management measures employed to mitigate impacts to vegetation and areas of environmental values (e.g. ESA's). There is a moderate risk of potential erosion, land degradation and sedimentation impacts, and weed introduction caused by vegetation disturbances, whilst all other potential impacts were classed as low risk.

Table 24: Vegetation Management

Related Documents: APPEA Code of Environmental Practice; APIA Code of Environmental Practice, *Nature Conservation Act 1992*; *Vegetation Management Act 1997*; *Environment Protection and Biodiversity Conservation Act 1999*.

Targets and Objectives of Management:

- No unauthorised clearing of endangered, rare or vulnerable species or Environmentally Sensitive Areas (ESA's) including endangered or of concern regional ecosystems or essential habitat for threatened species.
- No mortalities of threatened fauna species from clearing activities.
- No introduction of weeds resulting from disturbances caused by clearing.
- No evidence of erosion or sedimentation due to a lack of vegetation cover that is significantly inconsistent with the surrounding landscape, and not stabilised or remediated.

Environmental Aspect	Impact	Mitigation	Responsibility
Carrying out routine petroleum activities including: <ul style="list-style-type: none"> ▪ Installation of new flowlines, well sites, access roads and facilities; ▪ Ongoing maintenance of flowline easements and well sites; and ▪ Seismic surveys. 	<ul style="list-style-type: none"> ▪ Loss of habitat connectivity and creation of fragments. 	Remove regrowth trees within 3 m of either side of the centreline of flowlines at the seedling or sapling stage to ensure the roots do not create a safety risk to the pipeline. Remove saplings at ground level.	Production Manager All field Staff
	<ul style="list-style-type: none"> ▪ Loss of Endangered, rare and vulnerable species. 	Encourage ground cover and shrub layer re-establishment over flowline easement.	Production Manager All field Staff
	<ul style="list-style-type: none"> ▪ Loss of fauna habitat. 	Avoid damage to vegetation outside the easement unless unavoidable (due to access or safety requirements) and only clear vegetation with landowner consent and the approval of regulatory authorities where required.	Land & Approvals Manager Environment Manager
	<ul style="list-style-type: none"> ▪ Spread or introduction of weeds and competition from weed species leading to displacement of agricultural crops or native flora. 	Trim vegetation instead of removing vegetation wherever possible.	All
		Retain all trees that contain hollows wherever practicable.	Construction Contractor Environment Manager
	<ul style="list-style-type: none"> ▪ Soil erosion and sedimentation of land and waters. 	A suitably qualified fauna spotter and handler will be present on-site during large scale clearing activities.	Construction Contractor Environment Manager
	<ul style="list-style-type: none"> ▪ Direct impacts to ESA's. 	Upon completion of petroleum activities involving temporary earthworks (e.g. flowline dig-ups), cleared vegetation will be re-spread to provide habitat for fauna species.	Construction Contractor Environment Manager
	<ul style="list-style-type: none"> ▪ Indirect impacts on ESAs from petroleum activities. 	Only disturb riparian areas where necessary for the construction and / or maintenance of roads, tracks and flowline ROW's that are essential for carrying out the authorised petroleum activities and where no	Construction Contractor Environment Manager

Table 24: Vegetation Management

	reasonable alternative location is feasible.	
	<p>Where practicable, do not clear vegetation:</p> <ul style="list-style-type: none"> ▪ In or within 50 m of the high bank of a watercourse ▪ In or within 50 m of the static high water mark of wetlands, lakes or springs; ▪ In a way that isolates clumps or dissects corridors of vegetation ▪ On slopes greater than 5%; ▪ On dispersible soils, and ▪ In existing or potential groundwater discharge areas. 	Construction Contractor Environment Manager
	Prior to any clearing, the proposed area of disturbance will be surveyed for Endangered, rare or vulnerable fauna and flora species and other important habitat attributes (e.g. hollow bearing trees)	Land & Approvals Manager Environment Manger
	Plan activities so as to avoid ESA's and associated buffer zones wherever possible.	Land & Approvals Manager Environment Manager
	Activities must not be carried out in ESA's or ESA buffer zones without the relevant regulatory approvals..	Land & Approvals Manager Environment Manager
	Ensure all personnel are made aware of the location of any ESA's and what level of restriction is placed on the proposed activity.	Land & Approvals Manager Environment Manager Field Supervisor
	Ensure that the management of any petroleum activity takes into account the indirect effects on nearby ESA's (e.g. potential for sedimentation or contamination from run-off).	Land & Approvals Manager Environment Manager Production Manager
	Develop and implement strict controls to minimise the clearing required and limit disturbances when operating in ESA's (e.g. reduce width of flowline ROW and access tracks; clearly flag areas required to be cleared and no-go zones etc).	Land & Approvals Manager Environment Manager
	Re-instate disturbed areas and encourage natural regeneration of	Land & Approvals

Table 24: Vegetation Management

	native vegetation as soon as possible after earthworks, to minimise potential for weed establishment and spread and erosion.	Manager Environment Manager
	Provide adequate ground cover (e.g. blue stone aggregate) at facility sites to minimise potential for weed establishment and erosion associated with disturbed areas.	Land & Approvals Manager Environment Manager
	Section 6.4 - Vegetation management measures to be implemented.	Land & Approvals Manager Environment Manager
	Section 6.6 – Earthworks and land use management measures to be implemented.	Land & Approvals Manager Environment Manager
	Section 6.11 – Water management measures to be implemented.	Land & Approvals Manager Environment Manager

6.4 Weed Management

Weeds have the potential to adversely alter ecosystem function, reduce primary industry productivity and profitability, and seriously limit the long-term sustainability of agricultural and natural resources. The conduct of petroleum activities including construction, operation, monitoring, surveillance and routine maintenance activities have the potential to develop new weed infestation areas through the:

- Disturbance to topsoil;
- Removal of vegetation competition;
- Redistribution of weed seed-stock; and
- Introduction of species from other infested areas.

The key potential environmental impacts associated with the establishment and infestation of weed populations include:

- Competition from weed species and displacement of agricultural crops or native flora;
- Reduced primary industry productivity and produce quality;
- Impacts to sensitive environments and ecosystem function; and
- Loss of visual amenity.

Table 25 outlines the key management measures employed to mitigate impacts to vegetation and to manage weeds. A risk assessment of the key impacts was undertaken with the highest level of risk being identified as moderate for impacts related to reduce primary industry productivity and produce quality and competition from weed species and displacement of agricultural crops or native flora. All other impacts were assigned a low level of risk.

Table 25: Weed Management

Related Documents: Petroleum Industry – Pest Spread Minimisation Advisory Guideline 2008; *Lands Protection (Pest and Stock Route Management) Act 2002*; APPEA Code of Environmental Practice; APIA Code of Environmental Practice.

Targets and Objectives of Management:

- No new infestations of declared weed species or introduction of new weed species
- No complaints from stakeholders about the spread of weed species

Environmental Aspects	Potential Impact	Mitigation	Responsibility
Carrying out routine petroleum activities including: <ul style="list-style-type: none"> ▪ Access; ▪ Earthworks; ▪ Vegetation clearing; ▪ Disturbance to topsoils; ▪ Removal of vegetation competition; and ▪ Redistribution of weed seed-stock. 	<ul style="list-style-type: none"> ▪ Competition from weed species and displacement of agricultural crops or native flora; 	Implement wash down procedures for machinery and equipment that has been operated or travelled through an area where declared plants / weeds are present. Record inspections and washdowns on a washdown register.	Environment Manager
		Wash slashing equipment prior to moving from known weed infestation areas to weed free areas. Record inspections and washdowns on a washdown register.	Field Supervisor
	<ul style="list-style-type: none"> ▪ Reduced primary industry productivity and produce quality; 	Monitor weed growth along tracks, easements, wells and facilities. Determine excessive weed growth by comparing the amount of weeds within the managed areas to adjacent undisturbed areas.	Field Staff
		Educate relevant contractors in weed identification and management techniques.	Environment Manager
	<ul style="list-style-type: none"> ▪ Impacts to sensitive environments and ecosystem function; and ▪ Loss of visual amenity. ▪ Introduction of species from infested areas into unaffected areas; 	Control declared weed species by spot spraying, boom spraying or hand pulling, in accordance with the control requirements of the Lands Protection Act and information regarding weed-specific control measures.	Environment Manager All Field Staff
		Minimise soil disturbance along pipelines, access roads, well and facility sites and road verges.	All
		All personnel must be made aware of obligations and responsibilities with regards to weed management.	Environment Manager Field Supervisor
		Seek landholder approval before importing foreign soil material. Where soil is imported, ensure the source area is weed free.	Land & Approval Manager

6.5 Disease Control

Plant and animal diseases have the potential to cause serious environmental, economic and social problems, particularly if introduced to commercial stock and/or cropping operations. The many known plant diseases present in Queensland are usually caused by bacteria or phytoplasma infection to the host plants and can result in widespread die-off of species or can reduce potential harvest. The spread of plant diseases can occur over long distances during severe weather events

Diseases and pests may be present in soil, manure and organic matter that may be transported and spread by vehicles, machinery, people or equipment. Diseases can also be spread by the movement of infected plant materials.

Table 26 outlines the key management measures employed to mitigate the potential impact of diseases associated with PL 446 activities. A risk assessment rating of low was assigned to key potential impacts caused by the spread of disease, such as adverse impacts on agricultural activities and native flora and fauna.

Table 26: Disease Control

Related Documents: DEEDI Fact Sheets; DEWHA fact sheets; APIA and APPEA codes of environmental practice.

Targets and Objectives of Management

- No introduction or transmission of diseases or pathogens as a result of PL 446 activities.

Environmental Aspects	Potential Impacts	Mitigation	Responsibility
<p>Transient operations across a large area with different landholder and property management requirements.</p> <p>Activities that have the potential to introduce or spread disease include:</p> <ul style="list-style-type: none"> Access Earthworks / soil disturbance; Soil and vegetation transportation 	<ul style="list-style-type: none"> Spread of diseases or introduction of diseases into new areas Adverse impacts to agricultural activities resulting in lost productivity or revenue, with associated social impacts. Adverse impacts to native species. 	Seek landholder approval before importing any foreign soil material. Where soil is imported, soil will be from certified weed and pest free sources.	Land & Approval Manager
		Consult with all landholders and regulatory authorities to identify any existing disease-affected properties or areas. Where special management measures and exclusion zones may be required, implement the required measures and manage access for affected areas.	Land & Approval Manager
		Consult with the regulatory authorities and affected landholders if an outbreak of a new exotic disease occurs to create an appropriate management plan for all personnel to implement.	Land & Approval Manager
		Maintain information on disease and pathogen risks and appropriate hygiene in the areas of activity obtained from the relevant government authority.	Health & Safety Manager
		Always implement machinery, vehicle and personnel hygiene measures and maintain appropriate records.	Field Supervisor
		Section 6.1 – Access management measures to be implemented.	Field Supervisor Environment Manager

6.6 Earthworks and Land Use Management

Earthworks are only carried out on an as-needed basis and are primarily undertaken for the construction and installation of new infrastructure and for maintenance activities.

Common construction and maintenance activities requiring earthworks include:

- Site maintenance;
- Creation of new well leases and associated aboveground facilities;
- New flowline construction;
- Road repairs; and
- Flowline repairs.

The key potential issues associated with earthworks that may affect land use are:

- Soil erosion and sediment release;
- Interruption to natural surface, overland and groundwater flows;
- Disturbance to native vegetation and wildlife;
- Temporary disruption to residents, landowners and third parties and their activities;
- Localised nuisance from increased dust generation; and
- Introduction of weed species.

Table 27 outlines the key management measures used to mitigate the potential issues resulting from earthworks. The risk assessment identified the impacts of erosion from land disturbance and the colonisation of weeds due to soil disturbance as moderate. All other impacts were identified as having a low risk.

Table 27: Earthworks and Land Use Management

Related Documents: APPEA and APIA Codes of Environmental Practice, IECA (2008) Guidelines

Targets and Objectives of Management

- No erosion, sedimentation and disruption of environmental flows from earthworks.
- No unapproved disturbance of vegetation or cultural or heritage areas.
- No complaints relating to unmitigated disruption of land uses from new earthworks.
- No complaints relating to amenity (e.g. noise and dust emissions).

Environmental Aspects	Potential Impacts	Mitigation	Responsibility
Carry out earthworks as part of routine petroleum activities and the construction of new infrastructure including: <ul style="list-style-type: none"> ▪ Site maintenance; ▪ Creation of new well leases and associated aboveground facilities; ▪ New flowline construction; ▪ Road repairs; and ▪ Flowline repairs. 	<ul style="list-style-type: none"> ▪ Soil erosion and sediment release. 	Use washdown facilities for machinery prior to arrival on site. Inspect machinery prior to it being unloaded. Keep a wash down register.	Field Supervisor
		Use appropriately credited personnel to supervise any excavations.	Field Supervisor
	<ul style="list-style-type: none"> ▪ Interruption to natural surface and groundwater flows. 	Manage soil and ground stability in accordance with OEMP.	Field Supervisor
		Maintain landscape profiles, as closely as practicable, to the original profile.	Construction contractors
	<ul style="list-style-type: none"> ▪ Disturbance to native vegetation and wildlife. 	Design water diversion structures required for erosion control in accordance with OEMP.	Construction contractors
		Prevent the entrapment of animals by placing hazard netting or branches around excavations. Regularly inspect excavations for fauna if left open for a period of time.	Construction contractors Environment Manager
	<ul style="list-style-type: none"> ▪ Temporary disruption to residents, landowners and third parties. 	Consult landowners prior to commencing work, wherever possible.	Land & Approvals Manager
		<ul style="list-style-type: none"> ▪ Introduction of weed species. 	Reschedule work to avoid disruptions to landowners where practicable, except in emergency situations.
	Use fill material that is clean, similar to the natural soil of the area and sourced from an area free from weeds. Return topsoil to facilitate revegetation.		Construction contractors
	Seek landholder permission prior to the introduction of the foreign soil material.		Land & Approvals Manager
<ul style="list-style-type: none"> ▪ Disturbance to cultural heritage items. 	Remove and stockpile topsoil for use in rehabilitation activities.	Construction contractors	

Table 27: Earthworks and Land Use Management			
		If cultural heritage items are discovered during earthworks, cease the activity immediately and advise relevant parties in accordance with the Cultural Heritage Management Plan and this OEMP (Section 6.10).	All
		Implement control measures detailed in Sections 6.2 to 6.5 to protect soil and ground stability, minimise vegetation impacts, and prevent the introduction and spread of weeds and diseases.	Production Manager Field Supervisor Environment Manager Land & Approvals Manager Construction Contractors

6.7 Fire Prevention

Ongoing production activities on PL 446 have some potential to create sources of ignition, including flares, hot works (e.g. welding) and hot machinery parts. However, the risk of ignition of a fire as a result of operation and maintenance activities on PL 446 is considered low.

The key potential environmental issues associated with bushfires are:

- Injuries to public or personnel;
- Damage to or loss of flora, fauna and habitat;
- Damage to agricultural production; and
- Damage to, or loss of, AGL or third party infrastructure.

Table 28 outlines key measures to minimise fire risks during the operation of activities on PL 446.

Table 28: Fire Prevention

Related Documents: Fire Warden 3 monthly checklist (MN-09_2); Silver Springs pump maintenance (SS-MN-06_4); Fire System Operation (SS-OP-46); Foam System Operation (SS-OP-47_3)

Targets and Objectives of Management

- Evidence that control measures have been implemented to minimise risk of fire ignition;
- No fires started as a result of operations and maintenance procedures used to prevent the spread of bushfire in the event of ignition; and
- Response to fire event in accordance with the Company Incident Management Strategy to provide adequate response in the event of ignition.

Environmental Aspects	Potential Impacts	Mitigation	Responsibility
<ul style="list-style-type: none"> ▪ Fire resulting from the operation and maintenance of PL 446 facilities 	<ul style="list-style-type: none"> ▪ Injuries to public or personnel. 	Open fires are not permitted on PL 446.	All
		Prevent build-up of flammable material in work areas.	All
	<ul style="list-style-type: none"> ▪ Damage to or loss of flora, fauna and habitat. 	Vegetation and other flammable material will be stockpiled well clear of any ignition sources or hot work activities.	Construction Contractor
		Vehicle and machinery exhaust systems shall be inspected regularly for leaks and accumulated vegetation debris. Fuel systems shall also be inspected for leaks.	Field Supervisor
	<ul style="list-style-type: none"> ▪ Damage to agricultural production. 	All vehicles will be equipped with portable fire extinguishers.	Health & Safety Manager
		Emergency Response Plan (ERP) shall include details on local contacts for fire fighting assistance.	Health & Safety Manager
	<ul style="list-style-type: none"> ▪ Damage to, or loss of, AGL third party infrastructure. 	All relevant bylaws with regard to fire management shall be adhered to.	All
		The status of fire bans should be checked prior to any works involving potential ignition sources.	All
		Adequately train personnel regarding fire prevention and safety, personnel responsibilities and basic fire management.	Health & Safety Manager
		Fire-fighting equipment will be provided at all work and camp sites. All appropriate crew members will be trained in the use of the equipment.	Health & Safety Manager
		Maintain firebreaks around above ground facilities, especially flares and other activities resulting in flames or sparks.	Production Manager
		Water trucks will be available for use as fire trucks in the event of fire.	Production Manager
		Local emergency response authorities are to be briefed and provided with the ERP and up to date company / project contacts.	Health & Safety Manager

6.8 Air Emissions

Adverse effects on air quality are predominantly created by exhaust emissions from fuel burning equipment (point source and continuous), any gas emissions from leaks (fugitive and/or diffuse), controlled purging and venting activities (point source and infrequent) and vehicle movements (diffuse). The compressor units operating at the SSPP contribute the largest proportion of point source emissions of all activities on PL 446. The main pollutants of concern are NO_x (predominantly as NO₂) and CO. A detailed description of compressor emissions is provided in Section 2.9.

The key potential issues associated with air emissions are:

- Increase in localised ground concentrations due to point source pollutant emissions;
- Contribution to greenhouse gas emission load in regional air shed;
- Localised nuisance to sensitive receptors due to odour ;
- Temporary reduction in amenity associated with dust;
- Localised nuisance to sensitive receptors due to dust; and
- Impacts to flora and fauna from point source, diffuse, fugitive and dust emissions.

Table 29 outlines the key management measures used to minimise and mitigate air emissions during the operation and maintenance of PL 446 facilities. The impacts associated with the air emissions from the SSPP are considered a low risk.

Table 29: Air Emissions Management

Related Documents: *Environmental Protection (Air) Policy 2008*; National Environment Protection Measures (Air)

Targets and Objectives of Management

- To minimise the generation of dust and potential dust and odour nuisance.
- To prevent the release of fugitive emissions from operational plant.
- Where appropriate, comply with regulatory emission limits from point sources and ensure ground level concentrations of point source pollutants meet the EPP (Air) limits.
- To ensure that petroleum activities do not have a discernible impact on the regional air shed.
- No complaints in relation to air emissions. Complaints are actioned and closed out.

Environmental Aspects	Potential Impacts	Mitigation	Responsibility	
<ul style="list-style-type: none"> ▪ Adverse effects on air quality from purging and flaring during maintenance activities and accidental or fugitive gas release ▪ Adverse effects on localised air quality from excessive emissions from point sources. ▪ Dust and exhaust emissions from vehicle and machinery operation 	<ul style="list-style-type: none"> ▪ Increase in localised ground concentrations due to point source pollutant emissions; 	Smoke generation will be avoided by a strict no burning policy.	All	
		Conduct purging or venting activities only as needed and with consideration of potential noise receptors. Complete an individual Risk Assessment or Job Hazard Analysis for major venting.	Production Manager	
		<ul style="list-style-type: none"> ▪ Contribution to greenhouse gas emission load in regional air shed; 	Conduct frequent checks to detect gas leaks from above ground facilities.	Production Manager
			Monitor emissions from fuel burning equipment to ensure emissions are in accordance with regulatory limits.	Environment Manager
		<ul style="list-style-type: none"> ▪ Localised nuisance to sensitive receptors due to odour ; 	A program of regular inspection and maintenance of plant to be implemented to ensure optimal efficiency to minimise emissions.	Environment Manager Production Manager
			A register of fuel burning equipment must be developed and maintained	Production Manager
		<ul style="list-style-type: none"> ▪ Temporary reduction in amenity associated with dust; 	Dust suppression measures such as the use of a water cart, seeding with grass or use of gravel to reduce dust at sensitive locations.	Production Manager Field Supervisor
			Cease work temporarily if dust impacts become unacceptable and cannot be adequately controlled, particularly in proximity to sensitive receptors.	Production Manager Field Supervisor
		<ul style="list-style-type: none"> ▪ Localised nuisance to sensitive receptors due to dust; and ▪ Impacts to flora and fauna from point source, diffuse, fugitive and dust emissions. 	Regularly maintain vehicles and equipment (compressors).to minimise emissions.	Production Manager
			Vehicle speeds will be limited on access tracks to reduce dust, and traffic in close proximity to residences will slow considerably.	All

Table 29: Air Emissions Management			
		Access routes will be maintained to minimise dust (good condition, compacted, watering where required).	Field Supervisor
		Exposed surfaces will be rehabilitated as rapidly as practicable after land disturbances.	Production Manager Environmental Manager
		Manage waste facilities (handling and disposal) in accordance with mitigation measures in Section 6.13 to minimise the potential for odour nuisance.	Field Supervisor

6.9 Noise Emissions

The current conditions relating to the management of noise in the existing Integrated Authority 150 120 state that the operations must not cause a nuisance at noise sensitive places. As described in Section 3.5, there are approximately 11 identified sensitive receptors in the vicinity of the PL 446 project area with two of these being located within three kilometres of the SSPP (see Table 13). To date, AGL has not received any complaints regarding noise emissions from existing PL 446 operations.

There are a number of fixed and transient operations on PL 446 with the potential to cause noise nuisance. The compressor units located at SSPP are the predominant source of noise emissions on PL 446. This is a fixed and continuously operating activity. Compressors generate noise on a continuous basis from the following components:

- Compressor Gas Turbines, including:
 - » Engine air inlet;
 - » Engine exhaust;
 - » Engine mechanical;
 - » Cooling fan; and
- Generators.

Other stationary noise sources include beam pump generators on well sites.

Drilling activities are the principal transient noise source that has potential to cause noise nuisance at sensitive receptors. Drilling wells in PL 446 is not intended to be extensive into the future and will occur intermittently in the next five years. Where a well is required to be drilled within 1 km of a sensitive receptor, AGL propose to undertake noise modelling to determine the potential noise nuisance caused by the drilling activity, prior to carrying out the activity. Furthermore, all potentially affected landholders will be fully consulted prior to and during the drilling activity, and where necessary, alternative arrangements will be put in place. Other sources of transient noise include flowline construction, well work-overs, venting, purging and flowline pigging, as well as corrective and preventative maintenance activities. These activities have the potential to create elevated noise levels; however they will be of a short-term nature and will occur predominantly during daylight hours (7am – 6pm).

The key issues associated with noise emissions are:

- Disturbance to local residents and other land users; and
- Disturbance to stock and wildlife.

Table 30 outlines the key management measures used to mitigate noise emissions during the operation and maintenance of the PL 446 activities. A risk rating of moderate has been attributed to noise related impacts.

Table 30: Noise Emissions

Related Documents: Environmental Protection (Noise) Policy 2008, World Health Organisation Guidelines, DERM Planning for Noise Control Guideline 2004 and the Low Frequency Noise Draft Guidelines, DERM Noise Measurement Manual.

Targets and Objectives of Management

- No complaints in relation to noise nuisance.
- Any recorded complaints are actioned and closed out.
- Any required noise monitoring demonstrates compliance with regulatory requirements.
- Evidence of consultation and planning for planned but irregular noise events.
- Faulty/noisy equipment is repaired or replaced.

Environmental Aspects	Potential Impacts	Mitigation	Responsibility
<ul style="list-style-type: none"> ▪ Adverse impacts on the noise environment of sensitive receptors from the operation of mobile and stationary plant and equipment. 	<ul style="list-style-type: none"> ▪ Disturbance to local residents and other land users. ▪ Disturbance to stock and wildlife. 	Earthmoving equipment and other vehicles will be fitted with appropriate noise control devices (e.g. mufflers) and such devices will be appropriately maintained.	Field Supervisor
		Vehicle speeds will be limited on all access roads in proximity to residences (and other sensitive receptors).	All
		Works will be conducted during normal business hours (7am - 6pm Monday – Saturday and 7am – 5pm Sunday) except for activities such as drilling, compression or emergency maintenance works which must operate on a 24 hour basis.	Production Manager
		Noisy activities will be carried out sufficient distances from residences to limit any impacts.	Production Manager Land & Approvals Manager
		Potentially affected landholders will be notified of timing and duration prior to and during any planned construction, drilling, operational and /or maintenance activities with the potential to create noise nuisance. Where appropriate, alternative arrangements may be made with landholders for the period that the noise may cause a nuisance.	Land & Approvals Manager
		Prior to drilling within 1 km of a sensitive receptor, noise modelling will be carried out to determine the potential impact of noise. Where a likely noise nuisance is identified, steps will be taken to mitigate the noise and consultation with potentially impacted landholders will be undertaken.	Drilling & Completions Manager

Table 30: Noise Emissions		
	Generators at the drill rig site will be orientated such that the noise producing components are directed away from the sensitive receptor.	Production Manager
	Compressors / generators will be fitted with appropriate noise attenuation devices where necessary.	Production Manager
	Complaints will be documented, and immediately reported to the Land & Approvals Manager who will close out the complaint.	Land & Approvals Manager

6.10 Cultural Heritage

The greatest risk to the preservation of cultural heritage is the disturbance or destruction of unidentified / unknown sites. Routine maintenance activities are unlikely to disturb heritage areas, as the majority of surface sites where infrastructure exists would have been identified / disturbed during construction activities. New activities such as well drilling and flowline construction and non-routine maintenance activities have a higher likelihood of uncovering or damaging heritage areas. Activities such as these may require an archaeological assessment to be conducted, depending on the nature of surface disturbance at the proposed location.

Through induction processes, personnel are made aware that they may uncover areas of unknown burial sites or artefacts and that if such a discovery occurs, the excavation is to immediately stop and the relevant regulatory authorities and the registered Aboriginal Party notified.

AGL has an existing Cultural Heritage Management Plan (CHMP) in place with the Mandandanji people, the registered Aboriginal party for the area. Activities must be carried out in accordance with the objectives and agreements made within this document.

Table 31 outlines the key management measures used to mitigate disturbances to cultural heritage during the operation and maintenance of PL 446.

Table 31: Cultural Heritage

Related Documents: Mandandanji Cultural Heritage Management Plan (CHMP); Duty of Care Guidelines; *Aboriginal Cultural Heritage Act 2003*

Targets and Objectives of Management:

- No disruption to cultural heritage sites; and
- Inspections carried out and approvals obtained for disturbances at any identified sites and for any works carried out in undisturbed areas.

Environmental Aspects	Potential Impacts	Mitigation	Responsibility
<ul style="list-style-type: none"> ▪ Excavation or disturbance of soils for operational activities 	<ul style="list-style-type: none"> ▪ Disturbance or destruction of heritage site or artefact 	All potential impacts associated with Indigenous Cultural Heritage will be dealt with in accordance with the existing or negotiated CHMP or other agreements and the <i>Aboriginal Cultural Heritage Act 2003</i> .	Land & Approvals Manager Environment Manager
		Only representative of the registered Aboriginal Party are to advise on, or interfere with, sites or material and artefacts of cultural significance and heritage.	
		Cultural heritage monitoring will be undertaken in accordance with duty of care guidelines and the CHMP. Monitoring of sites will be undertaken by traditional owners or other approved personnel.	
		Brief all personnel through induction process to ensure that there is appropriate awareness of the procedures to follow should cultural heritage sites or items be identified.	
		Where necessary, signage, flagging, fencing or erosion control measures will be installed to protect any identified sites.	

6.11 Water Management

Potential water related contamination issues are primarily related to run-off and erosion control.

Where activities require disturbance to land, soils and vegetation, the potential impacts to water quality associated with the activity is evaluated and addressed prior to commencement of the activity.

Run-off and erosion controls are created in susceptible areas during construction or operation of the pipeline and/or facility. The condition of these controls is monitored during routine surveillance. Specific attention is given to steep sections, watercourses and drainage lines that cross the pipeline easement. Any run-off / erosion issues that are identified are addressed as soon as possible.

Petroleum activities, through drilling, production and the inappropriate containment of contaminants (i.e. dams) have the potential to cause impacts to groundwater. Industry wide acceptable practices and regulatory restrictions and guidelines will be implemented at all times when conducting activities such as these to prevent groundwater impacts.

The key issues associated with water management are:

- Reduction in water quality as a result of increased sediment loads;
- Contamination of surface water or groundwater, due to inappropriate stormwater / run-off management, spills of fuel / chemicals or leakage from evaporation ponds; and
- Altered drainage patterns and water flow regimes.

Table 32 outlines the key water management strategies employed during the operation and maintenance of the SSPP. A risk assessment of the key impacts was undertaken with the highest level of risk being identified as *Low* for all of the impacts assessed.

Table 32: Water Management

Related Documents: *Environmental Protection (Water) Policy 2009*

Targets and Objectives of Management;

- No significant or recurring erosion in areas disturbed by petroleum activities.
- No sedimentation of waterways or land caused by petroleum activities.
- No evidence of contamination of waters from petroleum activities, including uncontrolled releases, or seepage from evaporation ponds and chemical / fuel spills.
- No complaints relating to altered flow regimes or surface water flows

Environmental Aspects	Potential Impacts	Mitigation	Responsibility	
Changes to quality or water flow patterns resulting from: <ul style="list-style-type: none"> ▪ Above ground petroleum activities including waste storages, spills and dams; ▪ Use of heavy machinery and vehicles. ▪ Vegetation removal; ▪ Excavations / soil disturbance. ▪ Direct disturbance to watercourses. 	<ul style="list-style-type: none"> ▪ Reduction in water quality as a result of increased sediment loads; 	Inspect and monitor disturbed areas in, or within the vicinity of watercourses, for stability during routine surveillance.	Environment Manager Field Staff	
		<ul style="list-style-type: none"> ▪ Contamination of surface water or groundwater, due to inappropriate stormwater / run-off management, spills of fuel / chemicals or leakage from evaporation ponds; and 	Manage soil and ground stability issues in accordance with Sections 6.2 and 6.6).	All
			Install, inspect and maintain erosion control measures in erosion prone areas.	Field Staff
	Obtain a water license from the relevant government department prior to taking water from a watercourse for use in petroleum activities.		Land & Approvals Manager	
	Store, transport and handle fuels, oils and chemicals in accordance with this OEMP (Section 6.15) and away from water bodies.		Health & Safety Manager Production Manager	
	Minimise the risk of spills (particularly of harmful substances) in accordance with this OEMP (Section 6.14).		Field Supervisor Production Manager	
	Construct storage areas and stockpiles so as to divert stormwater run-off and prevent potential contamination of waters.		Environment Manager Production Manager	
	<ul style="list-style-type: none"> ▪ Altered drainage patterns and water flow regimes. 	Ensure that waste test water from hydrotesting is not disposed of to waters and is handled in accordance with relevant EA conditions.	Construction Contractors	
		Store wastes in accordance with OEMP (Section 6.13).	Environment Manager Production Manager	
	Restore drainage patterns and water flow regimes as near as practicable to the original profile, if altered during flowline maintenance activities.	Construction Contractors Environment Manager		

Table 32: Water Management

	Manage incidents in accordance with the Company's emergency response plan, the Incident Response Manual and the spill response procedures.	Health & Safety Manager Environment Manager Production Manager
	No maintenance or refuelling of vehicles or machinery is to be undertaken within 150 m of a watercourse or water body. Use suitable controls to prevent water contamination.	Field Supervisor
	Any new dam will not be constructed in areas estimated to be submerged by a 1 in 50 year flooding event from a recognised watercourse.	Production Manager
	A groundwater monitoring network must be established around the produced water storage areas to detect any impacts to groundwater quality.	Environment Manager Production Manager
	Design, install and maintain appropriate diversions around ponds to prevent overland flow capture and protect the stability of pond walls.	Environment Manager Production Manager
	Prior to the re-use of any produced waters, ensure that the appropriate regulatory approvals are in place (e.g. beneficial use approval)	Land & Approvals Manager Environment Manager
	Adequately control stormwater run-off to divert around key potentially contaminated activities at aboveground sites.	Field Supervisor Environment Manager

6.12 Facilities Management

There are a range of aboveground facilities present on PL 446, including the SSPP, the Taylor Satellite Plant, petroleum wells, evaporation ponds and flowline facilities such as pig receivers and launchers. Descriptions of these facilities are provided in Sections 2.5 to 2.13.

The key potential impacts associated with managing facilities and plant are:

- Hazards which may result in safety, plant fire, bushfire, or other incidents if not properly managed;
- Noise disturbance to local residents, other land use and wildlife or stock;
- Impacts to local air quality from point source and fugitive emissions;
- Reduction of visual amenity; and
- Soil or water contamination from fuel or chemical spills or inappropriate management of stormwater runoff from facilities.

Table 33 outlines the key strategies used to manage PL 446 facilities. A risk level of low was assigned to the identified impacts.

Table 33: Facilities Management

Related Documents: APIA and APPEA Codes of Environmental Compliance

Targets and Objectives of Management

- No safety hazards, fires or unauthorised emissions from the operation of PL 446 facilities.
- All identified safety hazards, unauthorised emissions, leaks or spills are repaired / removed as soon as practicable.

Environmental Aspects	Potential Impacts	Mitigation	Responsibility
Routine and reactive maintenance and monitoring operations.	<ul style="list-style-type: none"> ▪ Hazards which may result in safety, plant fire, bushfire, or other incidents if not properly managed; 	Where appropriate, facility sites should be securely fenced and locked to prevent entry by unauthorised persons.	Production Manager Field Supervisor
		Store and maintain fire-fighting equipment on-site.	Production Manager Field Supervisor
	<ul style="list-style-type: none"> ▪ Noise disturbance to local residents, other land use and wildlife or stock; 	Where appropriate, the ground surface of facilities will be gravelled to reduce fire risks and prevent weed infestation.	Production Manager Field Supervisor
		Monitor all above ground facilities for leaks during routine maintenance. Address identified leaks as appropriate.	Production Manager Field Supervisor
	<ul style="list-style-type: none"> ▪ Impacts to local air quality from point source and fugitive emissions; 	Potential fire risks will be managed in accordance with Section 6.7.	Production Manager Field Supervisor
		Potential air emissions, dust and odour issues shall be managed in accordance with Section 6.8: Air Emissions and Section 6.13 – Waste Management.	Production Manager Field Supervisor Environment Manager
	<ul style="list-style-type: none"> ▪ Reduction of visual amenity; and; ▪ Soil or water contamination from fuel or chemical spills or inappropriate management of stormwater runoff from facilities. 	Keep all facilities free of vegetation and weeds.	Field Supervisor
		Keep all facilities in a clean and tidy condition.	Field Supervisor
		Noise from facilities shall be managed in accordance with Section 6.9 Noise Emissions.	Production Manager Land & Approvals Manager
		Chemicals and fuel will be managed in accordance with Sections 6.14 (spill prevention and response) and Section 6.15 (Fuel and Chemical Storage).	Production Manager Field Supervisor Environment Manager
	Stormwater will be adequately controlled and run-off diverted away from potentially contaminating activities such as fuel storage areas.	Production Manager Environment Manager	

6.13 Waste Management

Routine activities on PL 446 have the potential to generate a variety of waste materials. Volumes / quantities of each waste type will be dependent on the scale of each activity being carried out at any one time. If wastes are handled in accordance with AGL procedures, the environmental authority conditions and the EPP (Waste) 2008, the risk of impacts to the environment from waste producing activities is limited.

The types of wastes produced on-site could include:

- General rubbish;
- Human wastes (sewage);
- Putrescible waste;
- Solid inert wastes such as building rubble, concrete, bricks, timber, plastic, glass, metals and tyres;
- Hazardous wastes such as cleaning chemicals, waste oils, pigging waste and spill materials;
- Drilling muds and cuttings;
- Oily water;
- Cleared vegetation; and
- Produced water.

The key potential environmental issues associated with waste management are:

- Contamination of land, soil and water, including groundwater;
- Health risks to the community and the workforce;
- Nuisance to sensitive receptors from odour;
- Adverse effects on native vegetation and wildlife; and
- Reduction of visual amenity.

Table 34 summarises the key strategies used to manage waste resulting from PL 446 operations. Produced water from wells and processing operations is one of the more significant waste streams associated with PL 446 operations and as such is discussed further in Section 6.13.1.

6.13.1 Produced Water Management

As described in Section 2.8, evaporation is currently the primary means of disposal for produced waters on PL 446. The evaporation dams at Silver Springs are the main dams utilised, which are a series of settling ponds, joined by an underflow system. Monitoring of the ponds is completed daily and includes visual checks of storage levels, potential oil contamination and pond wall integrity. Inspections for potential leaks, seepage or issues with bund walls are conducted twice a year.

AGL are proposing to develop and introduce a more rigorous monitoring regime for evaporation ponds and will include the following:

-
- Daily visual assessment of evaporation ponds for visible oil and grease and gross pollutants;
 - Daily record of water volumes entering the pond;
 - Daily assessment of storage levels;
 - Fortnightly in-situ water sampling;
 - Monthly detailed water quality analysis;
 - Quarterly inspections of pond walls for seepage, leaks or potential failure;
 - Annual hazard and integrity assessment;
 - Maintenance checks at intervals specified by manufacturer guidelines for transfer pumps and any water dosing equipment; and
 - Any recommendations made by the suitably qualified engineer as an outcome of the dam hazard and dam integrity assessments will be implemented.

A groundwater monitoring network will also be installed at the Silver Springs evaporation ponds to assist in the detection of any contaminants seeping through pond liners. Baseline groundwater quality data will be obtained prior to sampling monitoring bores around the ponds.

Groundwater monitoring will be conducted monthly for the first 12 months post installation of the monitoring bores, and quarterly thereafter for the following water quality characteristics:

- Electrical Conductivity;
- pH;
- Total Oil and Grease;
- Major Cations and Anions; and
- Any other requirement for groundwater monitoring as required by the conditions of the environmental authority.

All sampling and analysis of waters will be conducted by a suitably qualified person and NATA accredited laboratories. In the event that monitoring detects issues associated with the operation of the existing ponds, appropriate remedial measures will be implemented immediately to ensure that compliance with the EA conditions and the EP act is achieved and maintained.

In an effort to improve water quality in the interceptor pond and evaporation ponds, AGL will undertake an operability assessment of all oily water treatment systems to reduce the risk of gross oil contamination carrying over from the oily water interceptors to the final evaporation pond. Where engineering solutions are practicable, these will be implemented to improve oily water treatment and consequently water quality, thereby reducing environmental contamination risks.

AGL will develop a pond operations manual/procedure that prescribes the required monitoring / assessments, identifies the time intervals by which these must be conducted and will also detail appropriate emergency response measures in case of dam failure. A regulated dam register will also be developed and maintained after the completion of the hazard assessments in accordance with conditions of the environmental authority.

This OEMP will be updated to reflect any changes in the management of produced waters.

6.13.1.1 Future management of produced water

As discussed in Section 2.8.4, AGL recognise that evaporation as a primary means of disposal of produced water is no longer a preferred practice. Consequently, AGL is investigating water disposal / management alternatives and will develop a detailed Water Management Plan that conforms to the requirements of the new DERM CSG Water Management Policy (where it can be appropriately applied to conventional activities) and the EP Act. This plan will detail the long term management of waters produced on PL 446, including waters generated from the gas withdrawal stage of the gas storage project. The plan will consider management options in line with the hierarchy of preferred options stipulated in the CSG water management guidelines.

Alternative options for produced water disposal currently being investigated include (but are not limited to):

- The injection of produced waters to an aquifer of similar or lesser water quality;
- Opportunities for the beneficial re-use of produced waters; and
- Water treatment technologies if produced waters are required to be treated prior to re-injection or re-use.

Similarly, if it is determined that additional storages will be required to aggregate produced water, AGL will commit to:

- Reviewing the suitability of existing storages on PL 446 and consider options to upgrade them to better reflect the higher construction standards prescribed by DERM (namely investigate the feasibility of lining the floor and sides of the storage with HDPE to provide an additional measure to prevent seepage into the surrounding environment); and
- Constructing any new water storage in accordance with the new standards for CSG water aggregation dams and as per any requirements stipulated in the environmental authority.

The Water Management Plan will be developed over the next 18 months. At this time, the feasibility of the above options will have been investigated in full, and the final water management strategy will be presented in the plan, ready for implementation at the time that water begins to be produced from the gas storage facility in approximately three years. DERM will be fully consulted at the time that the water Management Plan is finalised.

Table 34: Waste Management

Related Documents: Waste Management Procedure (HSE-09_2); Operation of SSP Refuse Pit (HSE-12_4); Operation and Management of Landfarm (HSE-07_4), *Environmental Protection (Waste Management) Policy 2000*; *Environmental Protection (Water) Policy 2009*; CSG Water Management Policy, DERM Manual for assessing Hazard Categories and Hydraulic Performance of Dams.

Targets and Objectives of Management

- Implement recycling and reuse to minimise the amount of waste generated to maximise the efficiency of resource use.
- No complaints relating to the visual effects of waste produced during operation.
- No inappropriate disposal or management of waste.
- Appropriate record of regulated waste disposal.
- No uncontrolled release of water from evaporation ponds or interceptor ponds.
- No seepage or leakage from evaporation ponds.
- No contamination of evaporation ponds with oil / emulsions.

Environmental Aspects	Potential Impacts	Mitigation	Responsibility
<ul style="list-style-type: none"> ▪ Storage and disposal of wastes generated by the operational activities including the maintenance of plant and general accommodation activities. ▪ Disposal of produced waters 	<ul style="list-style-type: none"> ▪ Contamination of land, soil and water, including groundwater; 	Adopt the principles of 'Reduce, Reuse, Recycle' in all operations.	All
		All work areas will be maintained in a neat and orderly manner and free of litter and general waste (such as lunch wrappers).	Field Supervisor
	<ul style="list-style-type: none"> ▪ Health risks to the community and the workforce; 	Refuse containers with lids will be located at each worksite to prevent access by fauna, the spread of rubbish by wind and escape of odour.	Field Supervisor
		All food wastes will be collected for disposal at the Silver Springs refuse pit, taking into account health and hygiene issues, and potential odour nuisance.	Field Supervisor
	<ul style="list-style-type: none"> ▪ Nuisance to sensitive receptors from odour; 	The Silver Springs refuse pit will be appropriately managed to control odour, pests, disease and health related impacts to landholders, members of the public and workers.	Field Supervisor
		All other litter and general waste disposal will be at a licensed disposal facility. Where waste contractors are used they will be appropriately licenced.	Field Supervisor
	<ul style="list-style-type: none"> ▪ Adverse effects on native vegetation and wildlife; and ▪ Reduction of visual amenity. 	Reusable and recyclable wastes will be stockpiled, salvaged and removed off-site.	Field Supervisor
		Spills of dangerous goods will be rendered harmless and collected for treatment and disposal at a designated site, including cleaning materials, absorbents and contaminated soils.	Field Supervisor Environment Manager

Table 34: Waste Management

	Hydrocarbon contaminated soils may be transported to the Silver Springs Land farm for treatment if on-site treatment is not viable.	Production Manager Environment Manager
	Small quantities (<250 kg) of contaminated soil may be transported to licensed facilities for disposal.	Field Supervisor
	Licensed waste transport and/or disposal permits for all contaminated materials (>250 kg) will be undertaken in consultation with the DERM.	Environment Manager
	Regulated wastes will be collected and removed from site (via a licensed waste contractor) to a facility licensed to accept such wastes.	Production Manager
	Waste tracking records will be maintained for the movement of regulated wastes.	Environment Manager Production Manager
	Low toxicity water based drilling muds and cuttings, may be dried in a fenced mud pit and used for rehabilitation.	Drilling and Completions Manager Environment Manager
	Dispose of sewage in approved septic or portable systems that are installed, maintained and operated in a proper and efficient manner.	Production Manager Environment Manager
	Waste oil and chemical storage areas will be suitably bunded in accordance with DERM requirements and will be stored and handled in accordance with the relevant Australian Standards (e.g. AS 1940) and Fire Safety regulations.	Environment Manager Health & Safety Manager
	All produced waters will be directed to an appropriate evaporation pond for disposal.	Production Manager Environment Manager
	Ponds	
	All ponds must be fenced to exclude stock and medium – large native animals.	Production Manager Field Supervisor
	Unauthorised activity on the pond and bund walls that has the potential to impact on their integrity must be prevented at all times.	Field Supervisor
	All oil skimmed from interceptor ponds must be disposed of to the waste oil tanks.	Field Supervisor Environment Manager
	Monitoring (current)	

Table 34: Waste Management

	All ponds are visually monitored daily for storage levels, capacity, oil contamination, and pond wall integrity.	Field Supervisor Environment Manager
	Seepage detection inspections are carried out every 6 months on all ponds.	Production Manager Environment Manager
Within 6 months of the date of issue of the environmental authority:		
	A hazard and integrity assessment will be undertaken by a suitably qualified and experienced engineer to ensure that dams are fit for purpose and do not pose a significant risk of environmental harm. High and significant hazard regulated dams will be certified and the certification lodged with DERM.	Production Manager Environment Manager
	An assessment of the hydraulic and structural integrity of the existing ponds will be conducted.	Production Manager Environment Manager
	A regulated dam register will be developed in accordance with the conditions of the environmental authority.	
	Recommendations made by the suitably qualified engineer as an outcome of the dam hazard and dam integrity assessment will be implemented.	Production Manager Environment Manager
	A pond operations manual will be developed and implemented.	Production Manager Environment Manager
	A new monitoring regime for the existing ponds will be implemented including: <ul style="list-style-type: none"> ▪ Daily visual assessment of evaporation ponds for visible oil and grease and gross pollutants; ▪ Daily record of water volumes entering the pond; ▪ Daily assessment of storage levels; ▪ Monthly in-situ water sampling; ▪ Quarterly detailed water quality analysis; ▪ Quarterly inspections of pond bunds for seepage, leaks or potential failure; ▪ Annual hazard and integrity assessment; 	Environment Manager Production Manager

Table 34: Waste Management

	<ul style="list-style-type: none"> ▪ Maintenance checks at intervals specified by manufacturer guidelines for transfer pumps and any water dosing equipment ▪ Any recommendations made by the suitably qualified engineer as an outcome of the dam hazard and dam integrity assessment will be implemented. ▪ Monthly groundwater monitoring for the first 12 months and quarterly thereafter. 	
	All water samples will be analysed by NATA accredited laboratories.	Environment Manager
Within 18 months of the date of issue of the environmental authority:		
	A water management plan will be developed identifying alternative water management strategies to be implemented.	Environment Manager Production Manager
New Ponds		
	Any new regulated dam will be designed, constructed and certified by a suitably qualified engineer and will adhere to DERM's dam construction requirements.	Land and Approvals Manager Production Manager Environment Manager

6.14 Spill Prevention and Response

The potential for spills is inherent in a number of production related activities including:

- Refueling and fuel storage;
- Storage and handling of chemicals;
- Operation and maintenance of machinery;
- Flowline ruptures;
- Oily water treatment systems; and
- Pond overflow or leaks.

In recognition of this, standard operating procedures and maintenance and monitoring regimes for activities are in place to reduce the potential for a spill event.

Any fuels or chemical storage facilities are be managed in accordance with Section 6.15. The key issues associated with spills are:

- Safety hazards to the workforce and the public;
- Contamination of soil and water, including groundwater; and
- Direct and indirect impacts to vegetation, fauna and fauna habitat.

A land farm is operated at Silver Springs to treat hydrocarbon contaminated soils and sludges produced on PL 446 as described in Section 2.11. The key impacts associated with the operation of this plant are:

- Uncontrolled contamination of soils;
- Contamination of groundwater; and
- Contamination of stormwater and potential associated run-off impacts.

Table 35 summarises the key strategies used to reduce the potential for spills during the operation of PL 446 and the potential impacts from the land farm. The risk rating identified for the impacts associated with the landfarm is low.

Table 35: Spill Prevention and Response**Related Documents:** Handling of Minor Oil Spill (HSE-10_2); Emergency Response Plan; AGL Incident Notification Procedure (HSE_02-1)**Targets and Objectives of Management**

- No contamination of water, flora or fauna resulting from spills.
- No significant contamination of soils.
- All minor leaks / spills are remediated appropriately.
- No safety hazards caused by spills and inadequate spill response procedures.

Environmental Aspects	Potential Impacts	Mitigation	Responsibility
Spill of contaminants such as chemicals or fuels resulting from PL 446 activities including: <ul style="list-style-type: none"> ▪ Refuelling; ▪ Storage and handling of chemicals and produced water; and ▪ Operation of facilities and flowlines. 	<ul style="list-style-type: none"> ▪ Safety hazards to the workforce and the public; ▪ Contamination of soil and water, including groundwater; and ▪ Direct and indirect impacts to vegetation, fauna and fauna habitat. 	Minimise volumes of liquids required for all maintenance activities, wherever practicable.	Production Manager
		Train all personnel on spill response and recovery procedures. Maintain records of training.	Health & Safety Manager Environment Manager
		Carry out routine inspections to identify the likelihood of a spill event.	Field Supervisor Health & Safety Manager
		Routinely traverse all operational flowline easements, well heads and ponds to identify any oil or water leaks.	Field Supervisor
		Conduct spill response exercises to ensure spill response procedures are effective.	Production Manager
		Keep spill kits on hand and train personnel in their use during all refuelling activities or the handling of any chemicals, fuels, oils and lubricants. Keep records of spill response training.	Health & Safety Manager Production Manager
		Keep Material Safety Data Sheets (MSDS) with chemicals currently in use, at all times.	Health & Safety Manager
		Respond to any spill that occurs in accordance with relevant spill response and health and safety procedures; as described in the MSDS and/or product label for the spilled substance. Ensure appropriate PPE as described in the MSDS and/or product label for the spilled substance is worn.	Production Manager Health & Safety Manager
		Consider all spills of fuels, oils, lubricants and chemicals as environmental incidents, which require classification, reporting and investigation in accordance with the AGL Incident Notification,	Production Manager

Table 35: Spill Prevention and Response

		Procedure and the Environmental Authority conditions.	
		Contain and remove material contaminated as a result of a spill and place in an appropriate container to prevent further contamination. Dispose appropriately in line with local government requirements.	Field Supervisor Environment Manager
		Comply with management measures in Section 6.15 – fuel and chemical storage.	Production Manager Field Supervisor Health & Safety Manager
		Operate flowlines in accordance with relevant engineering standards to minimise the risk of failure.	Production Manager
		Comply with monitoring and management requirements in Section 6.13 for produced water and ponds.	Production Manager Environment Manager Field Supervisor
		Comply with facilities management measures in Section 6.12.	Production Manager Field Supervisor
<ul style="list-style-type: none"> ▪ Operation of land farm 	<ul style="list-style-type: none"> ▪ Uncontrolled contamination of soils; ▪ Contamination of groundwater; and ▪ Contamination of stormwater and potential associated run-off impacts. 	Regularly inspect the land farm perimeter to ensure there is no spillage of contaminated soils outside the bunded area.	Field Supervisor Environment Manager
		Regularly inspect the bunding to ensure there is no evidence of hydrocarbon staining due to leakage from the land farm.	Field Supervisor Environment Manager
		During heavy rainfall ensure that captured stormwater cannot escape the bunded area. If required, divert contaminated stormwater to the interceptor pits or evaporation ponds.	Field Supervisor Environment Manager
		Undertake soil sampling every six months in accordance with AS4482 (Section 2.11.2).	Field Supervisor Environment Manager
		Maintain a record of waste types, volumes, monitoring, remediation management strategies and inputs for the landfarm.	Production Manager Environment Manager

6.15 Fuel and Chemical Storage

PL 446 has multiple fuel and chemical storages on site. The principal fuels / chemicals stored on PL446 are oil / condensate and diesel. These storages are predominantly associated with the SSPP. Small amounts of other chemicals are stored at the SSP include weed control chemicals, general cleaning products, surfactants, solvents and lubricants. The quantities stored of these types of products can be up to 4000 L.

Fuel, oil and chemical storage may be required on-site during transient activities such as drilling, flowline construction and seismic surveys. In these situations, fuel and chemical storage areas are developed on a project by project basis.

Any other hazardous materials used on-site, such as explosives which may be used in seismic activities, will be handled, stored and transported in accordance with the relevant legislation, guidelines and manufacturer recommendations.

The key issues associated with fuel and chemical storage are:

- Contamination of soil and water including groundwater;
- Safety hazards to the workforce and the public; and
- Air and odour emissions.

Table 36 summarises the general storage procedures required for fuels and chemicals during the operation of PL 446. The identified risk associated with impacts from chemical and fuel storage is low.

Table 36: Fuel and Chemical Storage**Related Documents:** Handling of Minor Oil Spill (HSE-10_2); Fuelling Operations at SSP (HSE-OP-49_0)' MSDS; Australian Standards 1678, 2809, 2931 and 1940**Targets and Objectives of Management:**

- All fuels and chemicals stored appropriately to prevent contamination of soil and water and to avoid unacceptable safety hazards.

Environmental Aspects	Potential Impacts	Mitigation	Responsibility
Storage, use and handling of chemicals and fuels in the conduct of petroleum activities on PL 446.	<ul style="list-style-type: none"> Contamination of soil and water, including ground water. 	Bulk oil storages must be dipped daily to calculate storage capacity and avoid overfilling from excess production.	Field Supervisor
		Mobile tanks must be dipped prior to production into the tank.	Field Supervisor
	<ul style="list-style-type: none"> Air and odour emissions. 	Mobile tanks must be manually filled and drained and be empty prior to being moved to another location.	Field Supervisor
		A register of chemicals stored and their volumes shall be maintained.	Field Supervisor Health and Safety Manager
	<ul style="list-style-type: none"> Safety hazards to the workforce and the public. 	Chemicals, fuels and oils must be stored and handled in accordance with manufacturer's instruction, product Material Safety Data Sheets (MSDS) and all applicable legislation and standards.	Field Supervisor Health & Safety Manager
		MSDS must be kept at all storage locations.	Field Supervisor Health & Safety Manager
		Persons handling chemicals and fuels must wear appropriate PPE in accordance with MSDS, relevant legislations and standards.	Field Supervisor Health & Safety Manager
		Chemical use should be minimised where practicable.	Field Supervisor
		Fuels, lubricants and chemicals shall be stored and, where practicable, handled within containment facilities (e.g. bunded areas, leak proof trays, spill mats under couplings for refueling operations).	Field Supervisor Health & Safety Manager Environment Manager
		Fuels and chemicals must not be stored or handled near watercourses or water bodies.	Field Supervisor
Appropriate fuel and chemical handling procedures shall be adopted with the aim of avoiding spills to land or water.		Field Supervisor Health & Safety Manager Environment Manager	

Table 36: Fuel and Chemical Storage			
		Appropriate spill response equipment, including containment and recovery equipment, must be present at fuel and chemical storage locations.	Field Supervisor Health & Safety Manager Environment Manager
		Workforce training shall be conducted in fuel and chemical handling and spill response and recovery procedures.	Field Supervisor Health & Safety Manager

6.16 Decommissioning and Rehabilitation

Decommissioning and rehabilitation must be considered on an activity level and on a project level. Certain activities, such as drilling and seismic survey, are of a temporary nature and rehabilitation should be progressively undertaken after activities are complete. On a project level, infrastructure including buildings, ponds, production wells, access tracks, pipelines and certain facilities are in place for the duration of the project and rehabilitation and remediation will be the subject of considered specific rehabilitation plans at the relevant time of decommissioning. Certain types of infrastructure may be transferred to the landowner for their use, with the agreement of the landowner and the administering authority.

The following Sections are a brief overview of decommissioning and rehabilitation methods for ongoing production activities.

6.16.1 Drilling

For drilling activities well sites will be rehabilitated as follows; dependent on whether the well is to be completed as a production well or abandoned:

- The well is cased, plugged, marked and fenced in accordance with regulatory requirements;
- All surface structures, cellar framework, temporary storage buildings, unused chemicals, etc. Are removed (except those required for subsequent production);
- All rubbish is removed from the site and disposed of appropriately;
- All pits and cellars (if appropriate) are backfilled;
- Mud pits are fenced, awaiting backfilling when the drilling fluids are dry;
- The original contour and natural drainage is reinstated as far as practicable;
- Erosion control structures are installed on disturbed areas which may concentrate runoff;
- Appropriate reclamation measures are implemented (e.g. Respreading topsoil and vegetation, ripping of compacted areas) to ensure stability, encourage natural revegetation and prevent access to disturbed landscapes;
- Damaged fence lines or other property are repaired, temporary gates are removed; and
- Public access to the site is discouraged by using signs or other means.

6.16.2 Seismic

Seismic Survey Lines will be rehabilitated as follows:

- Remove all temporary survey markers, stakes, pinflags, flagging tape, etc;
- Remove all rubbish; and
- Back grade windrows and reinstate natural drainage as far as practicable.

In consultation with landowners, the following measures will also be undertaken:

- Install erosion control structures on disturbed areas and sensitive areas of slope, which may concentrate runoff;
- Implement appropriate reclamation measures (e.g. respread topsoil and vegetation) to ensure stability, encourage natural revegetation and prevent access to disturbed landscapes;
- Remove temporary gates and reinstate fences;
- Repair any damaged fence lines or other property; and
- Discourage public access to seismic lines and temporary access tracks by reinstating road verges, using signs or other means.

Shot holes, where utilised, will be:

- Backfilled and plugged where necessary;
- Made safe at all times;
- All detonator wire must be removed from the area; and
- Any holes that intersect non-artesian aquifers must be noted and reported; and appropriate action taken.

6.16.3 Flowline Corridors

Where relevant, upon completion of construction of flowlines:

- Remove all temporary survey markers, stakes, pinflags, flagging tape, etc;
- Remove all rubbish;
- Reinstate natural drainage as far as practicable;
- Install erosion control structures on disturbed areas and sensitive areas of slope, which may concentrate runoff;
- Implement appropriate reclamation measures (e.g. Respread topsoil and vegetation) to ensure stability, encourage natural revegetation and prevent access to disturbed landscapes;
- Clearly identify borrow pits left open for future work and rehabilitate other borrow pits;
- Repair any damaged fence lines or other property;
- Discourage public access by reinstating road verges, using signs or other means; and
- Install line-of-sight markers.

Generally, rehabilitation procedures will be initiated immediately after the area ceases to be required for construction or access purposes. The natural contours of disturbed ground within the right-of-way will be restored to allow normal surface drainage. Windrows or rills of material deposited during clear and grade operations will be respread across the right-of-way to prevent alterations to cross country drainage.

Areas which have been compacted by the passage of vehicles will be deep-ripped to depth of 300 mm or scarified as required. Topsoil with its contained seed load and root stock will be respread over the bared areas followed by respraying of previously cleared stockpiled vegetation (excluding weeds). Deep ripping in duplex soils will not be undertaken to avoid mixing topsoil and subsoil.

Contour Banks

In cultivated areas with contour banks or pondage banks, reinstatement of banks shall be undertaken immediately after the pipeline is laid. Replacement banks shall be at least 30% higher than existing contour banks to allow for settlement. Shallow ripping to a depth of 200 mm will ensure bonding of the bank to soil.

Diversion Banks

Diversion banks or “whoa boys” shall be formed across the entire width of the disturbed working area where slope exceeds 2%. Banks shall direct surface water away from the backfilled trench, and in the case of lines perpendicular to contours, shall direct water alternately to each side. Banks shall be a minimum of 450 mm high and 1 m wide, extending at least 2m to the side of disturbed land, to form a drain sloping at approximately 1 in 100, and shall be constructed at intervals of 70 m (2% slope), 40 m (5%), 25 m (10%) etc.

In areas with erosion-prone subsoil, banks shall be pushed from the lower side or constructed using imported material to prevent exposing the subsoil.

Developed Areas

Areas within 100 m of any residence shall be rehabilitated by seeding with grass species as appropriate, generally in consultation with the appropriate landowner.

Stream and River Crossings

In addition to surface drains and contour banks, brush matting and timber shall be laid to form a complete cover over topsoil parallel to the contour or stream banks if required. Rehabilitation of bank and channel profiles should replicate original contours to reduce erosion potential.

An erosion control bank shall be placed at the top of all banks of streams, rivers and watercourses. Attention will also be given to maintenance of bank and channel profiles as part of the erosion prevention program. Where the stream crossing unavoidably coincides with known stock watering or crossing points, the area will be fenced and an alternative stock access route provided, after consultation with the landholder.

Change of Slope

Where the right-of-way intersects the toe of slopes in duplex soils or other erosion-prone change of slope, earth banks will be formed above the disturbance to prevent run-on, and action taken to spread and direct run-off to less susceptible areas.

Gullies

Where the pipeline crosses gullies or eroding areas, site-specific rehabilitation measures will be developed. These may include:

- backfilling with more stable material;
- spreading of new topsoil;
- seeding or spreading clumps of vegetated soil
- brush matting or erosion fabrics
- fencing.

6.16.4 Access Tracks

Temporary tracks will be deep-ripped to 500 mm depth, spread with topsoil and mulched immediately following cessation of use, and will be restored to ensure free surface drainage. Any existing roads used by machinery will be repaired as necessary to original condition.

6.16.5 Campsites

Campsites, whether established for drilling, seismic or pipeline activities, will in general be rehabilitated as follows:

- Rubbish and sewage pits, drains, etc. Are backfilled so as to restore as nearly as practicable the original contours and to prevent contamination of the surface;
- All rubbish or discarded equipment, etc. Is removed from site;
- Topsoil and vegetation is respread (where this has been disturbed) to promote restoration; and
- Compaction is relieved to facilitate infiltration and revegetation.

For the permanent camp facilities at Silver Springs specific detailed plans will be prepared prior to rehabilitation and remediation at project close.

6.16.6 Dams

Dams will be subject to site specific rehabilitation plans that will be developed in accordance with the relevant regulations, industry standards and best environmental practices, at the time the dam is required to be decommissioned. Decommissioning will be completed in full consultation with DERM.

6.16.7 Processing Plants

- All aboveground infrastructure associated with the processing plants will be dismantled and removed;
- Concrete slabs and hardstand areas will be removed;
- Pits, drains and other unnatural alteration to the contours of the land will be backfilled and re-contoured;

-
- Ponds, landfills and landfarms will be decommissioned in full consultation with regulatory authorities;
 - All rubbish, discarded equipment and regulated wastes will be removed from site;
 - A contaminated land survey will be completed;
 - Compaction of disturbed areas will be relieved by ripping to facilitate infiltration and re-vegetation;
and
 - Stockpiled topsoil will be re-spread and the area seeded and planted out with native vegetation to promote restoration.

7.0 Measurement and Evaluation

7.1 Environmental Audits

A regular program of audit and review for activities such as plants, evaporation ponds and well sites has been implemented. Audits will also be undertaken at drilling and seismic sites during the relevant activity. The Environment Manager will be responsible for ensuring the audits / reviews are undertaken on schedule, and for ensuring that any identified corrective actions will be implemented.

Actions arising from audits are to be documented and reported to the appropriate Health, Safety and Environment Committee (HSE). The HSE Committee shall be responsible for ensuring any actions are implemented.

Table 37 outlines the audit types, the frequency of audits and the composition of the audit team. Additional on-site inspections or investigations will be undertaken in the event of significant environmental incidents. The Environment Manager will be responsible for regular review of the environmental performance of each site and of site personnel.

Table 37: Audit Types and Frequency

Audit Type	Frequency	Audit Objective	Audit Team
Well site environmental audit	Annually	<ul style="list-style-type: none"> ▪ To assess environmental awareness and adequacy of environmental controls ▪ To identify areas of potential environmental exposure ▪ To assess operations against conditions set by the regulators and commitments by AGL ▪ To assess the adequacy of the site environmental management plan 	<ul style="list-style-type: none"> ▪ Field Supervisor and other site personnel as required ▪ May also include a Specialist Consultant
Production facilities (plants) environmental audit	Semi-annually	<ul style="list-style-type: none"> ▪ To assess environmental awareness and the adequacy of environmental controls ▪ To identify areas of potential environmental exposure ▪ To assess operations against conditions set by regulators and commitments by AGL ▪ To assess the adequacy of site environmental management plan 	<ul style="list-style-type: none"> ▪ Field Supervisor and other site personnel as required. May also include a Specialist Consultant
Production facilities (evaporation ponds) environmental audit	Semi-annually	<ul style="list-style-type: none"> ▪ To assess environmental awareness and the adequacy of environmental controls ▪ To identify areas of potential environmental exposure ▪ To assess operations set by regulators and commitments by AGL ▪ To assess the adequacy of site environmental management plan 	<ul style="list-style-type: none"> ▪ Field Supervisor and other site personnel as required. May also include a Specialist Consultant
Review of performance	Annually	<ul style="list-style-type: none"> ▪ To review the performance of each Department against set business and environmental objectives, targets and reporting requirements 	<ul style="list-style-type: none"> ▪ The Department Manager will review the performance of operations and personnel with key environmental responsibilities

Audit Type	Frequency	Audit Objective	Audit Team
Inspections and investigations	As required following a significant environmental incident (e.g. a non-conformance, major spill, acute discharge)	<ul style="list-style-type: none"> To determine the cause of the incident and investigate measures to prevent recurrence of the incident or similar incidents 	<ul style="list-style-type: none"> Silver Springs Field Supervisor and other site personnel as require Appropriate Department Manager Other personnel depending upon the nature of the incident
Drilling	During each drilling program	<ul style="list-style-type: none"> To assess environmental awareness and adequacy of environmental controls To identify areas of potential environmental exposure To assess operations against conditions set by the regulators and commitments by AGL To assess the adequacy of the site environmental management plan 	<ul style="list-style-type: none"> Department Manager Drilling and Completions Manger Other personnel as appropriate May include a Specialist Consultant
Seismic	During each seismic program	<ul style="list-style-type: none"> To assess environmental awareness and adequacy of environmental controls To identify areas of potential environmental exposure To assess operations against conditions set by the regulators and commitments by AGL To assess the adequacy of the site environmental management plan 	<ul style="list-style-type: none"> Department Manager Seismic supervisor Other personnel as appropriate May include a Specialist Consultant

7.2 Document Review

Regular reviews of policies and procedures are required to ensure the currency of the information and directions in these documents. Review dates should be shown on policies and procedures. Table 38 indicates the typical review periods for key management documents.

Table 38: Review Periods for Environmental Management Documents

Document	Review Period
Policies	Every two years
Operational Environmental Management Plan	Every two years or after the implementation of new infrastructure
Standard Operating Procedures	
<ul style="list-style-type: none"> New procedures 	After 6-12 months
<ul style="list-style-type: none"> Existing procedures (critical) 	Every two years
<ul style="list-style-type: none"> Existing procedures (other) 	Every three years

Critical procedures are defined by the Production Manager and would include procedures that involve safety controls and equipment critical to plant operation. The CEO is required to sign off all environmental policies.

7.3 Environmental Reporting Procedures

7.3.1 Statutory Environmental Reporting

Environmental reporting includes the statutory reporting requirements under the *Environmental Protection Act 1994* and the *Environmental Protection Regulation 2008*. This includes the National Pollutant Inventory which is implemented in Queensland under the *Environmental Protection Act 1994*. The act provides the legal framework for NPI reporting in Queensland and ensures compliance with the National Environment Protection (National Pollutant Inventory) Measure made under Section 14 of the Commonwealth *National Environment Protection Council Act 1994*. Reporting required under the EP Act will include:

- Annual Returns for the Environmental Authority;
- National Pollutant Inventory due 30 September each year;
- Final Rehabilitation Reports for any area relinquished in part or in part; and
- Specific monitoring or reporting as required by the conditions of the environmental authority.

7.3.2 Incident Reporting

7.3.2.1 Statutory Environmental Incident Reporting

Accidental and/or unauthorised discharges to the environment, such as spills to soil or water, will be reported to the relevant authority according to the regulations and environmental authority conditions current at the time of the incident. Any incident which demonstrates non-compliance with EA conditions should be reported to the Department of Environment and Resource Management (DERM) as soon as practicable, but within 24 hours, via the DERM Pollution Hotline 1300 130 372.

Details of the incident and any future actions must also be provided to DERM in writing, within 10 days of the of the initial incident notification. The appropriate Department Manager (Production / Exploration / Drilling) is responsible for ensuring notification is carried out as required. .

In addition to the reporting obligations under the *Environmental Protection Act 1994*, some environmental incidents may also be Prescribed Incidents as defined in Schedule 2 of the *Petroleum and Gas (Production and Safety) Regulation 2004* which require reporting in accordance with Section 11 of the *Petroleum and Gas (Production and Safety) Regulation 2004*. The safety provisions of the new petroleum legislation apply to all petroleum tenures, including those still administered under the amended *Petroleum Act 1923*.

All environmental incidents during production operations are to be reported to the Silver Springs Field Supervisor, who will then report to the Environment Manager and the HSE Committee. All environmental incidents during exploration and drilling are to be reported to the appropriate field supervisor, who will then report to the appropriate Manager and the HSE committee. All incidents will be investigated and actions taken to ensure similar events are avoided. This is the responsibility of the appropriate HSE Committee Chairman.

Reference should always be made to the current legislation and specific licences and permits for specific reporting requirements. Information and records concerning environmental incidents will be made available to regulatory authorities upon request.

7.3.2.2 AGL Incident Reporting

AGL's Incident Management Procedure (LG-HSE-008) outlines the method of reporting incidents and Near Misses in the workplace. The procedure also classifies up to nine different types of incidents and specifies what actions are necessary in the event of each incident type occurring including when to carry out an investigation. The procedure applies to all AGL employees, contractors and site visitors.

Incidents that result in an alternate duties injury or lost time injury shall be reported immediately to the Production Manager by the Site Supervisor for action and investigation. All incidents involving AGL employees, contractors and site visitors shall be reported to the Site Supervisor as soon as possible.

All incidents shall be investigated in accordance with the internal AGL guidelines. Any investigation must aim to determine what critical root causes resulted in the incident so that appropriate measures can be implemented to prevent a similar incident occurring.

7.4 Complaints Management

Complaints registers will be maintained in accordance with the conditions of the environmental authority and be retained for five years. The complaints register will be the responsibility of the Land and Approvals Manager.

All complaints from landowners, local authorities and the general public in relation to the activities on PL 446 will be recorded. The register will be made available to the regulatory authorities upon request. Actions taken with respect to complaints will be noted and the complainant advised of the outcome. Follow up is the responsibility of the appropriate Departmental Manager. Should the complaint necessitate a review of procedures, this will be instigated through the HSE Committee.

7.5 Stakeholder Management

AGL recognise that initial and ongoing stakeholder engagement and management is critical to a successful operation. Consultation is an ongoing process and needs to ensure that local knowledge and expertise are utilised appropriately.

The relevant Land and Approvals Manager will ensure that liaison with landowners is maintained as activities occur on their property, to ensure that access requirements, scheduling of tasks and rehabilitation activities are managed in a way to minimise disruption to landowner activities. Appropriate documentation that must be utilised by AGL when engaging in stakeholder management includes, but is not limited to:

- Entry Notice pursuant to Section 78M of the *Petroleum Act 1923*;
- Further notification pursuant to Section 78T of the *Petroleum Act 1923*;
- Periodic notice after entry of land pursuant to Section 78V of the *Petroleum Act 1923*;

- Compensation agreement (and if appropriate deferral agreement, Section 79U) in accordance with Section 79P of the *Petroleum Act 1923* and record of payment or fulfillment of compensation liabilities; and
- Landowner signoff on completed rehabilitation in accordance with DERM requirements for environmental authority surrender processes.

8.0 Key Contacts

8.1 Emergency Services

Position Title	Phone Numbers
Emergency	000
Queensland Fire & Rescue Service	000
Air Traffic Control	13 17 57
Queensland Workplace Health & Safety (QWHS)	07 3896 3363 (accident notification) or 1300 369 915
Department of Environment and Resource Management (DERM)	1 300 130 372 (Incident Number)
Electrical Safety Office (ESO)	07 3235 4596 or 1300 650 662

8.2 State Government Departments

Position Title	Phone Numbers
Department of Emergency Services (DES)	07 3247 8821
Department of Employment, Economic Development and innovation (DEEDI)	Petroleum and Gas Inspectorate: 07 32371626 General Enquiries:1800 657 567
Department of Primary Industry (DPI)	13 25 23
Animal and Plant Health Service (APHS)	13 25 23
QLD Parks and Wildlife	07 3227 8185
Department of Environment and Resource Management (DERM)	General Enquiries: 1 300 130 372

9.0 References

AGL (2004) *Life Guard System Overview*

AGL (2010) *Petroleum Lease 16: Later Development Plan (1 December 2010 – 30 November 2015)*

APIA (2009) Australian Pipeline Industry Association *Code of Environmental Practice – Onshore Pipelines*

APPEA (2008) Australian Petroleum Production and Exploration Association *Code of Environmental Practice*

Beck, JM (2002) *An Environmental Management Plan also containing an Integrated Environmental Management System for Mosaic Oil Operations in the Surat Basin*

DERM (2004) *Planning for Noise Control Guideline*

DERM (2009) Department of Environment and Resource Management *Regional Ecosystem Extract: Digital Data Version 6.0*

DERM (2010a) *Wildlife Online Extract (Database)* accessed online at:
http://www.derm.qld.gov.au/wildlife-ecosystems/wildlife/wildlife_online/ Accessed on 8 November 2010

DERM (2010b) *Environmentally Sensitive Areas Mapping* accessed online at:
http://www.derm.qld.gov.au/ecoaccess/maps_of_environmentally_sensitive_areas.php Accessed on 26 October 2010

DERM (2010c) Regional Ecosystems http://www.derm.qld.gov.au/wildlife-ecosystems/biodiversity/regional_ecosystems Accessed in November 2010

DERM (2010d) *Queensland Heritage Register* accessed online at:
http://www.derm.qld.gov.au/heritage/registers_and_inventories/queensland_heritage_register.html, cited November 2010

DEWHA (2008a) *Weeping Myall Woodlands – Species Profile and Threats Database*. Accessed online at:
<http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=98>. Accessed in November 2010.

DEWHA (2008b) *Acacia Wardellii - Species Profile and Threats Database*. Accessed online at:
http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=3916. Accessed in November 2010.

DEWHA (2010) *EPBC Act Protected Matters Search Tool* accessed online at:
<http://www.environment.gov.au/erin/ert/epbc/index.html> Accessed on 8 November 2010

DPI and DHLGP (1993) Department of Primary Industries and Department of Housing, Local Government and Planning: *Planning Guidelines for the Identification of Good Quality Agricultural Land*

IECA (2008) International Erosion Control Association Australasia: *Best Practice Erosion and Sediment Control – Guidelines*

Katestone (2010) Silver Springs Gas Storage Facility – Air Quality Impact Assessment. Prepared December 2010

Milligan M (2004) *What are seismic surveys and how much “shaking” do they create?* *Survey Notes*, v.36 no. 3. Accessed at <http://geology.utah.gov/surveynotes/gladasked/gladseismicsurveys.htm>. Accessed on 10 November 2010

NRIC (1991) National Resource Information Centre Bureau of Rural Science *Digital Atlas of Australian Soils*, Digital Data Set

RPS (2010) *Ecological Assessment Report – Silver Springs Underground Gas Storage Project*, Prepared November 2010

RLMS (2007) *Environmental Field Survey, Mosaic Oil Project Areas*

RLMS (2009a) Draft *Environmental Management Plan – Mosaic Oil NL – Production Tenures*, prepared September 2009

RLMS (2009b) Draft *Mosaic Oil NL Environmental Assessment, for Silver Springs-Waggamba, Churchie-Downlands and Fairymount*, prepared November 2009

Sattler and Williams (1999) (editors) *The Conservation Status of Queensland’s Bioregional Ecosystems*. Environmental Protection Agency, Brisbane.

Sonus (2010) *Silver Springs Underground Gas Storage Facility, Environmental Noise Assessment*

10.0 Abbreviations and Units

AES	Aggregate Environmental Score
AGL	AGL Gas Storage Pty Limited
APIA	Australian Pipeline Industry Association
APPEA	Australia Petroleum Production and Exploration Association
AS	Australian Standard
BIM	Block Identification Map
Bscf	Billion Standard Cubic Feet
CAMBA	China Australia Migratory Birds Agreement
CEO	Chief Executive Officer
CHMP	Cultural Heritage Management Plan
CO	Carbon Monoxide
DEEDI	Department of Employment, Economic Development and Innovation
DERM	Department of Environment and Resource Management (Queensland)
EA	Environmental Authority
EMP	Environmental Management Plan
EP	Equivalent Persons
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EP Act	<i>Environmental Protection Act 1994</i>
EPP Air	<i>Environmental Protection (Air) Policy 2008 (Queensland)</i>
EPP Waste	<i>Environmental Protection (Waste Management) Policy 2000 (Queensland)</i>
ERA	Environmentally Relevant Activity
ERP	Emergency Response Plan
ESA	Environmentally Sensitive Area
EVR	Endangered, Vulnerable, Rare
GQAL	Good Quality Agricultural Land
HDPE	High Density Polyethylene
HSE	Health, Safety & Environment Policy
JAMBA	Japan Australia Migratory Birds Agreement
LGA	Local Government Authority
ML	MegaLitres
MMscf	Million Standard Cubic Feet
MSDS	Material Data Safety Sheets
Mosaic	Mosaic Oil N.L.
NOx	Nitrous Oxides
NZS	New Zealand Standard
OEMP	Operational Environment Management Plan
PL	Petroleum Lease
RE	Regional Ecosystem (as defined under the Queensland <i>Vegetation Management Act 1998</i>)

ROW	Right-of-Way
RNE	Register of the National Estate
ROKAMBA	Republic of Korea Australia Migratory Birds Agreement
SCL	Strategic Cropping Land
SPA	<i>Sustainable Planning Act 2009</i>
SSP	Silver Springs Pipeline
SSPP	Silver Springs Processing Plant
TEG	Triethylene glycol
WONS	Weed of National Significance

Appendix I

Integrated Authority I50 I20 and PL 16





Integrated Authority No. 150,120
Sections 93 & 311 Environmental Protection Act 1994

This integrated authority to carry out one or more level 1 and level 2 environmentally relevant activities is issued in accordance with sections 93 & 311 of the *Environmental Protection Act 1994*.

Under the provisions of the *Environmental Protection Act 1994*, this licence is issued to:

Mosaic Oil N.L.
 3rd Floor
 6-8 Underwood Street
 SYDNEY 2000

Santos Ltd
 Santos House
 60 Edward Street
 BRISBANE QLD 4000

in respect of carrying out the following level 1 and level 2 environmentally relevant activities of Schedule 1 of the *Environmental Protection Regulation 1998*:

ERA	Description
11(a)	<u>Crude oil or petroleum product storing</u> – storing crude oil or petroleum product in tanks or containers having a combined total storage capacity of more than 10,000 L but less than 500,000 L. (Taylor)
11(b)	<u>Crude oil or petroleum product storing</u> – storing crude oil or petroleum product in tanks or containers having a combined total storage capacity of 500,000 L or more. (Silver Springs, Fairymount)
13(b)	<u>Fuel gas refining or processing</u> – refining or processing of fuel gas in works having a design production capacity at standard temperature and pressure of more than 200 000 000 cubic metres per year. (Taylor, Silver Springs, Downlands)
17	<u>Fuel burning</u> – any process involving the use of fuel burning equipment (including, for example, a standby power generator) that is capable of burning (whether alone or in total) 500 kg or more per hour. (Taylor, Silver Springs, Fairymount)
21C	<u>Exploring for or mining minerals</u> - exploring for or mining minerals under a prospecting petroleum permit, authority to prospect, petroleum lease or pipeline granted under the <i>Petroleum Act 1923</i> . (All PLs, ATPs and PPL)
75(b)(i)	<u>Waste disposal</u> – operating a facility for disposing of regulated waste (other than limited regulated waste) whether alone or in combination with any waste mentioned in paragraph (a), if the facility is designed to receive waste at the rate of less than 50 000 t per year. (Fairymount, Downlands)



- 75(b) (ii) Waste disposal – operating a facility for disposing of regulated waste (other than limited regulated waste) whether alone or in combination with any waste mentioned in paragraph (a), if the facility is designed to receive waste at the rate of 50 000 t or more but less than 100 000 tonnes per year per year.
(Taylor, Silver Springs)
- 85 Regulated waste treatment – facility for receiving and treating regulated waste to render it less or non-hazardous.
(Silver Springs, Fairymount)

on or in relation to the relevant petroleum tenement(s) identified below:

Relevant petroleum tenement(s)	Project (where applicable)	Location description
PL 119	Downlands	Surat Basin
PLs 15, 16, 48, 49, & 66	Taylor/Silver Springs	Surat Basin
PL 46	Fairymount	Surat Basin
PL 192 & 202	Various	Surat Basin
ATPs 471P, 244P & 709P	Various	Surat Basin
PPL 87	Churchie gas field to the Silver Springs-Wallumbilla main line	Surat Basin

This Integrated Authority is subject to the conditions set out in the attached schedules.

The anniversary date of this licence is 02 July.

This licence takes effect from 10 August 2004.

Signed

10-08-04

Date

Ms Sally McFadyen
REGIONAL EXTENSION SERVICE OFFICER
Delegate of Administering Authority
Environmental Protection Act 1994

Note: This environmental authority document is not proof of the current status of the environmental authority. The current status of the environmental authority may be ascertained by contacting the Administering Authority.

This environmental authority is subject to the condition that the holder carry out the above environmentally relevant activities in accordance with the conditions of the relevant pipeline licence(s) (PPL 87) and in compliance with the approved Environmental Management Plan (PPL 87 dated 5 July 2002), the document titled 'Environmental Management Plan also containing an Integrated Environmental Management System for Mosaic Oil Operations in the Surat Basin', 1998 APIA Code of Environmental Practice and the *Interim Policy - Environmental Management for Activities under Petroleum Tenures* (dated 4 September 1995).

Schedule of conditions

The aforementioned description of the ERA for which this authority is issued is simply a restatement of the activity in the legislation at the time of issuing of the authority. Where there is conflict between the above description of the ERA for which this authority is issued and the conditions as specified in this authority as to the scale, intensity or manner of carrying out of the ERA, then such conditions prevail to the extent of the inconsistency.

This licence incorporates the following schedules of conditions relevant to various issues:

- Schedule A - General conditions
- Schedule B - Air
- Schedule C - Water
- Schedule D - Stormwater management
- Schedule E - Land application
- Schedule F - Noise
- Schedule G - Waste management
- Schedule H - Self monitoring and reporting
- Schedule I - Definitions
- Schedule J - Site plans

Schedule A - General conditions

The following conditions are prescribed:

- (A1) Emissions that may cause material or serious environmental harm and not specifically authorised by this environmental authority must not be released beyond the boundary of the activity except where they are authorised under an environmental authority for the petroleum activity.
- (A2) Any record required to be kept by a condition of this environmental authority must be kept at the licensed place and be available for examination by an authorised person.
- (A3) Copies of any record required to be kept by a condition of this environmental authority must be provided to any authorised person or the Administering Authority on request.
- (A4) A copy of this environmental authority must be kept in a location readily accessible to personnel carrying out the activity.
- (A5) All complaints received by the holder of this environmental authority relating to operations at the licensed place must be recorded.
- (A6) As soon as practicable after becoming aware of any emergency or incident which results in emissions not in accordance with the conditions of this environmental authority, the holder of this environmental authority must notify the administering authority of the release by telephone or facsimile and in writing within 14 days following the initial notification.
- (A7) Where regulated waste is removed from within the boundary of the environmental authority (other than by a release as permitted under another schedule of this environmental authority), the holder of this environmental authority must monitor and record the following:
 - (a) the date, quantity and type of waste removed; and
 - (b) name of the waste transporter and/or disposal operator that removed the waste.
- (A8) The holder of this environmental authority must notify the regulatory authority at the above address, in writing, of any monitoring result which indicates an exceedance of any licence limit, within 28 days of completion of analysis.
- (A9) The holder will comply with the relevant control strategies and standards detailed in the current Environmental Management Plan/IEMS to manage environmental impacts caused by the undertaking of the Environmentally Relevant Activity authorised under this Integrated Authority.



- (A10) This Integrated Authority is granted on the condition that breach of the terms of this authority in respect of one Environmentally Relevant Activity at a location will not affect this authority in relation to any other ERA at the same or any other location.
- (A11) This Integrated Authority only permits the burning of diesel and gas fuel in fuel burning equipment.

END OF CONDITIONS FOR SCHEDULE A

Schedule B - Air

The following conditions are prescribed:

Nuisance

- (B1) The release of any dust, particulate, aerosol or odour resulting from the activity must not cause an environmental nuisance at any sensitive place.

END OF CONDITIONS FOR SCHEDULE B

Schedule C - Water

The following conditions are prescribed:

SCHEDULE C - WATER

- (C1) Water emissions that may cause material or serious environmental harm must not be released directly or indirectly from the boundary of this activity to any waters or the bed and banks of any waters or into the general environment beyond the boundary of this activity.
- (C2) No produced water shall be released into the environment.
- (C3) Evaporation ponds located in areas frequented by livestock shall be securely fenced.
- (C4) All determinations of the quality of water emissions to waters must be made in accordance with methods prescribed in the Environmental Protection Agency *Water Quality Sampling Manual*, current edition. Soil sampling must be in accordance with the *Guidelines for the Assessment of Contaminated Land in Queensland*, Environmental Protection Agency (current edition).
- (C5) All determinations of the quality of water emissions or receiving environment must be made by a person or body registered by the National Association of Testing Authorities (NATA) for the required determinations, with the exception of the determination of dissolved oxygen content.

Erosion Protection Measures and Sediment Controls

- (C6) Erosion protection measures and sediment control measures must be implemented and maintained to minimise erosion and the release of sediment from all disturbed areas.
- (C7) Prevent any build up of sediment in any stormwater drain.

END OF CONDITIONS FOR SCHEDULE C

Schedule D - Stormwater

The following conditions are prescribed:

- (D1) The holder must implement and maintain measures to minimise the likelihood of the release of contaminated stormwater from the place where the activities are carried out to any stormwater drain or any waters.
- (D2) The maintenance and cleaning of vehicles and any other equipment or plant must be carried out in areas from where the resultant contaminants are unlikely to be released into any waters, roadside gutter or stormwater drainage system.
- (D3) Any spillage of wastes, or contaminants that may cause environmental harm, must be effectively contained and/or cleaned up as quickly as practicable. Such spillage must not be cleaned up by hosing, or otherwise releasing such waste or contaminants to any stormwater drainage system, roadside gutter or waters.

END OF CONDITIONS FOR SCHEDULE D

Schedule E - Land

The following conditions are prescribed:

Preventing Contaminant Release to Land

- (E1) Contaminants must not be released to land.

Pond Conditions

- (E2) The evaporation pond used for the storage of contaminants must be constructed, installed and maintained:
 - so as to prevent any release of contaminants through the bed or banks of the pond to any waters (including ground water);
 - so that a freeboard of not less than 0.5 metres is maintained at all times; and
 - so as to ensure the stability of the ponds' construction.
- (E3) Suitable banks and/or diversion drains must be installed and maintained to exclude stormwater runoff from entering the evaporation pond or other structures used for the storage or treatment of contaminants or wastes.

Land Rehabilitation

- (E4) Rehabilitation of disturbed areas must take place progressively as works are staged and new areas are disturbed.

END OF CONDITIONS FOR SCHEDULE E

Schedule F - Noise

The following conditions are prescribed:

Noise Nuisance

- (F1) Noise from activities must not cause an environmental nuisance at any noise sensitive place.
- (F2) The method of measurement and reporting of noise levels must comply with the latest edition of the Environmental Protection Agency's Noise Measurement Manual.

END OF CONDITIONS FOR SCHEDULE F

Schedule G - Waste management

The following conditions are prescribed:

Waste Handling

- (G1) Any loss or spillage of regulated wastes must be cleaned up forthwith.
- (G2) Regulated waste must be handled and transferred in a proper and efficient manner to prevent any leakage or spillage of waste.
- (G3) All regulated waste removed from the site must be removed by a person who holds a current authority to transport such waste under the provisions of the *Environmental Protection Act 1994* and sent to a facility licensed to accept such waste.
- (G4) Except as otherwise provided by the conditions of this authority, all disposal of waste generated in carrying out the environmentally relevant activity must be to a proper and appropriate facility that accepts that waste.

END OF CONDITIONS FOR SCHEDULE G

Schedule H - Self monitoring and reporting

The following conditions are prescribed:

END OF CONDITIONS FOR SCHEDULE H

Schedule I - Definitions

Some of the words and phrases used throughout this licence are defined below:

Words and phrases used throughout this authority are defined below:

Where a definition for a term used in this authority is sought and the term is not defined within this authority the definitions provided in the *Environmental Protection Act 1994*, its regulations, and Environmental Protection Policies shall be used.

Word Definitions

"administering authority" means the Department of Natural Resources and Mines or its successor.

"annual return" means the return required by the annual notice (under section 316 of the *Environment Protection Act 1994*) for the section 86(2) licence that applies to the development approval.

"authorised place" means the place authorised under this authority for the carrying out of the specified environmentally relevant activities.

"authority" means level 1 licence (without development approval), or level 1 approval (without development approval), or level 2 approval (without development approval) under the *Environmental Protection Act 1994*.

"contaminant" can be —

- (a) a gas, liquid or solid; or



- (b) an odour; or
- (c) an organism (whether alive or dead), including a virus; or
- (d) energy, including noise, heat, radioactivity and electromagnetic radiation; or
- (e) a combination of contaminants.

"contaminated land" means land contaminated by a hazardous contaminant.

"dust sensitive place" means:

- a dwelling, mobile home or caravan park, residential marina or other residential place;
- a motel, hotel or hostel;
- a kindergarten, school, university or other educational institution;
- a medical centre or hospital;
- a protected area;
- a park or gardens;
- a place used as an office or for business or commercial purposes, and includes the curtilage of any such place.

"dwelling" means any of the following structures or vehicles that is principally used as a residence:

- a house, unit, motel, nursing home or other building or part of a building;
- a caravan, mobile home or other vehicle or structure on land;
- a water craft in a marina.

"land" in Schedule F of this authority means land excluding waters and the atmosphere.

"noise sensitive place" means:

- a dwelling, mobile home or caravan park, residential marina or other residential premises;
- or
- a motel, hotel or hostel; or
- a kindergarten, school, university or other educational institution; or
- a medical centre or hospital; or
- a protected area; or
- a park or gardens; or
- a place used as an office or for business or commercial purposes, and includes the curtilage of such place.

"noxious" means harmful or injurious to health or physical well being.

"nuisance sensitive place" includes:

- a dwelling, mobile home or caravan park, residential marina or other residential premises;
- a motel, hotel or hostel;
- a kindergarten, school, university or other educational institution;
- a medical centre or hospital;
- a protected area;
- a park or gardens; or
- a place used as an office or for business or commercial purposes, and includes the curtilage of any such place.

"odour sensitive place" has the same meaning as a "dust sensitive place".

"offensive" means causing offence or displeasure; is disagreeable to the sense; disgusting, nauseous or repulsive.



"regulated waste" means non-domestic waste mentioned in Schedule 7 of the Environmental Protection Regulation 1998 (whether or not it has been treated or immobilised), and includes:
for an element - any chemical compound containing the element; and
anything that has contained the waste.

"site" means the place to which this authority relates.

"waters" includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water natural or artificial watercourse, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater and any part thereof.

END OF CONDITIONS FOR SCHEDULE I

Schedule J - Site plans

END OF CONDITIONS FOR SCHEDULE J

END OF ENVIRONMENTAL AUTHORITY

1/801

STAMP DUTY EXEMPT

No. 16
Vol. 88
Fol. 73

QUEENSLAND

"THE PETROLEUM ACTS, 1923 TO 1962"

LEASE

ELIZABETH THE SECOND, by the Grace of God, ~~of the United Kingdom, Australia, and Her other Realms and Territories, Queen, Head of the Commonwealth, Defender of the Faith~~

TO ALL TO WHOM THESE PRESENTS SHALL COME, GREETING:

WHEREAS INTERNATIONAL OIL LIMITED

in Our State of Queensland, in pursuance of the provisions of "The Petroleum Acts, 1923 to 1962" (hereinafter referred to as "the said Acts"), is now entitled to a lease of the land described in the Schedule endorsed on these presents for the term of twenty-one (21) years from the Thirtieth day of April, 1977 (with the preferent right to renew the same for further periods of twenty-one (21) years as hereinafter provided) at the rent and upon the payment of royalty hereinafter mentioned and with, under and subject to the reservations and conditions hereinafter contained and the rights, powers, privileges, terms, conditions, provisions, exceptions, restrictions, reservations, and provisos in the said Acts or any Acts amending the same and in the Regulations made or to be made thereunder: Now know Ye that in consideration of the premises and of the payment previous to the issue hereof of the rent prescribed in accordance with the said Acts for the said land and of the rent and royalty hereby reserved, We, in pursuance of the said Acts do hereby for Us, Our Heirs and Successors, demise and lease unto the said INTERNATIONAL OIL LIMITED

(hereinafter with its successors in title designated "the lessee") and its lawful assigns all that parcel of land described in the Schedule endorsed on these presents (hereinafter referred to as "the demised land") to hold the same unto the lessee and its lawful assigns for and during the term of twenty-one (21) years, to be computed from the Thirtieth day of April, 1977 (with the preferent right to renew the same for further periods of twenty-one (21) years; subject however in the case of any and each renewal to the provisions in force at the date of such renewal relating to the amount and payment of royalties on petroleum and the amount and payment of rent with respect to the demised land) with the exclusive right to prospect for, mine, extract, recover, remove, and dispose of all petroleum in or under the demised land, with the right to construct and maintain thereon all works, buildings, plant, waterways (including any pipelines for conveying water), roads, pipeline, reservoirs, tanks, pumping stations, and other structures necessary to the full enjoyment thereof with, under and subject to the reservations hereinafter particularly mentioned and with, under and subject to the rights, powers, privileges, terms, conditions, provisions, exceptions, restrictions, reservations, and provisos referred to, contained or prescribed by the said Acts or any Acts amending the said Acts or any Regulations made or which may hereafter be made under the said Acts: Yielding and paying unto Us, Our Heirs and Successors on or before the twenty-ninth day of April, in each and every year during the said term the yearly rent or sum of three thousand six hundred and forty dollars (\$3,640) and also yielding and paying unto Us, Our Heirs and Successors a royalty computed at the rate of Ten per centum on the selling value of all crude oil, casinghead petroleum spirit, and natural gas produced under this lease, as prescribed by the said Acts: Provided that all such payments of rent and royalty shall be made to the warden of the nearest mining district unless the Minister for Mines and Main Roads or other Minister of the Crown for the time being charged with the administration of the said Acts (hereinafter referred to as "the Minister") otherwise directs and provided always—

- (i.) That the lessee shall work the demised land in accordance with recognised good oilfield practice as accepted in the United States of America and in compliance with the said Acts, unless exemption or partial exemption is granted in such manner as may be prescribed;
- (ii.) That the lessee shall comply with the provisions of the said Acts;
- (iii.) That the lessee shall use the demised land continuously and bona fide exclusively for the purpose for which it is demised and in accordance with the said Acts, unless prevented from so doing by circumstances beyond his power and control;

APR 1977

- (iv.) That the lessee shall not assign, transfer, sublet, mortgage, or make the subject of any trust the lease or the land or any part thereof otherwise than in accordance with the said Acts;
- (v.) That the lessee, if directed by the Minister not to dispose of any petroleum or petroleum products for use or consumption outside Australia, will not so dispose of any petroleum or petroleum products;
- (vi.) That in the event of any breach of any covenant or condition of this lease by the lessee and the failure of the lessee completely to remedy the same within three (3) months (or such further time as the Minister may in his discretion allow) after the Minister shall have given to the lessee notice in writing to make good the same then the Minister may forfeit this lease;
- (vii.) Notwithstanding anything to the contrary herein contained any fixtures, equipment, plant, and production facilities of any kind whatsoever which may be installed or erected by the lessee on the demised land may within a period of six (6) calendar months from the expiration of the term hereby granted or any extension or renewal thereof provided that the lessee shall have paid all rent and royalty payable hereunder and observed and performed all the covenants, agreements, and provisions herein contained and on its part to be observed and performed be taken down and removed from the demised land for the lessee's own benefit: Provided that any such fixtures, equipment, plant, and production facilities which shall not be so taken down and removed within such period of six (6) calendar months shall thereupon become and be the property of the Crown and no compensation or other moneys whatsoever shall be payable by the Crown to the lessee:

Provided always and We do hereby reserve unto Us, Our Heirs and Successors the power to authorise mining on the demised land for any purpose other than the production or obtaining of petroleum or petroleum products, but not such as to interfere with, encroach upon or endanger operations for producing or obtaining petroleum: And We do hereby also reserve unto Us, Our Heirs and Successors all gold and minerals (the term "Minerals" whenever referred to herein to have the same meaning as the meaning set against the term "mineral" in "37 ~~the Mining Act 1968-1976~~ ~~Mining on Private Land Act, 1909 to 1956,~~" save and except that mineral oil occurring in a free state and which may be obtained by drilling or wells and natural gas shall be deemed to be excluded from the said meaning) and all mines on and below the surface of the demised land: And We do hereby also reserve unto Us, Our Heirs and Successors and to such persons as shall from time to time be duly authorised by Us in that behalf during the term of this lease, the free right and privilege of access, including ingress, egress, and regress into, upon, over, and out of the demised land for the purpose of searching for or working gold and minerals or any of them or mines of gold and minerals or any of them in any part of the demised land but not such as to interfere with, encroach upon or endanger operations for producing or obtaining petroleum: And We do further reserve the right of any person duly authorised in that behalf by the Governor of Our said State in Council at all times to go upon the demised land or any part thereof for any purpose whatsoever or to make any survey inspection or examination of the same.

IN WITNESS WHEREOF We have caused this Our Lease to be Sealed with the Seal of Our said State.

~~Witness~~ *Our Trusty and Well-beloved His Excellency the Honourable*
 MOSTYH HANGER, *Knight Commander of the Most Excellent*
Order of the British Empire, Chief Justice of the State of Queens-
land and Administrator of the Government of the said State,

~~WITNESS~~ *Our Trusty and Well-beloved SIR HENRY ABEL SMITH,*
Colonel on the Retired List of Our Corps of Household
Cavalry, Knight Commander of Our Royal Victorian
Order, Companion of Our Distinguished Service Order,
Governor in and over Our State of Queensland and its
Dependencies, in the Commonwealth of Australia, at
Government House, Brisbane, in Queensland aforesaid,
 this *Twenty-first* day of *April*
 in the *Twenty-sixth* year of Our Reign
 and in the year of Our Lord One thousand nine hundred
 and *twenty-seven*

Mostyn Hanger

SCHEDULE

ROMA MINING DISTRICT

Area: 85 Sub-Blocks

(About 100 square miles)

That part of the State of Queensland within the Blocks and Sub-Blocks as set out hereunder and as defined and shown on Department of Mines Block Identification Map - Series B:-

BLOCK IDENTIFICATION MAP - SERIES B

CHARLEVILLE

Blocks	Sub-Blocks
2944	v, w, x, y.
3016	a, b, c, d, f, g, h, j, l, m, n, o, q, r, s, t, v, w, x, y.
3086	r, s, t, u, v, w, x, y, z.
3087	g, h, j, k, n, o, p, t, u, v, w, x, y, z.
3088	a, b, c, f, g, l, m.
3158	a, b, c, d, e, f, g, h, j, k, l, m, n, o, p, q, r, s, t, u, z.
3159	a, b, c, d, e, f, l, q, r, v.

ENDORSEMENTS

This is to certify that the transfer of
 WHOLE interest in the within lease
 from INTERNATIONAL OIL LIMITED
 to BRIDGE OIL LIMITED AND OFFSHORE OIL NL
 as Tenants in Common in equal shares.
 was approved by the Minister for Mines on
 the Twenty-first day of October 1977.

[Signature]
 for Under Secretary

Memorandum of Mortgage No. 3/1985 registered
 over the within written lease, at the Department
 of Mines, Brisbane, this Nineteenth day of
 November, 1985.
 Date of Minister's Approval: 17th August, 1985.

Mortgage No. 3/1985 called
18th August 1985
[Signature]
 for Director-General.

Memorandum of Mortgage No. 4/1987 registered over
 the within written lease, at the Department of Mines
 Brisbane, this 3rd February, 1987.

Date of Minister's Approval: 3rd February, 1987.
Mortgage No. 4/1987 called
18th September 1987
[Signature]
 for Director-General,
 Department of Mines.

Memorandum of Mortgage No. 3/1978
 registered over the within written Lease, at
 the Department of Mines, Brisbane, this
13th day of May, 1978.
 Date of Minister's Approval: 19th May, 1978.

Mortgage No. 3/1978 called
13-12-87
[Signature]
 for Under Secretary
 Department of Mines

Memorandum of Mortgage No. 2/1981 registered of
 the within written Lease, at the Department of
 Mines, Brisbane, this Fifteenth day of
 December, 1981.
 Date of Minister's approval: 11th December, 1981

Release 3-12-1987
Mortgage Cancelled 15-11-1985
[Signature]
 for Under Secretary
 Department of Mines
 BRISBANE

Mortgage No. 6/87
 Registered at the Warden's
 Office, Brisbane, this
 day of October, 1987.

Mortgage No. 6/87 called
18th September 1987
 for Director-General
 Department of Mines

Memorandum of Mortgage No. 9/1985, registered
 over the within written Lease, at the Department
 of Mines, Brisbane, this Thirtieth day of
 December, 1983.
 Date of Minister's Approval: 20th October, 1983.

Release 3-12-1987
Mortgage Cancelled 15-11-1985
[Signature]
 for Director-General

Memorandum of Mortgage No. 1/1985, registered
 over the within written lease, at the Department
 of Mines, Brisbane, this Fifteenth day of April,
 1985.
 Date of Minister's Approval: 5th February, 1985.

Mortgage No. 1/1985 called
16-11-87
[Signature]
 for Director-General.

This is to certify that PETROZ NL
 has been
 recorded as the holder of 50% interest
 of the within written lease the name of the
 Company Offshore Oil NL

 having been changed to PETROZ NL

 Date Recorded: 28th day of
July 19 87
[Signature] for Minister

Annexed to the Original Instrument of Lease of Petroleum Lease Number 16 for the purpose of recording memorials.

Dated at Brisbane this Nineteenth day of May, 1995.



for Director-General

This is to certify that **PARKER & PARSLEY AUSTRALASIA LIMITED** has been recorded as the holder of 50% interest of the within written lease the name of the Company Bridge Oil Limited having been changed to **PARKER & PARSLEY AUSTRALASIA LIMITED**.

Date Recorded: 23rd day of March, 1995.



for Minister

This is to certify that **PARKER & PARSLEY AUSTRALASIA PTY LIMITED** has been recorded as the holder of 50% interest of the within written lease the name of the Company Parker & Parsley Australasia Limited having been converted to **PARKER & PARSLEY AUSTRALASIA PTY LIMITED**.


Date Recorded: 18th day of January, 1996.



for Minister

This is to certify that **SANTOS (BOL) PTY LTD** has been recorded as the holder of 50% interest of the within written lease the name of the Company Parker & Parsley Australasia Pty Limited having been changed to **SANTOS (BOL) PTY LTD**.

Date Recorded: 4th day of December, 1997.



for Minister

Pursuant to the provisions of the Petroleum Act, 1923 and after consideration of the standard criteria set out under the Environmental Protection Act, 1994 the Honourable the Minister on the 4th day of February, 2000 renewed the within Lease for a term of Twenty-one years, commencing on the Thirtieth day of April, 1998 subject to the provisions of the Petroleum Act, 1923 and with an annual rental at the rate of \$20.00 dollars per square kilometre payable in advance.

Dated at Brisbane this 23rd day of February, 2000.



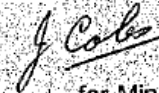
for Minister

This is to certify that the assignment of 50% interest in the within lease from Santos (BOL) Pty Ltd to **ANULKA N.L.** was approved on the 19th day of April, 2000.



for Minister

This is to certify that the assignment of 50% interest in the within lease from Petroz N.L to **ANULKA N.L.** was approved on the 16th day of May, 2000.



for Minister

This is to certify that **MOSAIC OIL QLD PTY LIMITED** has been recorded as the holder of 100% interest of the within lease the name of the Company Anulka N.L. having been changed and converted to **MOSAIC OIL QLD PTY LIMITED**.

Date Recorded: 10th day of July, 2000.



for Minister



Appendix 2

Environmental Management of Seismic Activities

(Modified from the document “Draft *Environmental Management Plan – Mosaic Oil NL – Production Tenures*,’ prepared by RLMS, September 2009)



I.0 Management Plan - Seismic Operations

I.1 Seismic Survey Planning

I.1.1 Regulations

Under the *Petroleum and Gas (Production and Safety) Act 2004* and the *Petroleum Act 1923* seismic acquisition is an authorised activity for Authorities to Prospect and Petroleum Leases.

The *Petroleum and Gas (Production and Safety) Regulation 2004* and the *Petroleum Regulation 2004* require that the following forms are lodged with Department of Employment, Economic Development and Innovation:

- Form PA 21A Notice of Intention to Carry Out Seismic Survey or Scientific or Technical Survey; and
- Form PA 22A Notice of Completion of Seismic Survey or Scientific or Technical Survey.

All notices and agreements relating to access to private land must be completed and be in place as per the Department of Employment, Economic Development and Innovation (DEEDI) Land Access Code, November 2010 and the P&G Act.

The use of a public road within the petroleum authority for transport relating to a seismic survey is a notifiable road use under the *Petroleum and Gas (Production and Safety) Act 2004*, and the holder must give 10 business days notice of the intended use, specifying the details in section 516 of the Act. The public road authority may give a road use direction which must pertain only to preserving the condition of the road or the safety of road-users or the public.

I.1.2 Contractors

Prior to the conduct of each seismic field program, a desk top risk assessment review, involving a team of AGL and contracting company representatives, is carried out to identify the key areas of safety and environmental risks. Once identified, the team assesses the magnitude and likelihood of each risk and devises a plan to mitigate the risk.

I.1.3 Landholder and Community Consultation

Consultation must be undertaken with land users (current landholders, traditional landowners and other affected parties) during the planning phase to exchange information and facilitate good working relationships. This process helps to:

- Identify and address potential concerns and conflicts of interest;
- Facilitate arrangements for the use and maintenance of infrastructure (e.g. water sources, roads, airstrips, fences, gates, etc.);
- Meet regulatory requirements for consultation and notification, particularly of landholders; and

- Conduct a cultural heritage survey and report on its findings. The parties involved in the survey are traditional landowner claimants who live locally and have an in-depth knowledge of the cultural significance of the area.

1.1.4 Environmental Awareness

Assessment of a proposed site should identify the following:

- The existing natural, cultural and social environment and its particular sensitivities. For example, land systems/units, heritage sites, seasonal values (animal breeding places, cropping and livestock issues), infrastructure (pipelines, cables, power lines etc);
- The potential impacts (i.e. disturbances, discharges, emissions, introduction and spread of weed species or diseases) which may occur (e.g. vegetation clearing, noise, campsite wastes, etc);
- The frequency, duration, nature and severity of environmental impacts likely to be caused by disturbances, discharges and emissions from the survey;
- Risks and appropriate measures to minimise those impacts;
- The significance of direct and indirect potential environmental impacts; and
- Measures to prevent or control potential environmental impacts.

1.1.5 Operating Procedures

Establish special operating procedures to protect sensitive areas. These may include:

- Cleaning of vehicles and equipment to prevent introduction of noxious weeds or pathogens. Certificates of cleaning (wash downs) are required from all vehicles involved in off-road driving that are brought into AGL field areas;
- Cables and geophones (e.g. across watercourses, steep slopes, etc.) are to be laid by hand thus obviating the need for prepared lines; and
- No drilling of shot holes within;
 - » 30 metres of water courses and dams,
 - » 20 metres of water tanks,
 - » 60 metres of residential structures,
 - » 30 m of oil/gas well & water bore, and
 - » 60 m of oil and gas pipelines.

1.1.6 Roads and Tracks

Environmental planning considerations regarding roads and tracks include:

- Using existing roads and tracks as far as practicable, thus minimising the operational footprint;

- Consult and agree with landholders and/or local authorities regarding use, maintenance and restoration of roads and tracks;
- Additional tracks, if required, should be placed so as to minimise environmental disturbance (i.e. avoiding slopes and watercourses);
- Consult with landholders and/or local authorities regarding establishment of new roads and tracks and rehabilitation of these after the survey is completed;
- Enforcing speed restrictions for project vehicles as appropriate to reduce potential impacts; and
- Prevent the use of roads by unauthorised third parties; and
- Prior to construction tracks should be designated as permanent or temporary in consultation with the landholder. Permanent tracks will be constructed, compacted and drained to ensure long-term stability.

1.1.7 Campsites

Generally, seismic crews do not require field camps, as accommodation is provided either in the town of Surat or at the Silver Springs camp. If a field camp is required, then environmental planning considerations regarding campsites include, wherever practicable, locating the camp:

- Away from major watercourses, lakes, dams or other surface water bodies and property infrastructure such as stock watering points or homesteads;
- Adjacent to existing access roads or tracks;
- In previously disturbed areas to avoid vegetation clearance and wildlife disturbance; and
- To minimise visual impact as far as practicable.

1.2 Survey Design

Survey design will be undertaken in consultation with the contracting company where appropriate. Incorporation of environment protection measures into seismic survey design is a necessary element of an overall environmental management program. Important environmental design considerations include:

1.2.1 Timing

Where possible, avoid seismic impacts during:

- Important agricultural or pastoral seasons
- Known significant wildlife breeding, migration or other natural cycles;
- Known wet seasons, bushfire seasons; and
- Other periods of significance to other resource users.

Also:

-
- Minimise the period of disruption in any one area by condensing field work in as short a timeframe as possible; and
 - Allow sufficient notification time for landholders and other resource users.

1.2.2 Grid layout

Where possible

- Align seismic lines to avoid sensitive areas such as Cultural heritage sites, large trees, shade areas provided by clumps of trees and large bushes, steep slopes, wildlife nesting sites, crops, water courses, dwellings, etc.

1.2.3 Use of Machinery

Where possible

- Consult landowners prior to commencing work, wherever possible;
- Disturbance due to vehicle access will be restricted to the greatest extent possible;
- Use line preparation equipment with minimum environmental impact such as rollers or slashers to establish a trafficable line while minimising the operational footprint;
- If available, use special vehicles such as wide tyred bikes or tracked vehicles, and minimise use of heavy earthmovers and bulldozers;
- Use GPS to accurately locate the positions of tracks and seismic lines, avoiding the need for clearance of line of sight; and
- Use appropriately credited personnel for seismic work.

1.2.4 Source

An approved and secure magazine area must be provided at a safe distance from occupied facilities when explosives are used as the seismic energy source. The actual storage must be provided using approved portable magazines.

1.3 Seismic Survey Operations

1.3.1 Crew Induction

An environmental and safety induction for all staff and contractors is conducted prior to commencement of the survey. Topics to be covered should include:

- Every person's general duty of environmental care in accordance with Section 319 of the *Environmental Protection Act 1994*;
- Regulatory requirements for the seismic survey;
- Environmental considerations and special procedures to be used for protection of the environment in the survey area;
- The environmental commitments made under the relevant Environmental Management Plan; and

- Safety and emergency response procedures with particular regard to safe use of vehicles, equipment and explosives and spills.

1.3.2 Wildlife and Domestic Animal Protection

Special procedures may be required to protect significant wildlife and domestic livestock. These may include:

- Stop work procedures if significant wildlife is encountered;
- Special source parameters to minimise impact, while maintaining data acquisition integrity;
- Spotting reports of significant wildlife and minimisation of operations during critical periods of migration and breeding;
- Negotiate with the landowner methods to protect domestic livestock; for example, move such animals to other areas during seismic operations; and
- As a courtesy, report distressed animals to the landowner as soon as possible.

1.3.3 Spill Prevention

Facilities and procedures to prevent spills must be in place during seismic survey operations including:

- Contained storage areas for oil and chemical packaging;
- Containment around oil- and chemical- use areas and equipment;
- Minimise volumes of liquids required wherever practicable;
- Train all personnel on spill response and recovery procedure;
- Conduct spill response exercises to ensure spill response procedures are effective;
- Keep spill kits on hand and ensure appropriate PPE as described in the MSDS and/or product label for the spilled substance is worn; and
- Safe fuel transfer procedures.

1.3.4 Land Management

Sound land management is an important consideration in the conduct of onshore seismic operations. Management considerations include:

- Use existing designated access roads, tracks and gates, and avoid detours and turning circles as much as practicable;
- Additional tracks, if required, should be placed so as to minimise environmental disturbance (i.e. avoiding slopes and watercourses);
- Controlling public access to the operations by measures such as physical barriers and signs;
- Minimise line width and surface disturbance (e.g. topsoil, seed and root stock) as far as practicable, topsoil may need to be stockpiled for subsequent rehabilitation;

-
- Minimise vegetation clearance, particularly large trees, slow-growing, rare and otherwise significant vegetation;
 - Implement weed management and disease control measures;
 - Minimise visual impact (e.g. by deviations around topographical features or stands of vegetation, doglegs at road crossings where feasible);
 - Avoid drainage alteration or impediment, provide off-take drains on disturbed areas;
 - Avoid areas of existing visible erosion where possible;
 - Install erosion control structures where necessary;
 - Avoid the creation of fire hazards (e.g. through stockpiling of cleared vegetation);
 - Avoid disturbance of third party property and leave infrastructure in an “as found” condition;
 - Ensure implementation of any special procedures that were identified in the planning phase, including; cleaning of vehicles and equipment to prevent introduction of weeds and pathogens; and hand carrying of cables and geophones in sensitive areas;
 - Erect barrier fencing around any excavations when unattended; and
 - Where, in consultation with landowners, it may be necessary to insert temporary gates in internal fence lines, the insertion of such gates should be avoided in tensioned boundary fences, unless explicit landowner permission is obtained.

1.3.5 Built-up Areas

Special procedures are required near public facilities (e.g. roads) and settled areas. These include:

- Procedures to minimise noise, lights and dust;
- Warning signposts and flagging for speed control; and
- Protective covers (e.g. cable mats) for cables at road crossings.

1.3.6 Shot Holes

Shot hole drilling is a source of potential environmental impact. Considerations include:

- Locate shot holes to the side of seismic lines;
- Minimise vehicle use along seismic line or near shot holes;
- Ensure backfilling and compacting level with ground surface; and
- Use small charge explosives.

1.3.7 Waste Management

A site waste management plan should be adopted taking into account the requirements of relevant legislation. Provisions may include:

1.3.7.1 Survey Area

- No rubbish to be left on lines (e.g. food packaging to be collected and returned to camp);
- Waste oils retained for collection and disposal at an appropriate waste oil dump;
- Wastes which can be economically and practically recycled, including scrap metal, oils, batteries, filters and other refurbishable items will be stored onsite in suitable containers for transportation to the relevant recycling collection centres;
- Containers which cannot be recycled, and cannot be returned to the manufacturer must be rendered unserviceable before being transported to an appropriate disposal centre;
- Tyres that cannot be repaired will be taken to an appropriate disposal centre.

1.3.7.2 Campsites

- Collection of domestic waste for proper disposal to recycling or landfill facilities.
- Segregation and safe storage and labelling of chemical packaging, lube oils, batteries, tyres, maintenance and other industrial wastes for proper disposal to recycling or landfill facilities; and
- Suitable drains and pits for the disposal of putrescible wastes (food wastes) and sewage, ensuring they will not contaminate surface or ground water and allowing for at least 1 m coverage of backfill on abandonment.

1.3.8 Chemicals and Hazardous Materials Management

A site management plan for chemicals and hazardous materials should be prepared which takes into account the relevant regulatory requirements. Provisions should include:

- Provision of Material Safety Data Sheets and handling procedures for hazardous chemicals and materials;
- Provision of absorbent material and spill cleanup equipment;
- Provision of a secure magazine for the storage of any explosives or tools containing explosives;
- Provision segregated and contained storage areas for hazardous materials; and
- Use of low impact chemicals and materials as far as practicable.

1.3.9 Emergency Response

The emergency response plan should include:

- Identification of sources of risk, procedures to minimise risk and potential impacts;
- Identification of internal and external emergency organisations, responsibilities and resources (human and equipment and materials) for oil spill response, and callout details; and
- Spill response and cleanup strategies.

1.3.10 Seismic Survey Completion - Environmental Audit

At the end of a survey, an assessment, or audit, of environmental performance should be undertaken. An assessment should include:

- Compliance with company standards and procedures;
- Compliance with regulatory requirements;
- Compliance with landholder requirements;
- Environmental incidents (e.g. unauthorised vegetation removal, erosion areas, loose rubbish, etc.);
- Observations or reports of wildlife or stock impact (e.g. injury from shot holes or vehicles);
- Logs of environmental matters which may have future significance (e.g. waste disposal sites, roads, water supply sources, campsites used, etc.);
- Identification of any ameliorative action or ongoing monitoring required; and
- Identification of improved practices or procedures for future surveys.

1.4 Rehabilitation

After disturbance activities have been completed:

- The project site will be inspected to ensure that any minor spills that may have occurred have been appropriately remediated;
- Erosion and sediment control structures will be routinely inspected and maintained, particularly after heavy or prolonged rainfall;
- The project site will be regularly inspected during operations to monitor rehabilitation; and
- Appropriate measures will be implemented to permanently solve any recurring erosion problems.

Abandonment of a seismic survey area requires the following:

1.4.1 Seismic Lines and Access Tracks

- Remove all temporary survey markers, stakes, pinflags, flagging tape, etc;
- remove all rubbish;
- Backgrade windrows and reinstate natural drainage as far as practicable; and
- Rehabilitation of disturbed areas will be undertaken progressively as works are completed.

In consultation with landowners:

- Install erosion control structures on disturbed areas and sensitive areas of slope, which may concentrate runoff;
- Implement appropriate rehabilitation measures (e.g. respread topsoil and vegetation) to ensure stability, encourage natural revegetation and prevent access to disturbed landscapes;
- Remove temporary gates and reinstate fences;

- Repair any damaged fence lines or other property; and
- Discourage public access to seismic lines and temporary access tracks by reinstating road verges, using signs or other means.

1.4.2 Shot holes

- All shot holes shall be backfilled and plugged where necessary;
- Shot holes must be made safe at all times;
- All detonator wire must be removed from the area; and
- Any drill holes that intersect non-artesian aquifers must be noted and reported and appropriate action taken.

1.4.3 Campsites

- Remove all rubbish or discarded equipment, etc;
- Respread disturbed topsoil and vegetation (where this has been disturbed) to promote restoration; and
- Relieve compaction and facilitate infiltration and revegetation of heavily compacted areas (e.g. by ripping).

Landowner/s to sign release that indicates their satisfaction with the restoration work.



Appendix 3

Environmental Management of Drilling Activities

(Modified from the document “Draft *Environmental Management Plan – Mosaic Oil NL – Production Tenures*,” prepared by RLMS, September 2009)



I.0 Management Plan - Drilling Operations

I.1 Drilling Program Planning

I.1.1 Regulations

Under the *Petroleum and Gas (Production and Safety) Act 2004*, and the *Petroleum Act 1923* drilling is an authorised activity for Authorities to Prospect and Petroleum Leases.

The *Petroleum and Gas (Production and Safety) Regulation 2004* and the *Petroleum Regulation 2004* require that the following forms are lodged with Department of Employment, Economic Development and Innovation (DEEDI):

- Form 19A Notice of Intention to Drill a Petroleum Well or a Water Bore;
- Form 20A Notice of Completion, Alteration or Abandonment of a Petroleum Well or a Water Bore; and
- Form 19A is to be accompanied by a Well Proposal Report.

Prior to entry to private land, landowners must receive an Entry Notice and Form PA 23AA – Entry Notice Information Statement, at least 10 business days prior to entry. For public land, the relevant public land authority must receive an Entry Notice at least 30 business days prior to entry. Compensation must be agreed upon with the relevant landowner.

The use of a public road within the petroleum authority for transport relating to a drilling activity is a notifiable road use under the *Petroleum and Gas (Production and Safety) Act 2004*, and the holder must give 10 business days notice of the intended use, specifying the details in section 516 of the Act. The public road authority may give a road use direction which must pertain only to preserving the condition of the road or the safety of road-users or the public.

A Permit to take Water under section 237 of the *Water Act 2000* will be required if water is to be taken from a watercourse, lake, spring or aquifer for activities associated with drilling the well, unless the water is taken from an existing AGL well.

I.1.2 Landholder and Community Consultation

Consultation with landholders, Aboriginal communities and other affected parties will:

- Exchange information and facilitate good working relationships;
- Promptly identify and address potential concerns and conflict of interest;
- Facilitate arrangements for the use and maintenance of infrastructure (e.g. Water sources, roads, airstrips, etc.) And construction of new roads if necessary; and
- Meet regulatory requirements for consultation and notification.

1.1.3 Well Location and Access Route Selection

While the location of a well site is constrained by geological and technical factors; potential locations and access tracks / roads are assessed for any environmental, cultural heritage or land management issues which may arise.

Where practicable well sites and access tracks/roads should be located in a manner which:

- Minimises land surface disturbance, particularly in environmentally sensitive landscapes (e.g. Erosion-prone, high conservation value, high crop value, high visual impact areas);
- Avoids sensitive areas (e.g. Heritage sites, large trees, steep slopes, wildlife nesting sites, crops, water courses, etc.);
- Prior to construction tracks should be designated as permanent or temporary in consultation with the landholder. Permanent tracks will be constructed, compacted and drained to ensure long-term stability; and
- Consult with landholders and/or local authorities regarding establishment of new roads and tracks and rehabilitation of these after the survey is completed.

1.1.4 Environmental Awareness

Assessment of a proposed site should identify the following:

- The existing natural, cultural and social environment and its particular sensitivities. For example, land systems/units, heritage sites, seasonal values (animal breeding places, cropping and livestock issues), infrastructure (pipelines, cables, power lines etc);
- The potential risks of adverse impacts (i.e. disturbances, discharges and emissions, introduction and spread of weed species or diseases) which may occur (e.g. access road construction, drill site construction, drilling wastes, noise, campsite wastes, etc.);
- The significance of environmental impacts, both direct and indirect; and
- Measures to prevent or control potential environmental impacts (e.g. careful alignment of roads, lined drilling fluid disposal pits, weed and pathogen control procedures, rehabilitation programs, etc.).

1.1.5 Roads and Tracks

Important environmental planning considerations regarding roads and tracks include the following:

- Access tracks will follow existing tracks, areas of disturbance or the right-of-way as far as practicable, and shall avoid erosion-prone slopes and soils when possible;
- Consult and agree with landholders and/or local authorities regarding use, maintenance and repair responsibilities;
- Consult with landholders and/or local authorities regarding establishment of new roads and tracks and rehabilitation of these after drilling is completed;

-
- Enforcing speed restrictions for project vehicles as appropriate to reduce potential impacts; and
 - Prevent the use of roads by unauthorised third parties.

1.1.6 Campsites

Important environmental considerations regarding campsites include, wherever practicable, locating:

- Away from major watercourses, lakes, dams or other surface water bodies and property infrastructure such as stock watering points or homesteads;
- Adjacent to existing access roads or tracks;
- In already cleared areas to avoid vegetation clearing and wildlife disturbance;
- To minimise visual impact as far as practicable; and
- As close as practicable to the rig to minimise vehicle movement and impact in the area.

1.2 Well Program Design

The incorporation of environment protection measures into well program design is an essential element of overall environmental management of drilling programs. Important environment protection considerations include:

1.2.1 Timing

Where possible, avoid drilling impacts during:

- Important agricultural or pastoral seasons;
- Known significant wildlife breeding, migration or other natural cycles;
- Known wet seasons or bushfire seasons; and
- Other periods of significance to other resource users.

1.2.2 Drilling Methods

Where possible:

- Utilise special drilling methods to avoid physical or other impacts on resources; and
- Utilise special drilling methods such as small or slim-hole methods to minimise total cuttings discharge.

I.2.3 Drilling Fluid Systems

Where possible:

- The use of oil-based mud formulations is prohibited; and
- Non-toxic, water based drilling fluids and cuttings utilised during well drilling operations may be stored in lined pits within the construction footprint of well sites. Where this occurs, drill fluids and cuttings will be left to dry in-situ and reused for site rehabilitation purposes.

I.2.4 Drilling Rig

The drilling rig should be suitable for the task and in particular:

- Ensure that rig selection identifies discharges from leaking mud tanks, valves, inspection / dump hatches, dresser sleeves and other circulating system leaks;
- Ensure that rig is fitted with efficient solids control equipment such as shale shakers, de-sanders, de-silter etc;
- Mud mixing system including hopper and pumps should be efficient and free of leaks;
- Ensure that rig bell nipple, flow line and mud collection system is satisfactory and free of leaks; and
- Choke, kill and flare lines should be tested and free of leaks.

I.3 Drilling Operations

I.3.1 Crew Induction

An environmental and safety induction for all staff and contractors should be conducted prior to the commencement of any drilling-related operations (including site access and pad preparation). Topics covered should include:

- Every person's general duty of environmental care in accordance with Section 319 of the *Environmental Protection Act 1994*;
- Regulatory requirements for the drilling operations;
- Environmental considerations and special procedures to be used for environment protection during all drilling-related operations;
- The environmental commitments made under the relevant Environmental Management Plan; and
- Safety and emergency response procedures with particular regard to the safe use of vehicles and equipment and any explosives or explosive tools and spills.

1.3.2 Wildlife Protection

- Ensure that adequate fencing or containment devices are present around fluid pits to prevent wildlife access to unsuitable water sources;
- Stop work procedures if significant wildlife is encountered;
- Negotiate with the landowner methods to protect domestic livestock; for example, move such animals to other areas during seismic operations; and
- As a courtesy, report distressed animals to the landowner as soon as possible.

1.3.3 Spill Prevention

Facilities and procedures to prevent spills must be in place during drilling operations including:

- Safety systems such as blowout preventers;
- Contained storage areas for oil and chemical packaging;
- Containment around oil- and chemical-use areas and equipment;
- Minimise volumes of liquids required wherever practicable;
- Train all personnel on spill response and recovery procedure;
- Conduct spill response exercises to ensure spill response procedures are effective;
- Keep spill kits on hand and ensure appropriate PPE as described in the MSDS and/or product label for the spilled substance is worn; and
- Enforce safe fuel transfer procedures.

1.3.4 Land Management

Sound land management is an important consideration in the conduct of drilling operations. Management considerations include:

- Use existing designated access roads, tracks and gates, and avoid detours and turning circles as much as practicable;
- Public access shall be controlled by measures such as physical barriers and signs;
- Minimise the surface area of the well site to that necessary for the safe operation of the rig;
- Minimise vegetation clearance, particularly large trees, slow-growing, rare and otherwise significant vegetation;
- Implement weed management and disease control measures;
- Stockpile topsoil and cleared vegetation from the well site for re-spreading after completion of drilling and subsequent rehabilitation;
- Avoid drainage alteration and provide drainage on disturbed areas where runoff may concentrate;

-
- Avoid areas of existing visible erosion where possible;
 - Install erosion control structures where necessary;
 - Avoid the creation of fire hazards (e.g. through stockpiling of cleared vegetation, use of equipment without mufflers or spark arresters, etc.);
 - Avoid disturbance of third party property and leave infrastructure in an "as found" condition; and
 - Identify and implement any special procedures such as cleaning of vehicles and equipment to prevent introduction of weeds and pathogens; and
 - Erect barrier fencing around any excavations when unattended.

1.3.5 Built-up Areas

Special procedures may be required near public facilities (e.g. roads) and settled areas. These may include:

- Procedures to minimise the impact of noise, lights and dust; and
- Warning signposts for speed control.

1.3.6 Spill Contingency

The emergency response plan should include:

- Identification of sources of risk, procedures to minimise risk and potential impacts;
- Identification of internal and external emergency organisations, responsibilities and resources (human and equipment and materials) for spill response, and callout details; and
- Spill response and cleanup strategies.

1.3.7 Waste Management

A site waste management plan should be prepared which takes into account the relevant regulatory requirements. Provisions should include:

1.3.7.1 Drilling Site

- The removal of all rubbish;
- Segregation and safe storage and labelling of chemical packaging, lube oils, batteries, tyres, excess drilling chemicals, maintenance and other industrial wastes for proper disposal to recycling or landfill facilities;
- Pits, sumps and levees to control and contain any spillage of well fluids or other liquids that may result from drilling or workover operations (located and/or designed to prevent contamination of surface or ground water and constructed to enable adequate backfilling);

-
- Pits or other containment structures of sufficient capacity to meet the volumes of drill cuttings and fluids anticipated for storage (located and/or designed to prevent contamination of surface or ground water and constructed to enable adequate backfilling); and
 - Flare pits located a safe distance from the site and any public area and designed to contain the flare and prevent fire (located and/or designed to prevent contamination of surface or round water and constructed to enable adequate backfilling).

1.3.7.2 Campsites

- Collection of domestic waste for proper disposal to recycling or landfill facilities.
- Segregation and safe storage and labelling of chemical packaging, lube oils, batteries, tyres, maintenance and other industrial wastes for proper disposal to recycling or landfill facilities; and
- Collection of sewage for proper disposal.

1.3.8 Air Emissions

Management of atmospheric emissions, such as flaring, should aim to minimise and control avoidable releases, without compromising safety requirements, and could include:

- Collection of liquids obtained during testing operations for subsequent sale;
- Collection of gas through flowlines where appropriate to avoid flaring; and
- Regularly monitor and maintain equipment such as generators and compressors, blowout preventers and other pressure-related facilities, to ensure they remain in good working order.

1.3.9 Chemicals and Hazardous Materials Management

A site management plan for chemicals and hazardous materials should be prepared which takes into account the relevant regulatory requirements. Provisions should include (but not be limited to):

- Provision of Material Safety Data Sheets and a dangerous goods register will be available, and easily accessible, for all hazardous and dangerous chemicals and materials;
- Spill mats and spill response kits will be available during refuelling and maintenance activities, and relevant personnel will be trained in their correct use;
- Provision of absorbent material and spill cleanup equipment;
- Provision of segregated and contained storage areas;
- Provision of a secure area at a safe distance from the rig and campsite for the storage of any explosives or tools containing explosives;
- Use of low impact chemicals and materials (low toxicity, biodegradable, lowest concentration) as far as practicable; and
- If disposal is necessary, a licensed disposal facility will be used.

1.3.10 Drilling Site Completion - Environmental Audit

At the end of a drilling operation, an assessment, or audit, of environmental performance should be undertaken. An assessment should include:

- Compliance with regulatory requirements;
- Compliance with landholder requirements;
- Compliance with company standards and procedures;
- Observations or reports of wildlife impacts;
- Environmental incidents or issues (e.g. Fuel spills, erosion areas, loose rubbish, etc.);
- Records of environmental matters which may have future significance (e.g. Roads, water supply sources, campsites used, etc.);
- Identification of any ameliorative action or ongoing monitoring required; and
- Identification of improved practices or procedures for future drilling operations.

I.4 Rehabilitation

Prior to completion of a well ensure that:

I.4.1 Well Site

- The well is cased, plugged, marked and fenced in accordance with regulatory requirements;
- All surface structures, cellar framework, temporary storage buildings, unused chemicals, etc. Are removed (except those required for subsequent production);
- All rubbish is removed from the site and disposed of appropriately;
- All pits, the rathole, mousehole and cellar (if appropriate) are backfilled;
- Mud pits are fenced, awaiting backfilling when the drilling fluids are dry;
- The original contour and natural drainage is reinstated as far as practicable;
- Erosion control structures are installed on disturbed areas which may concentrate runoff;
- Appropriate reclamation measures are implemented (e.g. Respreading topsoil and vegetation, ripping of compacted areas) to ensure stability, encourage natural revegetation and prevent access to disturbed landscapes;
- Damaged fence lines or other property are repaired, temporary gates are removed; and
- Public access to the site is discouraged by using signs or other means.

I.4.2 Access Roads

- Appropriate reclamation measures are implemented (e.g. Backgrading of windrows, installing erosion control measures) to ensure stability, encourage natural revegetation and prevent access to disturbed landscapes; and
- Any existing roads used by machinery will be repaired as necessary to original condition.

I.4.3 Campsites

- Remove all rubbish or discarded equipment, etc;
- Re-spread disturbed topsoil and vegetation (where this has been disturbed) to promote restoration; and
- Relieve compaction and facilitate infiltration and re-vegetation of heavily compacted areas (e.g. by ripping).

Landowner/s to sign release that indicates their satisfaction with the restoration work.



Appendix 4

Management Strategies for Flowlines

(Modified from the document "Draft *Environmental Management Plan – Mosaic Oil NL – Production Tenures*," prepared by RLMS, September 2009)



I.0 Management Plan – Pipeline Construction

I.1 Pipeline Construction Planning

I.1.1 Regulations

This management plan includes construction of both licensed and unlicensed pipelines, for petroleum or water.

Under the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act) Section 110 allows the lease holder to construct and operate petroleum pipelines and water pipelines within a lease or one or more adjacent contiguous leases held by the same holder. Section 44 of the *Petroleum Act 1923* allows the construction of petroleum pipelines and water pipelines within a 1923 Act lease.

The construction of a licensed pipeline requires:

- A public notice requirement under Section 411; and
- The granting of a pipeline licence, under the *petroleum and gas (production and safety) act 2004*; and
- The acquisition of pipeline land, either by owning the land, acquiring an easement or a part 5 permission (see section 399) over private land in the area or the licence; or
- Construction on public land subject to the provisions of the 2004 Act.

All notices and agreements relating to access to private land must be completed and be in place as per the Department of Employment, Economic Development and Innovation (DEEDI) Land Access Code, November 2010 and the P&G Act.

If the use of a public road at more than the threshold rate (State-controlled road 50,000 tonnes per year, or another public road, 10,000 tonnes per year) relates to pipeline construction the holder must give the relevant public road authority notice of a notifiable road use at least 10 business days prior to the use. This also applies to areas outside the area of the petroleum authority.

With respect to public land, the public land authority has the power to give works directions and the public road authority may give directions about the way the holder may use the road (e.g. when the road may be used, preferred routes, safety precautions that must be taken).

A Permit to take Water under Section 237 of the *Water Act 2000* will be required if hydrotest water is to be taken from a watercourse, lake, spring or aquifer.

For a licensed pipeline it will be necessary to undertake a formal environmental assessment.

1.1.2 Landholder and Community Consultation

Consultation with land users (current landholders, traditional landowners and other affected parties) must be undertaken during the planning phase to exchange information and facilitate good working relationships. This process helps to:

- Identify and address potential concerns and conflicts of interest;
- Facilitate arrangements for the use and maintenance of infrastructure (e.g. water sources, roads, airstrips, fences, gates, etc.); and
- Meet regulatory requirements for consultation and notification, particularly of landholders.

1.1.3 Environmental Awareness

Assessment of a proposed route should identify the following:

- The existing natural, cultural and social environment and its particular sensitivities. For example, land systems/units, heritage sites, seasonal values (animal breeding places, cropping and livestock issues), infrastructure (pipelines, cables, power lines etc);
- The potential impacts (i.e. disturbances, discharges, emissions, introduction and spread of weed species or diseases) which may occur (e.g. vegetation clearing, noise, campsite wastes, etc);
- The frequency, duration, nature and severity of environmental impacts likely to be caused by disturbances, discharges and emissions from the construction;
- Risks and appropriate measures to minimise those impacts;
- The significance of direct and indirect potential environmental impacts; and
- Measures to prevent or control potential environmental impacts.

1.1.4 Operating Procedures

Establish special operating procedures to protect sensitive areas. These may include:

- Cleaning of vehicles and equipment to prevent introduction of noxious weeds or pathogens;
- Modified construction techniques at river or creek crossings; and
- Limiting clearing as much as is practicable for safe construction.

1.1.5 Roads and Tracks

Access tracks will follow existing tracks, areas of disturbance or the right-of-way as far as practicable, and shall avoid erosion-prone slopes and soils when possible.

Prior to construction tracks should be designated as permanent or temporary in consultation with the landholder. Permanent tracks will be constructed, compacted and drained to ensure long-term stability.

Environmental planning considerations regarding roads and tracks include:

- Using existing roads and tracks as far as practicable, thus minimising the operational footprint;
- Consult and agree with landholders and/or local authorities regarding use, maintenance and restoration of roads and tracks;
- Consult with landholders and/or local authorities regarding establishment of new roads and tracks and rehabilitation of these after construction is completed;
- Enforcing speed restrictions for project vehicles as appropriate to reduce potential impacts; and
- Prevent the use of roads by unauthorised third parties.

1.1.6 Campsites

If a field camp is required, then environmental planning considerations regarding campsites include, wherever practicable, locating the camp:

- Away from major watercourses, lakes, dams or other surface water bodies and property infrastructure such as stock watering points or homesteads;
- Adjacent to existing access roads or tracks;
- In previously disturbed areas to avoid vegetation clearance and wildlife disturbance; and
- To minimise visual impact as far as practicable.

1.2 Right of Way Clearing and Grading

Wherever possible, clearing will be minimised with appropriate route selection, however, when clearing is required the following will apply:

- Plan to minimise the time between initial clearing and restoration;
- Reduce the cleared easement to the smallest practicable width whilst maintaining safety and other environmental requirements (e.g. erosion control, spoil storage);
- Minimise the loss of tree canopy when clearing riparian vegetation by methods such as trimming branches and reducing cleared easement width;
- Avoid small pockets of remnant vegetation;
- Boundaries of the easement and any protected trees or environmentally sensitive areas are to be clearly flagged before clearing commences;

- Clearing will be confined to the pipeline right-of-way and access tracks;
- Stock proof fences are to be secured immediately after equipment has passed through; or temporary fencing and gates installed along the right-of-way in consultation with the landowner;
- Clearing to ground level is to be minimised wherever possible so that some rootstock remains in place. Some stubble will enhance re-growth and will not interfere with construction;
- Tree stumps within the easement will be removed for safety;
- Cleared vegetation will be stockpiled for re-spreading during rehabilitation (note this excludes declared pest species), subject to landholder approval;
- Cleared vegetation in stockpiled areas must not impede traffic, stock or wildlife, and must be located away from live vegetation that could be damaged; and
- Where cultural heritage items are discovered during earthworks, cease the activity immediately and advise relevant parties in accordance with the cultural heritage management plan and the OEMP.

Grading is required in areas where construction is likely to damage topsoil or where the surface soil conditions cannot accommodate construction activities. Grading can also remove material that could be a fire hazard. During grading the following will apply:

- Where topsoil is required to be removed, it will be cleared to a depth of approximately 150 mm or to the point where a prominent change in soil cover is observed;
- Topsoil, removed by grading, and sub-surface soils, removed by trenching, are to be stockpiled separately and redistributed to their original soil horizons on completion of the pipe installation;
- Topsoil will not be used for any purpose other than surface restoration;
- All soil stockpiles will be clear from fences, trees and other objects, and in areas where wind and water erosion can be minimised or controlled;
- Where appropriate, containment devices (e.g. silt fences) will be used to preserve stockpiled soils;
- Drainage channels will be made in the soil stockpiles on sloping terrain to avoid accelerating localised water erosion;
- Drainage lines and ditches will remain clear from soil stockpiles;
- Stability of soil and surface is to be maintained at all times throughout construction;
- Temporary containment structures such as silt fences or bunds will remain in place until cleanup is completed; and
- Alteration to topography or drainage will be minimised.

1.2.1 Use of Machinery

Dozing will only be carried out to clear timber where necessary.

- Consult landowners prior to commencing work, wherever possible;
- Disturbance due to vehicle access will be restricted to the greatest extent possible;
- Wherever possible (i.e. improved pasture, open sandy country etc) a soft tyred grader may be used in preference to dozers;
- The blade will not be lowered further than necessary;
- Sufficient plant material shall be left to regenerate and spread across excavated areas;
- The use of a stick rake on a dozer will be encouraged wherever practicable;
- Dozers and graders are not to cut across cultivation with their blades down; and
- Use appropriately credited personnel to supervise any operations.

1.2.2 Trees

- Where stands of trees must be disturbed, the required width of clearing will be assessed to minimise the number of trees removed in order to retain the canopy cover to the maximum practicable extent. Scattered trees retained within 1-2 metres of the boundary of the right-of-way can be avoided during construction if necessary.
- Pushed timber will be stockpiled for later use in erosion control.
- Where possible, timber will be stacked free of topsoil on the edge of the right-of-way.

1.2.3 Watercourses

- Where the right-of-way or access tracks cross natural drainage lines or watercourses, measures will be taken to prevent the diversion or obstruction of stream flow and to minimise stream bank erosion.
- As far as practicable, the right-of-way will intersect streams on a straight section of the stream rather than on bends, where there is a higher probability of erosion of the outside bank and consequent problems for successful rehabilitation. If possible, intersections should be perpendicular to the stream to minimise the area of stream bank disturbance and the extent of canopy removal along the banks. Where practicable, known stock watering or crossing points will be avoided.
- Cleared material will not be pushed into the watercourse.
- Vegetation clearance on the 15 metre easement must be kept to a minimum at stream crossings, and may be subject to additional approvals under the *Water Act 2000*.
- Large trees will be undisturbed wherever possible, either by minimising the width of the right-of-way clearing or by realignment if required.
- Wherever practicable, cleared timber and brush (excluding weed species) shall be retained and laid as brush on cleared stream banks and at other locations within the right-of-way.

1.2.4 Weed Infestation and Disease Control

- All machinery used must be certified “clean” by the operators, and have the appropriate documentation.
- Prior to clearing by machinery, weed infestation should be assessed and scattered individuals or small clumps removed by hand. Larger areas of infestation may be cleared by machinery but should be stockpiled separately in areas removed from spoil and topsoil stockpiles and out of trafficked areas. Machinery used to clear areas of weed infestation should not then move to clearing weed-free areas without a clean-down.
- In areas of weed infestation, all vehicles shall be washed down as they leave the right-of-way and/or at property boundaries as advised. Vehicles not required to enter the weed areas shall remain on designated “clean” areas or routes.
- Access routes, clean areas and infested areas shall be clearly identified and restrictions on crossing boundaries, shifting earth or other materials or moving between clean and infested areas shall be strictly observed.
- Consult with all landholders and regulatory authorities to identify any existing disease-affected properties or areas. Where special management measures and exclusion zones may be required, implement the required measures and manage access for affected areas.
- All onsite vehicles have certification of appropriate washdown / cleanliness.

1.3 Construction

1.3.1 Trenching

The dimensions of the trench will conform to the appropriate standard unless otherwise specified in the detailed engineering design. These dimensions will be sufficient to allow the installation of the pipe without damaging the integrity of the pipeline coating. During trenching the following will apply:

- Trench spoil will not be mixed with topsoil or cleared vegetation;
- Drainage lines and ditches will not be blocked by soil stockpiles;
- Breaks in the continuity of the trench should be left at regular intervals to allow for safe access across the trench for livestock, vehicles and construction staff;
- Dirt or plywood escape ramps may be provided within the open trench to enable stricken animals that may have fallen in the trench to escape;
- Stockpiles will not be within 5 to 10 metres of creeks or other perennial water bodies;
- Appropriate erosion and sedimentation measures will be implemented where soil is stockpiled;
- The duration that the trench is open will be minimised as much as possible;
- While the trench is open, all precautions will be taken to ensure the safety of the public and wildlife and to reduce the potential for erosion;
- Where required, breaks will be provided in soil stockpiles, the trench and pipe strings for access to adjacent areas during construction and to reduce the potential for water erosion;

- Where boring of stream crossings or roads occurs the resulting waste is to be disposed of appropriately;
- Bed and bank material removed from creek crossings will be kept separate from other spoil piles and replaced as soon as practicable after the pipeline has been installed; and
- Seek landholder approval before importing any foreign soil material. Where soil is imported, soil will be from certified weed and pest free sources.

1.3.2 Pipe Stringing and Backfilling

The following guidelines will apply:

- Pipe delivery routes will be via existing roadways or access tracks as agreed with the relevant landowners and road authorities;
- Impacts resulting from pipe transport such as soil compaction, dust and noise are to be minimised;
- All welding will comply with the relevant Australian standards;
- Welded sections of pipe (pipe strings) will be closed at both ends at the completion of work daily to prevent wildlife or other objects entering the pipe;
- Pipe strings will be laid on padded supports to protect the pipe coating;
- Gaps will be required in the pipe strings for vehicle, stock or wildlife access and where possible these gaps should coincide with fences, tracks, wildlife or stock pads;
- The trench will be bedded with appropriate material prior to lowering of the pipe string;
- In areas where de-watering of the trench is required, relevant erosion prevention and water quality management techniques such as flow dissipaters, i.e. rock rip-rap or geotextiles are to be adopted for water discharge;
- Trench breakers will be installed on slopes or where subsurface soil erosion potential is high;
- Appropriate fire fighting facilities will be available on site during welding and grinding activities;
- Excavated or borrowed soil will be returned to the trench following pipe installation, and will be compacted to avoid subsequent subsidence;
- Spoil material used for backfill will contain minimal rock, stones and organic material;
- Backfill will be to 300mm below natural ground level, followed by lightly compacted topsoil slightly mounded to a crown or rill of no more than 150mm above ground level to allow for settling;
- Breaks shall be provided at a maximum spacing of 50-100 metres to prevent channelling or ponding;
- Excess spoil material not required for backfilling will be disposed of within the right-of-way or borrow pits by scraping an area free of topsoil, spreading and compacting spoil no more than 500 mm high so as to avoid ponding or a surface hazard and reinstating topsoil after consultation with the landowner; and
- Excess topsoil shall be evenly spread in layers up to 300mm high after consultation with the landowner.

1.3.3 Hydrostatic Testing

Water used for hydrostatic testing will be discharged only once authorisation from the administering authority has been obtained. A hydrotest management plan must be developed and submitted to DERM. The plan should include the following methods:

- Where no chemicals (e.g. corrosion inhibitors) have been added, hydrotest water, may be discharged to land providing it meets the water quality criteria as set out in the relevant Environmental Authority;
- If corrosion inhibitors have been added to the hydrostatic testing water the water will be treated to remove the inhibitors e.g. aeration to oxidise the inhibitors by spraying and undergo water quality testing prior to release;
- Consultation will occur before water is removed from an existing water source with the landowner and relevant authority;
- Management of hydrotest water shall not impact upon landholders and their property values;
- Water removed from a natural source will be filtered at the intake;
- Adequate flow rates and water levels in existing water sources will be maintained to minimise potential impacts;
- Hydrotest water will only be discharged to appropriately licensed dams and will not be discharged to waters (including waterways and drainage lines that are not licensed to receive associated water);
- Appropriate erosion control measures will be implemented at the point of discharge;
- The quality of the discharge water will be monitored to ensure it is suitable for an intended re-use, where this is proposed;
- A Permit to take Water under section 237 of the *Water Act 2000* will be required if hydrotest water is to be taken from a watercourse, lake, spring or aquifer.

1.3.4 Wildlife Protection

- All reasonable steps will be taken to prevent unnecessary disturbances to and destruction of, flora, fauna and other natural resources on the right-of-way and elsewhere where works are carried out;
- Measures shall be taken to reduce the likelihood of trapping fauna or stock in the trench, including installation of ramps; ramping the final 10 metres of excavation where a continuous run of trench terminates.

1.3.5 Chemicals and Hazardous Materials Management

A site management plan for chemicals and hazardous materials should be prepared which takes into account the relevant regulatory requirements. Provisions should include (but not be limited to):

- Material safety data sheets and a dangerous goods register will be available, and easily accessible, for all hazardous and dangerous materials used;
- Spill mats and spill response kits will be available during refuelling and maintenance activities, and relevant personnel will be trained in their correct use;

- Provision of a secure magazine for the storage of any explosives or tools containing explosives;
- Provision segregated and contained storage areas for hazardous materials;
- Use of low impact chemicals and materials as far as practicable;
- If disposal is necessary, a licensed disposal facility will be used;
- Construct storage areas so as to divert stormwater run-off and prevent potential contamination of waters;
- Store, transport and handle fuels, oils and chemicals away from water bodies; and
- No maintenance or refuelling of vehicles or machinery is to be undertaken within 150 m of a watercourse or water body.

1.3.6 Spill Prevention

Facilities and procedures to prevent spills must be in place during construction operations including:

- Contained storage areas for oil and chemical packaging;
- Containment around oil- and chemical- use areas and equipment;
- Minimise volumes of liquids required wherever practicable;
- Train all personnel on spill response and recovery procedure;
- Conduct spill response exercises to ensure spill response procedures are effective;
- Keep spill kits on hand and ensure appropriate PPE as described in the MSDS and/or product label for the spilled substance is worn; and
- Safe fuel transfer procedures.

1.3.7 Built-up Areas

Special procedures are required near public facilities (e.g. roads) and settled areas. These include:

- Procedures to minimise noise, lights and dust; and
- Warning signposts and flagging for speed control.

1.3.8 Waste Management

A site waste management plan should be adopted taking into account the requirements of relevant legislation. Provisions may include:

1.3.8.1 Right of Way and Access Tracks

- No rubbish to be left on right-of-way, access tracks or areas used for storage (e.g. food packaging to be collected and returned to camp).

1.3.8.2 Campsites

- Collection of domestic waste and sewage for proper disposal to recycling or landfill facilities;
- Segregation and safe storage and labelling of chemical packaging, lube oils, batteries, tyres, maintenance and other industrial wastes for proper disposal to recycling or landfill facilities; and
- Collection of sewage for proper disposal at an appropriately licensed facility

1.3.9 Emergency Response

The emergency response plan should include:

- Identification of sources of risk, procedures to minimise risk and potential impacts;
- Identification of internal and external emergency organisations, responsibilities and resources (human and equipment and materials) for oil spill response, and callout details; and
- Spill response and cleanup strategies.

1.4 Rehabilitation

Upon completion of construction:

- Remove all temporary survey markers, stakes, pinflags, flagging tape, etc;
- Remove all rubbish;
- Rehabilitation of disturbed areas will be undertaken progressively as works are completed;
- Reinstatement of natural drainage as far as practicable;
- Erosion and sediment control structures will be routinely inspected and maintained, particularly after heavy or prolonged rainfall;
- The project site will be regularly inspected during operations to monitor rehabilitation; and
- Appropriate measures will be implemented to permanently solve any recurring erosion problems.

In consultation with landowners:

- Install erosion control structures on disturbed areas and sensitive areas of slope, which may concentrate runoff;
- Implement appropriate rehabilitation measures (e.g. respread topsoil and vegetation) to ensure stability, encourage natural revegetation and prevent access to disturbed landscapes;
- Repair any damaged fence lines or other property;
- Discourage public access by reinstating road verges, using signs or other means; and
- Install line-of-sight markers.

Generally, rehabilitation procedures will be initiated immediately after the area ceases to be required for construction or access purposes.

- The natural contours of disturbed ground within the right-of-way will be restored to allow normal surface drainage. Windrows or rills of material deposited during clear and grade operations will be respread across the right-of-way to prevent alterations to cross country drainage.
- Stump holes and wheel ruts will be filled with subsoil and compacted before final trimming.
- Clay soils shall not be deep-ripped or worked while saturated or in adverse weather conditions, and duplex soils shall not be inverted.
- Some areas may require special consideration:

1.4.1 Non-sensitive Corridor Areas

These areas include plains and gently sloping areas where surface and subsurface erosion is unlikely to be severe. Following the placing of the line within the ditch, overburden will be returned to the trench and compacted. If topsoil was stripped, this will be respread.

Areas which have been compacted by the passage of vehicles will be deep-ripped to depth of 300mm or scarified as required. Topsoil with its contained seed load and root stock will be respread over the bared areas followed by respraying of previously cleared stockpiled vegetation (excluding weeds). Deep ripping in duplex soils will not mix topsoil and subsoil.

1.4.2 Contour Banks

In cultivated areas with contour banks or pondage banks, reinstatement of banks shall be undertaken immediately after the pipeline is laid. Replacement banks shall be at least 30% higher than existing contour banks to allow for settlement. Shallow ripping to a depth of 200mm will ensure bonding of the bank to soil.

1.4.3 Diversion Banks

Diversion banks or “whoa boys” shall be formed across the entire width of the disturbed working area where slope exceeds 2%. Banks shall direct surface water away from the backfilled trench, and in the case of lines perpendicular to contours, shall direct water alternately to each side. Banks shall be a minimum of 450mm high and 1 m wide, extending at least 2m to the side of disturbed land, to form a drain sloping at approximately 1 in 100, and shall be constructed at intervals of 70m (2% slope, 40m (5%), 25m (10%) etc.

In areas with erosion-prone subsoils, banks shall be pushed from the lower side or constructed using imported material to prevent exposing the subsoil.

1.4.4 Developed Areas

Areas within 100 m of any residence shall be rehabilitated by seeding with grass species as appropriate.

1.4.5 Stream and River Crossings

In addition to surface drains and contour banks, brush matting and timber shall be laid to form a complete cover over topsoil parallel to the contour or stream banks if required. Rehabilitation of bank and channel profiles should replicate original contours to reduce erosion potential.

An erosion control bank shall be placed at the top of all banks of streams, rivers and watercourses. Attention will also be given to maintenance of bank and channel profiles as part of the erosion prevention program.

Where the stream crossing unavoidably coincides with known stock watering or crossing points, the area will be fenced and an alternative stock access route provided, after consultation with the landholder.

1.4.6 Change of Slope

Where the right-of-way intersects the toe of slopes in duplex soils or other erosion-prone change of slope, earth banks will be formed above the disturbance to prevent run-on, and action taken to spread and direct run-off to less susceptible areas.

1.4.7 Gullies

Where the pipeline crosses gullies or eroding areas, site-specific rehabilitation measures will be developed. These may include:

- Backfilling with more stable material;
- Spreading of new topsoil;
- Seeding or spreading clumps of vegetated soil
- Brush matting or erosion fabrics
- Fencing.

I.4.8 Access Tracks

Temporary tracks will be deep-ripped to 500 mm depth, spread with topsoil and mulched immediately following cessation of use, and will be restored to ensure free surface drainage. Any existing roads used by machinery will be repaired as necessary to original condition.

I.4.9 Campsites

Upon completion of construction

- Remove all rubbish or discarded equipment, etc;
- Re-spread disturbed topsoil and vegetation (where this has been disturbed) to promote restoration; and
- Relieve compaction and facilitate infiltration and revegetation of heavily compacted areas (e.g. by ripping).

Landowner/s to sign release that indicates their satisfaction with the restoration work.

I.5 Monitoring

Monitoring of the right-of-way and construction work areas will assess the short-term suitability of the rehabilitation. Remedial measures will be carried out as required. Long-term vegetation development and stability will be evaluated at two-yearly intervals and involve comparison with the vegetation outside the right-of-way. Traverses at right angles to the pipeline will study regrowth, natural vegetation and the edge effect between the two zones. Plant density, species composition and structure will be compared. If substantial anomalies exist, remedial measures will be introduced if appropriate.

Vegetation adjacent to the pipeline centre line and within 5 metres either side will be limited to grasses and herbage, to decrease the chances of roots damaging the pipe or its protective coating. The line-of-sight markers also need to be clearly visible, so regrowth needs to be controlled to maintain visibility. Within the 10 metre strip; chemical and mechanical means are employed to control trees and shrubs.

Light vehicle access needs to be maintained to monitor the cathodic protection, provide access for maintenance and operational procedures. A light vehicle track is to be maintained in consultation with the landowner.



Appendix 5

Proposed EA Conditions for Dams on PL 446



EXISTING DAMS

1. Within 6 months of the date of issue of this authority, the holder of this authority must have a suitably qualified and experienced person assess:
 - (a) the hazard category of each dam on PL16 in accordance with the most recent version of *"Manual for Assessing Hazard Categories and Hydraulic Performance of Dams"*;
 - (b) the condition and adequacy of each dam for dam safety; and
 - (c) each dam's structural, geotechnical and hydraulic integrity.
2. The holder of this environmental authority must, upon receipt of the results of the assessment, consider the report and its recommendations and take action to ensure that each dam will safely perform its intended function.
3. Within two months of receiving the report, the holder of this authority must notify the administering authority in writing of the outcomes and recommendations of the dam assessment report and the actions taken to ensure the integrity of each dam.
4. Within two months of a dam being identified as being a regulated dam, the holder of this authority must:
 - (a) ensure that the name of the regulated dam is clearly sign posted at the dam location at all times.
 - (b) the Mandatory Reporting Level is marked on each Regulated Dam in such a way that it is clearly observable.
 - (c) ensure the dam is appropriately certified and the certification is lodged with DERM.
 - (d) enter the relevant details into the regulated dam register as per condition 7.
5. All existing dams on PL16 must be maintained:
 - (a) in accordance with generally accepted engineering standards and practices;
 - (b) to prevent the release of contaminants to waters; and
 - (c) to ensure the stability of the dam's construction.

ALL DAMS

6. Construction of any dam or modifications to an existing dam determined to be in the high hazard or significant hazard category in accordance with the most recent version of *"Manual for Assessing Hazard Categories and Hydraulic Performance of Dams"* is prohibited unless the required design plan details have been entered into the Regulated Dam Register and certified by the chief executive officer for the holder of the environmental authority, or their delegate, as being accurate and correct.

Regulated Dam Register

7. The holder of this environmental authority must maintain a Register of Regulated Dams that must include, as a minimum, the following information for each Regulated Dam:
 - (a) dam name, the coordinates for its location and date of entry in the register;
 - (b) dam purpose and its proposed/actual contents;
 - (c) hazard category assessed using the most recent version of *"Manual for Assessing Hazard Categories and Hydraulic Performance of Dams"*;
 - (d) details of the composition and construction of any liner;
 - (e) dimensions (metres) and surface area (hectares) measured at the footprint of the dam;
 - (f) maximum operational volume (megalitres);
 - (g) design storage allowance at 1 November each year (megalitres);
 - (h) mandatory reporting level (metres);
 - (i) date construction was certified as compliant with the design plan (not applicable for existing dams);
 - (j) name and qualifications of certifier;

- (k) dates on which the dam was inspected for structural and operational adequacy;
 - (l) date on which the report of the structural and operational adequacy inspection was provided to the administering authority;
 - (m) dates on which the dam was inspected for the detection of leakage through any liner; and
 - (n) dates on which the dam was inspected for the purpose of annually ascertaining the available storage capacity on the 1 November each year.
8. The holder of this environmental authority must provisionally enter the required information in the Register of Regulated Dams when a design plan for a Regulated Dam is submitted to the administering authority.
 9. The holder of this environmental authority must make a final entry of the required information in the Register of Regulated Dams once compliance with Condition 18 has been achieved.
 10. The holder of this environmental authority must ensure that the information contained in the Register of Regulated Dams is complete and current on any given day.
 11. All entries in the Register of Regulated Dams must be certified by the chief executive officer for the environmental authority holder, or their delegate, as being accurate and correct.
 12. The holder of this environmental authority must submit the Register of Regulated Dams or information contained in the Register available to the administering authority at each annual return and when requested to do so in the form requested by the administering authority.

CONSTRUCTION AND OPERATIONAL REQUIREMENTS FOR NEW DAMS

13. All regulated dams constructed after the date of issue of this environmental authority must:
 - (a) be designed with a floor and sides of material that will contain the wetting front and any entrained contaminants within the bounds of the containment system during its operational life including any period of decommissioning and rehabilitation; and
 - (b) have a system that will detect any passage of the wetting front or entrained contaminants through the floor or sides of the dam and enable the repair of the containment system or its decommissioning and rehabilitation.
14. All Regulated Dams must be designed in accordance with the requirements of the most recent version of *"Manual for Assessing Hazard Categories and Hydraulic Performance of Dams"* and constructed under the supervision of a suitably qualified and experienced person.

Regulated Dam Design Plan and 'As Constructed' Certification for New Dams

15. The construction and operation of Regulated Dams is prohibited unless the holder of this environmental authority has submitted to the administering authority a copy of the design plan, together with the certification of a suitably qualified and experienced person that the regulated dam:
 - (a) will deliver the performance stated in the design plan;
 - (b) has had its hazard category assessed and been designed in accordance with the requirements of the most recent version of *"Manual for Assessing Hazard Categories and Hydraulic Performance of Dams"*; and
 - (c) when constructed and operated, will be compliant in all respects with the relevant conditions of this environmental authority.

16. The design plan must include, but not be limited to:
- (a) a statement of the relevant legislation, regulatory documents and engineering practice relied upon in the design plan;
 - (b) a statement of the facts and data being used in the design plan and the limitations to the application and interpretation of that material;
 - (c) an assessment of the hazard category of the proposed dam based on the identification of potential impacts on any sensitive receptors for any applicable dam failure scenarios, including the cumulative impact should all dams fail at once;
 - (d) detailed specifications for the design, operation, maintenance and decommissioning of the dam(s);
 - (e) an operational plan that includes contingency / emergency response procedures designed to avoid / minimise discharges resulting from any overtopping or loss of structural integrity of the dam;
 - (f) design, specification and operational rules for any related structures and systems used to prevent the overtopping of the proposed dam;
 - (g) a detailed plan for the decommissioning and rehabilitation of the dam at the end of its operational life;
 - (h) any other matter required by the certifying suitably qualified and experienced person; and
 - (i) evidence supporting the claims of the certifier that they are a suitably qualified and experienced person.
17. If, within the 20 business days following the lodgement of a certified design plan the administering authority notifies the holder of this environmental authority, in writing, that the design plan is not compliant with either:
- (a) the conditions of this environmental authority; or
 - (b) the requirements set out in the most recent version of "*Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*"
- then the construction and operation of the Regulated Dam is prohibited until the administering authority provides written advice that its construction may proceed.
18. When construction of any Regulated Dam is complete, the holder of this environmental authority must submit to the administering authority one hard copy and one electronic copy of a set of 'as constructed' drawings, together with the certification of a suitably qualified and experienced person that the dam 'as constructed' will deliver the performance stated in the design plan and at the time of certification it is compliant in all respects with conditions 13 to 17 of this environmental authority.
19. Each Regulated Dam must be maintained and operated in a manner that is consistent with the design plan and the certified 'as constructed' drawings for the duration of its operational life and until decommissioned and rehabilitated.
20. Upon any change in its purpose or stored contents of a regulated dam, the hazard category of the dam must be determined by a suitably qualified and experienced person.

MANDATORY REPORTING LEVEL (ALL DAMS)

21. The Mandatory Reporting Level marking on each Regulated Dam must be maintained so that it is clearly observable during routine inspections of each dam.
22. The holder of this environmental authority must notify the administering authority immediately when the level of the contents of any Regulated Dam reaches the Mandatory Reporting Level, and immediately act to prevent or, if unable to prevent, to minimise any actual or potential environmental harm.

ANNUAL INSPECTION AND REPORT (ALL REGULATED DAMS)

23. Each Regulated Dam must be inspected annually by a suitably qualified and experienced person.
24. At each annual inspection, each regulated dam must be assessed for:
 - (a) condition and adequacy for dam safety; and
 - (b) its structural, geotechnical and hydraulic performance (against the criteria contained in the certified design plan for all dams constructed after the date of issue of this environmental authority).
25. Every two years, each regulated dam must be assessed for its hazard category in accordance with the most recent version of *“Manual for Assessing Hazard Categories and Hydraulic Performance of Dams”*
26. An assessment of the adequacy of the available storage in each Regulated Dam is to be made, based on an actual dam level observed in the month of October in each year, and the resultant estimate of the level in that dam as at 1 November in each year must be equal or less than the design storage allowance for the dam.
27. Where the assessment of the adequacy of the available storage in any Regulated Dam indicates that the design storage allowance will be exceeded, or at any other time the holder of this environmental authority becomes aware that the design storage allowance has been or will be exceeded, the holder of this environmental authority must immediately notify the administering authority, and immediately act to prevent or, if unable to prevent, to minimise any actual or potential environmental harm.
28. For each annual inspection, a copy of a report on the condition and adequacy of each Regulated Dam, certified by the suitably qualified and experienced person and including any recommended actions to be taken to ensure the integrity of each Regulated Dam, must be provided to the administering authority upon request.
29. The holder of this environmental authority must, upon receipt of the annual inspection report, consider the report and its recommendations, take action to ensure that each Regulated Dam will safely perform its intended function, and within one month of receiving the report, notify the administering authority in writing of the recommendations of the inspection report and the actions taken to ensure the integrity of each Regulated Dam.

Appendix 6

Soil Sampling Protocol and Methodology



I.0 Soil Sampling Protocol

I.1 General

- Check sampling design and sample locations
- Check that sample containers are appropriate
- Prepare carrier boxes (i.e. add ice to eskies)
- Label containers (include site number, sample depth, date, time and person)
- Seal containers and pack in carrier box
- Complete documentation
- Send or deliver to the laboratory.

I.2 Sampling Methodology

- Refer to AS4482 – Guide to the Sampling and Investigation of Contaminated Soil.
- Soil samples for metals and organics analysis should be collected in prepared glass sample bottles (500/1000mL) fitted with teflon-lined lids. Bottles should be acid and solvent washed (Envirotest can supply appropriately prepared containers).
- Surface and depth soil samples should be collected using a hand auger and stainless steel trowel. Surface samples should be collected from a depth of 0 – 100mm. Depth samples depend on the nature of the contamination.
- All sampling equipment should be washed, rinsed and dried between sample locations to prevent cross contamination.
- Duplicate samples and field blanks should be collected for quality assurance purposes. A field blank is a sampling container that is treated the same as other samples (i.e. opened, sealed, labelled and transported – but no soil).
- Photos may be useful.
- Label sample bottles in the field (location, sample, date and depth), stored on ice in eskies and transport directly to the Envirotest laboratory for registration and preparation.
- Complete sample form and Chain-of Custody.



Appendix 7

DERM Wildnet Search and EPBC Search





Queensland
Government

Wildlife Online Extract

Search Criteria: Species List for a Specified Point

Species: All

Type: All

Status: All

Records: All

Date: All

Latitude: 27.5779

Longitude: 149.1976

Distance: 25

Email: elizabeth.dunlop@rpsgroup.com.au

Date submitted: Monday 08 Nov 2010 16:18:56

Date extracted: Monday 08 Nov 2010 16:31:02

The number of records retrieved = 203

Disclaimer

As the DERM is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

No statements, representations or warranties are made about the accuracy or completeness of this information. The State of Queensland disclaims all responsibility for this information and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you may incur as a result of the information being inaccurate or incomplete in any way for any reason.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
animals	birds	Acanthizidae	<i>Acanthiza nana</i>	yellow thornbill		C		1
animals	birds	Acanthizidae	<i>Smicronis brevirostris</i>	weebill		C		2
animals	birds	Artamidae	<i>Cracticus tibicen</i>	Australian magpie		C		1
animals	birds	Artamidae	<i>Strepera graculina</i>	pieb currawong		C		1
animals	birds	Artamidae	<i>Cracticus torquatus</i>	grey butcherbird		C		4
animals	birds	Artamidae	<i>Cracticus nigrogularis</i>	pieb butcherbird		C		2
animals	birds	Cacatuidae	<i>Nymphicus hollandicus</i>	cockatiel		C		1
animals	birds	Cacatuidae	<i>Eolophus roseicapillus</i>	galah		C		1
animals	birds	Columbidae	<i>Ocyphaps lophotes</i>	crested pigeon		C		2
animals	birds	Columbidae	<i>Phaps chalcoptera</i>	common bronzewing		C		1
animals	birds	Corcoracidae	<i>Struthidea cinerea</i>	apostlebird		C		1
animals	birds	Corvidae	<i>Corvus coronoides</i>	Australian raven		C		2
animals	birds	Estrildidae	<i>Taeniopygia guttata</i>	zebra finch		C		2
animals	birds	Halcyonidae	<i>Dacelo novaeguineae</i>	laughing kookaburra		C		2
animals	birds	Maluridae	<i>Malurus lamberti</i>	variegated fairy-wren		C		1
animals	birds	Meliphagidae	<i>Lichenostomus leucotis</i>	white-eared honeyeater		C		1
animals	birds	Meliphagidae	<i>Manorina melanocephala</i>	noisy miner		C		4
animals	birds	Monarchidae	<i>Grallina cyanoleuca</i>	magpie-lark		C		1
animals	birds	Nectariniidae	<i>Dicaeum hirundinaceum</i>	mistletoebird		C		1
animals	birds	Pachycephalidae	<i>Pachycephala pectoralis</i>	golden whistler		C		1
animals	birds	Pachycephalidae	<i>Pachycephala rufiventris</i>	rufous whistler		C		2
animals	birds	Pomatostomidae	<i>Pomatostomus temporalis</i>	grey-crowned babbler		C		1
animals	birds	Psittacidae	<i>Barnardius zonarius</i>	Australian ringneck		C		1
animals	birds	Psittacidae	<i>Northiella haematogaster</i>	blue bonnet		C		1
animals	birds	Rhipiduridae	<i>Rhipidura albiscapa</i>	grey fantail		C		1
animals	reptiles	Elapidae	<i>Hemiaspis damelii</i>	grey snake		E		1/1
fungi	sac fungi	Chrysothricaceae	<i>Chrysothrix candelaris</i>			C		1/1
fungi	sac fungi	Hymeneliaceae	<i>Aspicilia</i>			C		1/1
fungi	sac fungi	Lecanoraceae	<i>Lecanora oreinoides</i>			C		1/1
fungi	sac fungi	Parmeliaceae	<i>Punctelia subflava</i>			C		1/1
fungi	sac fungi	Parmeliaceae	<i>Xanthoparmelia exuviata</i>			C		2/2
fungi	sac fungi	Parmeliaceae	<i>Xanthoparmelia barbatica</i>			C		1/1
fungi	sac fungi	Parmeliaceae	<i>Xanthoparmelia lithophila</i>			C		1/1
fungi	sac fungi	Parmeliaceae	<i>Xanthoparmelia glareosa</i>			C		1/1
fungi	sac fungi	Parmeliaceae	<i>Xanthoparmelia murina</i>			C		1/1
fungi	sac fungi	Pertusariaceae	<i>Pertusaria subventosa</i>			C		1/1
fungi	sac fungi	Physciaceae	<i>Buellia</i>			C		2/2
fungi	sac fungi	Physciaceae	<i>Dirinaria complicata</i>			C		1/1
fungi	sac fungi	Physciaceae	<i>Pyxine berteriana</i>			C		1/1
fungi	sac fungi	Physciaceae	<i>Physcia jackii</i>			C		1/1
fungi	sac fungi	Solorinellaceae	<i>Gyalidea</i>			C		1/1
fungi	sac fungi	Teloschistaceae	<i>Caloplaca</i>			C		1/1
plants	ferns	Adiantaceae	<i>Cheilanthes sieberi subsp. sieberi</i>			C		3
plants	higher dicots	Acanthaceae	<i>Brunoniella australis</i>	blue trumpet		C		3
plants	higher dicots	Acanthaceae	<i>Rostellularia adscendens</i>			C		1
plants	higher dicots	Acanthaceae	<i>Pseuderanthemum variabile</i>	pastel flower		C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Amaranthaceae	<i>Nyssanthes erecta</i>			C		1
plants	higher dicots	Amaranthaceae	<i>Ptilotus macrocephalus</i>	green pussytails		C		1/1
plants	higher dicots	Apiaceae	<i>Daucus glochidiatus</i>	Australian carrot		C		1/1
plants	higher dicots	Apocynaceae	<i>Carissa ovata</i>	currantbush		C		1
plants	higher dicots	Apocynaceae	<i>Marsdenia viridiflora</i>			C		1
plants	higher dicots	Apocynaceae	<i>Sarcostemma viminale subsp. brunonianum</i>			C		1/1
plants	higher dicots	Apocynaceae	<i>Parsonsia eucalyptophylla</i>	gargaloo		C		2
plants	higher dicots	Apocynaceae	<i>Alstonia constricta</i>	bitterbark		C		1
plants	higher dicots	Asteraceae	<i>Calotis cuneifolia</i>	burr daisy		C		1/1
plants	higher dicots	Asteraceae	<i>Vittadinia sulcata</i>	native daisy		C		1/1
plants	higher dicots	Asteraceae	<i>Calotis lappulacea</i>	yellow burr daisy		C		2/1
plants	higher dicots	Asteraceae	<i>Conyza bonariensis</i>		Y			1/1
plants	higher dicots	Asteraceae	<i>Glossocardia bidens</i>	native cobbler's pegs		C		2
plants	higher dicots	Asteraceae	<i>Leptorhynchos baileyi</i>			C		1/1
plants	higher dicots	Asteraceae	<i>Olearia gordonii</i>			C		5/1
plants	higher dicots	Asteraceae	<i>Cassinia laevis</i>			C		1/1
plants	higher dicots	Asteraceae	<i>Vittadinia</i>			C		1
plants	higher dicots	Asteraceae	<i>Olearia elliptica subsp. elliptica</i>	sticky daisy bush		C		1/1
plants	higher dicots	Asteraceae	<i>Vittadinia dissecta var. dissecta</i>			C		1/1
plants	higher dicots	Asteraceae	<i>Chrysocephalum apiculatum</i>	yellow buttons		C		1
plants	higher dicots	Asteraceae	<i>Rhodanthe anthemoides</i>	white paper daisy		C		1/1
plants	higher dicots	Asteraceae	<i>Cyanthillium cinereum</i>			C		1
plants	higher dicots	Bignoniaceae	<i>Pandorea pandorana</i>	wonga vine		C		2/1
plants	higher dicots	Cactaceae	<i>Opuntia stricta</i>		Y			1
plants	higher dicots	Cactaceae	<i>Opuntia tomentosa</i>	velvety tree pear	Y			2
plants	higher dicots	Caesalpiniaceae	<i>Senna pleurocarpa</i>			C		2/2
plants	higher dicots	Caesalpiniaceae	<i>Petalostylis labicheoides</i>			C		2/2
plants	higher dicots	Caesalpiniaceae	<i>Senna pleurocarpa var. pleurocarpa</i>			C		2/2
plants	higher dicots	Caesalpiniaceae	<i>Senna artemisioides subsp. zygomphylla</i>			C		5/3
plants	higher dicots	Campanulaceae	<i>Isotoma axillaris</i>	australian harebell		C		1/1
plants	higher dicots	Capparaceae	<i>Capparis lasiantha</i>	nipan		C		1
plants	higher dicots	Capparaceae	<i>Capparis loranthifolia</i>			C		1
plants	higher dicots	Capparaceae	<i>Capparis mitchellii</i>			C		1/1
plants	higher dicots	Capparaceae	<i>Apophyllum anomalum</i>	broom bush		C		1
plants	higher dicots	Casuarinaceae	<i>Casuarina cristata</i>	belah		C		3/1
plants	higher dicots	Celastraceae	<i>Maytenus cunninghamii</i>	yellow berry bush		C		1
plants	higher dicots	Chenopodiaceae	<i>Sclerolaena</i>			C		1
plants	higher dicots	Chenopodiaceae	<i>Rhagodia spinescens</i>	thorny saltbush		C		1
plants	higher dicots	Chenopodiaceae	<i>Einadia hastata</i>			C		1
plants	higher dicots	Chenopodiaceae	<i>Enchylaena tomentosa</i>			C		1
plants	higher dicots	Chenopodiaceae	<i>Dysphania glomulifera</i>			C		1/1
plants	higher dicots	Chenopodiaceae	<i>Chenopodium desertorum subsp. microphyllum</i>			C		2/1
plants	higher dicots	Chenopodiaceae	<i>Sclerolaena convexula</i>			C		1/1
plants	higher dicots	Chenopodiaceae	<i>Sclerolaena muricata</i>			C		1
plants	higher dicots	Convolvulaceae	<i>Evolvulus alsinoides</i>			C		1
plants	higher dicots	Dilleniaceae	<i>Hibbertia stricta</i>			C		1/1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Euphorbiaceae	<i>Bertya opposens</i>			C	V	7/6
plants	higher dicots	Euphorbiaceae	<i>Beyeria viscosa</i>			C		2/2
plants	higher dicots	Fabaceae	<i>Medicago minima</i> var. <i>minima</i>		Y			1/1
plants	higher dicots	Fabaceae	<i>Tephrosia</i> sp. (The Grampians L.H.Bird AQ565381)			C		1/1
plants	higher dicots	Goodeniaceae	<i>Goodenia rotundifolia</i>			C		1/1
plants	higher dicots	Lamiaceae	<i>Prostanthera</i>			C		1/1
plants	higher dicots	Lamiaceae	<i>Westringia cheelii</i>			C		1
plants	higher dicots	Lamiaceae	<i>Marrubium vulgare</i>	white horehound	Y			1/1
plants	higher dicots	Lamiaceae	<i>Spartothamnella puberula</i>			C		5/1
plants	higher dicots	Lamiaceae	<i>Prostanthera</i> sp. (Baking Board V.Hando 135)			C		1/1
plants	higher dicots	Lamiaceae	<i>Spartothamnella juncea</i>	native broom		C		1
plants	higher dicots	Lamiaceae	<i>Teucrium corymbosum</i>	forest germander		C		2/2
plants	higher dicots	Loranthaceae	<i>Amyema maidenii</i>			C		3
plants	higher dicots	Loranthaceae	<i>Amyema miquelii</i>			C		1
plants	higher dicots	Loranthaceae	<i>Amyema maidenii</i> subsp. <i>maidenii</i>			C		3/3
plants	higher dicots	Malvaceae	<i>Abutilon</i>			C		3/1
plants	higher dicots	Malvaceae	<i>Hibiscus sturtii</i>			C		2
plants	higher dicots	Malvaceae	<i>Sida cunninghamii</i>			C		1/1
plants	higher dicots	Malvaceae	<i>Sida filiformis</i>			C		1
plants	higher dicots	Malvaceae	<i>Sida fibulifera</i>			C		1
plants	higher dicots	Malvaceae	<i>Abutilon oxycarpum</i>			C		2
plants	higher dicots	Malvaceae	<i>Abutilon fraseri</i> subsp. <i>fraseri</i>			C		1/1
plants	higher dicots	Malvaceae	<i>Sida</i> sp. (Musselbrook M.B.Thomas+ MRS437)			C		1/1
plants	higher dicots	Malvaceae	<i>Sida</i> sp. (Aramac E.J.Thompson+ JER192)			C		1/1
plants	higher dicots	Malvaceae	<i>Malvastrum americanum</i> var. <i>americanum</i>		Y			1
plants	higher dicots	Malvaceae	<i>Gossypium sturtianum</i>			C		1/1
plants	higher dicots	Mimosaceae	<i>Acacia aneura</i>			C		2
plants	higher dicots	Mimosaceae	<i>Acacia aprepta</i>	Miles mulga		C		2/1
plants	higher dicots	Mimosaceae	<i>Acacia wardellii</i>			V	V	5/5
plants	higher dicots	Mimosaceae	<i>Acacia macradenia</i>	zig-zag wattle		C		1/1
plants	higher dicots	Mimosaceae	<i>Acacia microsperma</i>	bowyakka		C		1/1
plants	higher dicots	Mimosaceae	<i>Acacia deanei</i> subsp. <i>deanei</i>			C		2/2
plants	higher dicots	Mimosaceae	<i>Acacia muelleriana</i>			C		1/1
plants	higher dicots	Mimosaceae	<i>Acacia harpophylla</i>	brigalow		C		1
plants	higher dicots	Mimosaceae	<i>Acacia catenulata</i>	bendee		C		5/2
plants	higher dicots	Mimosaceae	<i>Acacia burrowii</i>			C		3/2
plants	higher dicots	Myoporaceae	<i>Eremophila</i>			C		1
plants	higher dicots	Myoporaceae	<i>Myoporum montanum</i>	boobialla		C		1
plants	higher dicots	Myoporaceae	<i>Myoporum acuminatum</i>	coastal boobialla		C		1/1
plants	higher dicots	Myoporaceae	<i>Eremophila mitchellii</i>			C		4
plants	higher dicots	Myoporaceae	<i>Eremophila deserti</i>			C		1
plants	higher dicots	Myrtaceae	<i>Eucalyptus</i>			C		1
plants	higher dicots	Myrtaceae	<i>Kardomia jucunda</i>			C		5/4
plants	higher dicots	Myrtaceae	<i>Eucalyptus exserta</i>	Queensland peppermint		C		2/1
plants	higher dicots	Myrtaceae	<i>Eucalyptus melanoleuca</i>	Nanango ironbark		C		2/2
plants	higher dicots	Myrtaceae	<i>Melaleuca pallescens</i>			C		2/2

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	higher dicots	Myrtaceae	<i>Eucalyptus populnea</i>	poplar box		C		4
plants	higher dicots	Myrtaceae	<i>Eucalyptus crebra</i>	narrow-leaved red ironbark		C		1/1
plants	higher dicots	Myrtaceae	<i>Eucalyptus orgadophila</i>	mountain coolibah		C		1/1
plants	higher dicots	Myrtaceae	<i>Eucalyptus melanophloia</i>			C		1
plants	higher dicots	Nyctaginaceae	<i>Boerhavia dominii</i>			C		1
plants	higher dicots	Oleaceae	<i>Notelaea microcarpa</i>			C		3/2
plants	higher dicots	Oleaceae	<i>Jasminum didymum subsp. racemosum</i>			C		1/1
plants	higher dicots	Passifloraceae	<i>Passiflora aurantia var. aurantia</i>			C		2/2
plants	higher dicots	Phyllanthaceae	<i>Phyllanthus similis</i>			C		1/1
plants	higher dicots	Pittosporaceae	<i>Bursaria incana</i>			C		1
plants	higher dicots	Pittosporaceae	<i>Auranticarpa rhombifolia</i>			C		1/1
plants	higher dicots	Plantaginaceae	<i>Plantago turrifera</i>			C		1/1
plants	higher dicots	Proteaceae	<i>Hakea lorea subsp. lorea</i>			C		2/2
plants	higher dicots	Rhamnaceae	<i>Cryptandra armata</i>			C		2/2
plants	higher dicots	Rubiaceae	<i>Psydrax odorata</i>			C		1
plants	higher dicots	Rubiaceae	<i>Asperula hoskingii</i>			C		1/1
plants	higher dicots	Rubiaceae	<i>Psydrax odorata forma subnitida</i>			C		1/1
plants	higher dicots	Rutaceae	<i>Phebalium glandulosum subsp. glandulosum</i>			C		5/5
plants	higher dicots	Rutaceae	<i>Boronia odorata</i>			C		1/1
plants	higher dicots	Rutaceae	<i>Geijera parviflora</i>	wilga		C		4/1
plants	higher dicots	Rutaceae	<i>Phebalium glandulosum</i>			C		3
plants	higher dicots	Rutaceae	<i>Philothea difformis subsp. difformis</i>			C		2/2
plants	higher dicots	Sapindaceae	<i>Dodonaea viscosa</i>			C		2
plants	higher dicots	Sapindaceae	<i>Dodonaea viscosa subsp. spatulata</i>			C		2/2
plants	higher dicots	Sapindaceae	<i>Alectryon diversifolius</i>	scrub boonaree		C		2
plants	higher dicots	Sapindaceae	<i>Dodonaea boroniifolia</i>			C		1/1
plants	higher dicots	Sapindaceae	<i>Dodonaea heteromorpha</i>			C		1/1
plants	higher dicots	Solanaceae	<i>Solanum</i>			C		1
plants	higher dicots	Solanaceae	<i>Solanum ferocissimum</i>			C		4/2
plants	higher dicots	Solanaceae	<i>Solanum mitchellianum</i>			C		1/1
plants	higher dicots	Solanaceae	<i>Solanum semiaratum</i>	prickly nightshade		C		1
plants	higher dicots	Solanaceae	<i>Solanum innoxium</i>			C		5/5
plants	higher dicots	Solanaceae	<i>Solanum coracinum</i>			C		1/1
plants	higher dicots	Solanaceae	<i>Solanum nemophilum</i>			C		2
plants	higher dicots	Solanaceae	<i>Solanum argopetalum</i>			C		6/6
plants	higher dicots	Solanaceae	<i>Solanum jucundum</i>			C		4/4
plants	higher dicots	Surianaceae	<i>Cadellia pentastylis</i>	ooline		V	V	1/1
plants	higher dicots	Thymelaeaceae	<i>Pimelea trichostachya</i>	flaxweed		C		1/1
plants	higher dicots	Zygophyllaceae	<i>Roepera apiculata</i>			C		1/1
plants	monocots	Hemerocallidaceae	<i>Dianella revoluta</i>			C		1
plants	monocots	Laxmanniaceae	<i>Lomandra multiflora subsp. multiflora</i>			C		2
plants	monocots	Poaceae	<i>Panicum effusum</i>			C		1
plants	monocots	Poaceae	<i>Aristida lignosa</i>			C		1/1
plants	monocots	Poaceae	<i>Themeda triandra</i>	kangaroo grass		C		1
plants	monocots	Poaceae	<i>Aristida calycina</i>			C		2
plants	monocots	Poaceae	<i>Sporobolus caroli</i>	fairy grass		C		1

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	monocots	Poaceae	<i>Austrostipa scabra</i>			C		1
plants	monocots	Poaceae	<i>Chrysopogon fallax</i>			C		1
plants	monocots	Poaceae	<i>Pennisetum ciliare</i>		Y			1
plants	monocots	Poaceae	<i>Digitaria ammophila</i>	silky umbrella grass		C		1
plants	monocots	Poaceae	<i>Paspalidium gracile</i>	slender panic		C		1
plants	monocots	Poaceae	<i>Cymbopogon refractus</i>	barbed-wire grass		C		4/1
plants	monocots	Poaceae	<i>Eragrostis lacunaria</i>	purple lovegrass		C		2
plants	monocots	Poaceae	<i>Leptochloa decipiens</i>			C		1
plants	monocots	Poaceae	<i>Tripogon loliiformis</i>	five minute grass		C		1
plants	monocots	Poaceae	<i>Aristida jerichoensis</i>			C		2
plants	monocots	Poaceae	<i>Aristida caput-medusae</i>			C		2
plants	monocots	Poaceae	<i>Bothriochloa decipiens</i>			C		1
plants	monocots	Poaceae	<i>Enneapogon polyphyllus</i>	leafy nineawn		C		2
plants	monocots	Poaceae	<i>Setaria paspalidioides</i>			C		1/1
plants	monocots	Poaceae	<i>Thyridolepis xerophila</i>			C		4
plants	monocots	Poaceae	<i>Ancistrachne uncinulata</i>	hooky grass		C		3
plants	monocots	Poaceae	<i>Austrostipa ramosissima</i>	bamboo grass		C		3/1
plants	monocots	Poaceae	<i>Paspalidium constrictum</i>			C		2
plants	monocots	Poaceae	<i>Chloris divaricata var. divaricata</i>	slender chloris		C		2

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992*. The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ().

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*. The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).

This number is output as 99999 if it equals or exceeds this value. The second number located after the / indicates the number of specimen records for the taxon.

This number is output as 999 if it equals or exceeds this value.



Australian Government

Department of the Environment, Water, Heritage and the Arts

Protected Matters Search Tool

You are here: [Environment Home](#) > [EPBC Act](#) > [Search](#)

8 November 2010 16:35

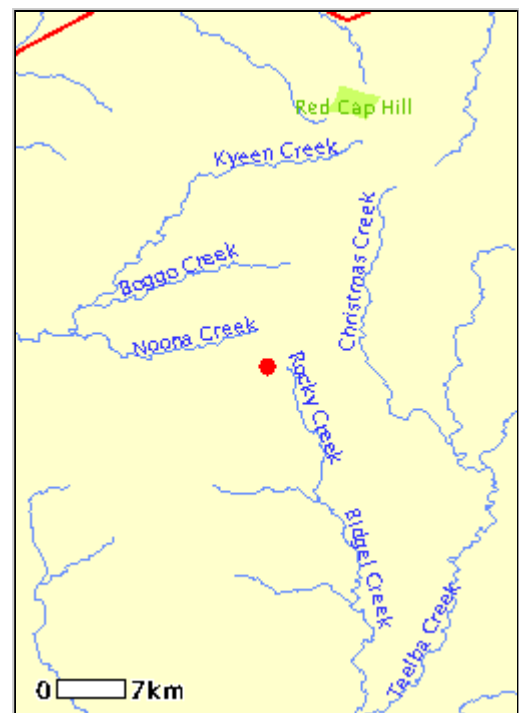
EPBC Act Protected Matters Report

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.

You may wish to print this report for reference before moving to other pages or websites.

The Australian Natural Resources Atlas at <http://www.environment.gov.au/atlas> may provide further environmental information relevant to your selected area. Information about the EPBC Act including significance guidelines, forms and application process details can be found at <http://www.environment.gov.au/epbc/assessmentsapprovals/index.html>

Search Type: Point
Buffer: 25 km
Coordinates: -27.57789,149.1975



Report Contents: [Summary](#)
[Details](#)

- [Matters of NES](#)
- [Other matters protected by the EPBC Act](#)
- [Extra Information](#)

[Caveat](#)
[Acknowledgments](#)

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

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 - see <http://www.environment.gov.au/epbc/assessmentsapprovals/guidelines/index.html>.

World Heritage Properties:	None
National Heritage Places:	None
<u>Wetlands of International Significance:</u> (Ramsar Sites)	1
Commonwealth Marine Areas:	None
<u>Threatened Ecological Communities:</u>	2
<u>Threatened Species:</u>	14
<u>Migratory Species:</u>	10

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 and the heritage values of a place on the Register of the National Estate. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage/index.html>.

Please note that the current dataset on Commonwealth land is not complete. Further information on Commonwealth land would need to be obtained from relevant sources including Commonwealth agencies, local agencies, and land tenure maps.

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. Information on EPBC Act permit requirements and application forms can be found at <http://www.environment.gov.au/epbc/permits/index.html>.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Places on the RNE:	None
<u>Listed Marine Species:</u>	8
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	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:	None
--------------------------------------	------

Other Commonwealth Reserves:	None
Regional Forest Agreements:	None

Details

Matters of National Environmental Significance

Wetlands of International Significance [[Dataset Information](#)]
(Ramsar Sites)

[NARRAN LAKE NATURE RESERVE](#) Within same catchment as Ramsar site

Threatened Ecological Communities [[Dataset Information](#)]

Status Type of Presence

[Brigalow \(*Acacia harpophylla* dominant and co-dominant\)](#)

Endangered Community known to occur within area

[Weeping Myall Woodlands](#)

Endangered Community likely to occur within area

Threatened Species [[Dataset Information](#)]

Status Type of Presence

Birds

[Geophaps scripta scripta](#)
Squatter Pigeon (southern)

Vulnerable Species or species habitat likely to occur within area

[Neochmia ruficauda ruficauda](#)
Star Finch (eastern), Star Finch (southern)

Endangered Species or species habitat likely to occur within area

[Polytelis swainsonii](#)
Superb Parrot

Vulnerable Species or species habitat may occur within area

[Rostratula australis](#)
Australian Painted Snipe

Vulnerable Species or species habitat may occur within area

Mammals

[Chalinolobus dwyeri](#)
Large-eared Pied Bat, Large Pied Bat

Vulnerable Species or species habitat may occur within area

[Nyctophilus timoriensis \(South-eastern form\)](#)
Greater Long-eared Bat, South-eastern Long-eared Bat

Vulnerable Species or species habitat may occur within area

Ray-finned fishes

[Maccullochella peelii peelii](#)
Murray Cod, Cod, Goodoo

Vulnerable Species or species habitat may occur within area

Reptiles

[Anomalopus mackayi](#)
Five-clawed Worm-skink, Long-legged Worm-skink

Vulnerable Species or species habitat may occur within area

[Egernia rugosa](#)
Yakka Skink

Vulnerable Species or species habitat likely to occur within area

[Furina dunmalli](#)
Dunmall's Snake

Vulnerable Species or species habitat may occur within area

Plants

[Acacia wardellii](#)

Vulnerable Species or species habitat may occur within area

Cadellia pentastylis Ooline	Vulnerable	Species or species habitat likely to occur within area
Homopholis belsonii	Vulnerable	Species or species habitat may occur within area
Tylophora linearis	Endangered	Species or species habitat may occur within area
Migratory Species [Dataset Information]	Status	Type of Presence

Migratory Terrestrial Species

Birds

Haliaeetus leucogaster White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Migratory	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Migratory	Species or species habitat may occur within area

Migratory Wetland Species

Birds

Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe	Migratory	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Migratory	Species or species habitat may occur within area

Migratory Marine Birds

Apus pacificus Fork-tailed Swift	Migratory	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Migratory	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Migratory	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [Dataset Information]	Status	Type of Presence
Birds		
Apus pacificus Fork-tailed Swift	Listed - overfly marine area	Species or species habitat may occur within area
Ardea alba Great Egret, White Egret	Listed - overfly marine area	Species or species habitat may occur within area
Ardea ibis Cattle Egret	Listed - overfly marine area	Species or species habitat may occur within area
Gallinago hardwickii	Listed -	Species or species habitat may occur

Latham's Snipe, Japanese Snipe	overfly marine area	within area
Haliaeetus leucogaster White-bellied Sea-Eagle	Listed	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail	Listed - overfly marine area	Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater	Listed - overfly marine area	Species or species habitat may occur within area
Rostratula benghalensis s. lat. Painted Snipe	Listed - overfly marine area	Species or species habitat may 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 Heritage and Register of National Estate properties, Wetlands of International 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 [migratory](#) and [marine](#) provisions of the Act have been mapped.

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.

Acknowledgments

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

- [New South Wales National Parks and Wildlife Service](#)
- [Department of Sustainability and Environment, Victoria](#)
- [Department of Primary Industries, Water and Environment, Tasmania](#)
- [Department of Environment and Heritage, South Australia Planning SA](#)
- [Parks and Wildlife Commission of the Northern Territory](#)
- [Environmental Protection Agency, Queensland](#)
- [Birds Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [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](#)
- Other groups and individuals

[ANUcliM Version 1.8, Centre for Resource and Environmental Studies, Australian National University](#) was used extensively for the production of draft maps of species distribution.

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

Last updated: Thursday, 20-Nov-2008 14:17:56 EST

[Department of the Environment, Water,
Heritage and the Arts](#)

GPO Box 787 Canberra ACT 2601 Australia
Telephone: +61 (0)2 6274 1111

© Commonwealth of Australia 2004



Appendix 8

AGL HSE Policy





Health, Safety and Environment Policy

AGL is committed to the health and safety of its people and to the protection of the environment. Life Guard, our Health, Safety and Environmental (HSE) Management System, applies to all AGL people, contractors, products and services.

Our policy is to:

- Provide a safe and healthy work place for all our people and our contractors
- Make Health, Safety and Environment (HSE) a part of all business decisions
- Identify, assess and manage HSE risks prior to commencing all activities, projects and acquisitions
- Apply standards that meet or exceed relevant legislation, regulations and community expectations
- Strive to operate in a manner which minimises HSE risk to our customers or to the public
- Continually improve our HSE performance by regular monitoring and review of Life Guard and by establishing goals at all levels within the Company
- Use resources and energy efficiently and minimise waste and emissions
- Reduce and, wherever possible, prevent pollution from our activities
- Lead, train and motivate our people and our contractors to work in a safe and responsible manner
- Communicate openly with our people, customers and the community on HSE matters
- Consult and seek contributions from our people on issues that have the potential to affect the environment, their health and safety
- Provide information and advice on the safe and responsible use of our products.
- On every job, no matter how small, we will take the time to perform our work safely and with proper regard for the environment.

We will:

- Strive towards having every person go home from work at least as healthy as when they came
- Consider contractor health and safety as important as that of our employees
- Encourage personal responsibility for HSE behaviour
- Build a culture of continuous improvement, openness and ownership
- Have simple systems that enable knowledge, spot trends and identify root causes
- Improve our HSE performance consistent with improving the long-term sustainability of the business

Michael Fraser
Managing Director
January 2008



**For more information call
02 9921 2999**



Health, Safety and Environment Policy Responsibilities

Employees

AGL people at all levels must:

- Comply with all legislation, standards and codes of practice that apply to their workplace
- Practise safe and environmentally sound work methods and behaviours
- Use all appropriate tools, materials, personal protective equipment and environmental safe guards correctly
- Take steps to fix, where safe to do so, and then report any hazards that are identified at work
- Report immediately to their leader all injuries, illness, environmental incidents and near misses, no matter how minor.

Leaders

Leaders are accountable for:

- Ensuring that their colleagues work, so far as is reasonably practicable, without risk to their health, safety or to the environment
- Conforming to and enforcing all legislation, standards and codes of practice that apply to their workplace
- Ensuring that every system of work and the working environment of each of their colleagues, so far as is reasonably practicable, is safe and without risk to health or to the environment
- Implementing the Life Guard Management System consistently in their workplace
- Training their colleagues so that they can develop and successfully maintain safe and environmentally sound working conditions and systems
- Taking steps to control hazards as they are reported
- Investigating incidents and implementing remedial actions to address the basic fundamental causes
- Resolving disputes regarding HSE issues.

Contractors and people supplying services

Contractors and people supplying services to AGL are required to know and comply with AGL's HSE Policy by:

- Conforming to and enforcing all legislation, standards and codes of practice and licensing that apply to work places under their control
- Adhering to any HSE requirements specified by AGL
- Ensuring that all personnel work, so far as is reasonably practicable, without risk to their health, safety or to the environment

Contractors and people supplying services continued...

- Ensuring that all personnel performing work on behalf of AGL have received appropriate training including safe and environmentally sound work practices
- Reporting immediately all incidents and near misses to AGL.

Life Guard Committees

The Life Guard committees will be supported by AGL people at all levels, and are responsible for:

- Assisting in the identification of workplace risks and making recommendations on safe systems of work
- Helping leaders, through consultation, to make the workplace safe and cause no harm to the environment
- Investigating, discussing and making recommendations about health, safety and environmental hazards and incidents
- Reviewing the remedial measures taken to ensure health, safety and the protection of the environment.

AGL HSE Management Groups

There are two AGL HSE Management groups, one for Merchant Energy and the other, Retail Energy and Corporate. These groups have senior management representation and are responsible for:

- Providing strategic direction for HSE policies and program development
- Providing clear leadership and commitment to AGL's HSE program by actively promoting Life Guard
- Developing and reviewing HSE policies that will assist leaders and colleagues in their business activities
- Establishing goals, setting targets, reviewing trends and ensuring HSE systems are reviewed regularly
- Ensuring continual improvement of the health and safety of AGL's people and contractors
- Ensuring that the Company's products and services are provided to the community and customers in a way that is safe and environmentally responsible
- Recommending additional resources as required and ensuring that Company HSE activities are managed consistently and constantly.

Appendix 9

Risk Management Matrix



Table 4.1 Environmental Impact Consequence Severity Rating Matrix

Area Impacted	Level 1 - Low severity	Level 2- Minor	Level 3 - Moderate	Level 4 - Major	Level 5 - High
General environmental and social effects	No lasting detrimental effect on the environment. Eg minor transient release of pollutant (including odour dust and noise), or minor social impact.		Long term detrimental environmental or social impact. eg. chronic and/or significant discharge of pollutant, a possible source of community annoyance.		Significant extensive detrimental long term impacts on the environment, the community and/or public health. Catastrophic and/or extensive chronic discharge of persistent hazardous pollutant.
Human health	Minor short-term inconvenience or symptoms.		Objective but reversible impairment to human health.		Fatal, long term or permanently disabling effects on human health, (more than one person affected)
Land -based ecosystem	Minor impacts on fauna / flora and habitat, but no negative effects on ecosystem function. Limited damage to a minimal area of land of no significant value. (ie no nature reserves, parks or unique habitats or values).		Significant changes in flora / fauna populations and habitat, but not resulting in eradication or any impact on endangered or beneficial species. Non-persistent but possibly widespread damage to land; damage that can be remediated without long term loss; or localised persistent damage		Long term and significant change in population (eg. eradication of beneficial or endangered species) or habitat with negative impact on ecosystem function. Widespread and persistent damage to a significant area of land and/or groundwater resource. (Having regard for the importance of the land, eg. unique habitat / national park).
Aquatic ecosystem	Minor impact on aquatic ecosystem, including flora, fauna and habitat. No significant impact on water resources.		Significant localised effects but without longer-term impact on aquatic ecosystems, and/or short term impacts on water resources.		Damage to an extensive portion of aquatic ecosystem resulting in severe impacts on aquatic populations and habitats and /or long term impact on water resources.
Cultural heritage	Minor repairable damage to commonplace structures, or minor infringement of cultural values.		Damage to structures / items of cultural significance, or significant infringement of cultural values / sacred locations.		Irreparable damage to highly valued structures / items / locations of cultural significance or sacred value.
Public / media reaction	Public concern restricted to local complaints.		May attract attention from local media and/or heightened concern by local community.		Probable public or media outcry (with national or international coverage).
Legal	Minor technical / legal issues. No serious breach of regulation. Prosecution unlikely. Minor licence non-compliances.		Possible or probable serious breach of regulation identified with on-the-spot fine and / or authority notification with prosecution or fine possible.		Major breach of regulation identified and/or serious incident notification and/or major investigation by authority with prosecution and significant fines probable.
Licence to operate	Some difficulties with regulator in gaining approvals.		Significant difficulties/delays in gaining approval or ability to continue to operate.		Licence to operate likely to be revoked or not granted.

Table 4.2 Qualitative Measures of Likelihood/ Frequency

Level	Descriptor	Description
A	Almost certain	The event is expected to occur in most circumstances
B	Likely	The event will probably occur in most circumstances
C	Moderate	The event should occur at some time
D	Unlikely	The event could occur at some time
E	Rare	The event may occur only in exceptional circumstances

Table 4.3 Qualitative Risk Analysis Matrix - Level of Risk

LIKELIHOOD	CONSEQUENCE SEVERITY				
	1 Low	2 Minor	3 Moderate	4 Major	5 High
A (almost certain)	S	S	H	H	H
B (likely)	M	S	S	H	H
C (moderate)	L	M	S	H	H
D (unlikely)	L	L	M	S	H
E (rare)	L	L	M	S	S
Legend:	<i>H: High risk</i> <i>S: Significant risk</i> <i>M: Moderate risk</i> <i>L: Low risk</i>				