Arckaringa Basin Exploration Drilling Activities

Statement of Environmental Objectives

October 2007

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Contents

Figures

Appendices

1 Introduction

This Statement of Environmental Objectives (SEO) for exploration drilling activities in the Arckaringa Basin has been prepared to meet the requirements of Sections 99 and 100 of the South Australian *Petroleum and* Geothermal Energy *Act 2000* and Regulations 12 and 13 of the *Petroleum and Geothermal Energy Regulations 2013*.

This SEO is based on a number of existing SEOs, in particular the *Statement of Environmental Objectives Drilling, Completion and Initial Production Testing,* for PEL 73 (DMS Partners LP 2007) and the *South Australia Cooper Basin Operators Statement of Environmental Objectives: Drilling and Well Operations* (Santos 2003).

The SEO was reviewed in October 2012 with reference to the requirements of the *Petroleum and Geothermal Energy Regulations 2013* section 14(2) which states that a review must take into account, or address:

- changes in information or knowledge in relevant areas
- community expectations in relation to relevant environmental issues
- changes in the use of land
- changes in operational practices
- other matters determined to be relevant by the Minister

The review concluded that all the above issues were appropriately addressed in the original SEO and that therefore there was no requirement to make significant changes and only minor changes have been made. These include,

- Updating the license details and map
- Ensuring that references to regulations and acts are correct
- Change references from PIRSA to DMITRE
- Change Coal Seam Gas Drilling to include all Coal Drilling such as Underground Coal Gasification drilling
- Incorporation of comments and responses received throughout consultation process

1.1 Purpose

The intent of this SEO is to outline the environmental objectives that SAPEX Limited (SAPEX) are required to achieve during drilling and initial production testing activities and the criteria upon which achievement of these objectives will be assessed.

The SEO has been developed based on the information and issues identified in the *Arckaringa Basin Exploration Drilling Activities Environmental Impact Report* (EIR) (RPS Ecos 2007).

The *Petroleum and Geothermal Energy Act* broadly defines the environment to include natural, social, cultural and economic aspects. The environmental objectives outlined in the SEO incorporate all of these aspects.

1.2 Scope

This SEO applies to all of SAPEX's drilling activities, including petroleum exploration drilling, initial production testing and coal drilling in the Arckaringa Basin, as described in the Environmental Impact Report.

Figure 1 shows the Arckaringa Basin.

There are two parks within the Arckaringa Basin, Tallaringa Conservation Park and Breakaways Conservation Park. These parks have access for mining and petroleum exploration activities, but both the Tallaringa Conservation Park and Breakaways Conservation Park areas are not covered within the scope of this SEO.

Activities covered by this SEO include:

- wellsite and access track construction
- petroleum exploration drilling
- coal exploration drilling
- well completions and workovers
- production testing (both drill stem tests and any initial production testing)
- well and zonal abandonment
- site and access abandonment and remediation.

The following operations are not covered by this SEO:

- seismic exploration activities
- production and processing operations beyond initial production testing.
- fracture stimulation activities

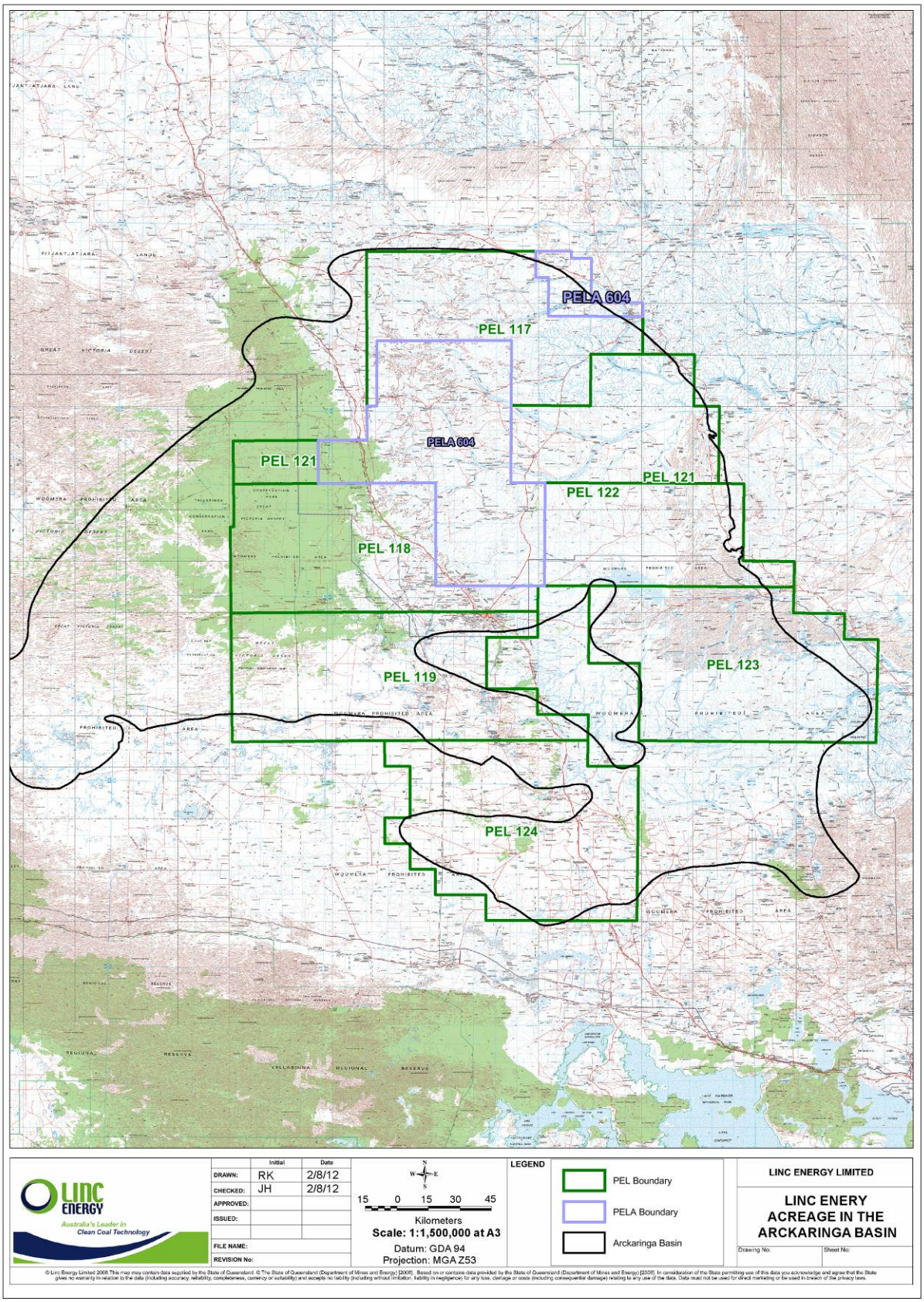

Figure 1: Arckaringa Basin

2 Environmental Objectives

Relevant objectives in the *Petroleum and Geothermal Energy Act* include:

- to minimise environmental damage from activities involved in exploration for, or the recovery or commercial utilization of, petroleum and other resources
- to establish appropriate consultative processes involving people directly affected by regulated activities and the public generally
- to protect the public from risks inherent in regulated activities.

Environmental hazards and risks of drilling and associated activities have been identified in the *Arckaringa Basin Exploration Drilling Activities Environmental Impact Report* (RPS Ecos 2007).

The relevant environmental objectives for drilling and initial production testing which must be achieved to address the risks identified in the EIR are:

1. Avoid disturbance to sites of Aboriginal and non-indigenous heritage significance.

2. Minimise disturbance to native vegetation and native fauna.

3. Prevent the introduction or spread of weeds and undertake control measures where required.

4. Minimise impacts to soil.

5. Minimise loss of reservoir and aquifer pressures and avoid aquifer contamination.

6. Minimise disturbance to drainage patterns and avoid contamination of surface waters and shallow groundwater resources.

7. Minimise risks to the safety of the public, employees and other third parties.

8. Minimise disturbance to stakeholders and associated infrastructure.

9. Minimise visual impact.

10. Minimise the impact on the environment of waste storage, handling and disposal.

11. Remediate and rehabilitate operational areas to agreed standards.

12. Minimise air pollution and greenhouse gas emissions.

3 Assessment Criteria

The environmental objectives identified above are subject to an assessment to measure the level of achievement. The assessment criteria for each objective will be one of the following:

- defined conditions – objectives for activities that can only be managed through the prevention of unacceptable actions (e.g. "No construction activities are carried out on salt lakes, wetlands or steep breakaway/tableland/stony hills landforms")
- defined requirements – the achievement of an objective can be assessed against the implementation of specific procedures or actions required for an activity (e.g. industry standards or Australian Standards)
- Goal Attainment Scaling (GAS) Criteria – objectives requiring visual assessment can be prone to uncertainties of subjective judgement. To minimise this occurring, GAS is used to measure such objectives against a series of criteria described by a written description and/or photographically. In this SEO, GAS is applied to wellsite construction and restoration and construction and restoration of borrow pits.

Appendix 1 tabulates the objectives and corresponding assessment criteria.

GAS criteria are presented in Appendix 2.

4 Reporting

It is a requirement under Section 85 of the *Petroleum* and Geothermal Energy *Act 2000* that any incidents that are determined to be 'serious' or 'reportable' incidents must be reported to the Minister.

4.1 Definitions

The following descriptions have been provided to help clarify and elaborate on the definitions given in Section 85(1) of the *Petroleum and* Geothermal Energy *Act 2000* and Regulation 32(1) of the *Petroleum and Geothermal* Energy *Regulations 2013*.

Serious Incidents

The Section 85(1) of the *Petroleum* and Geothermal Energy *Act 2000* defines a 'serious incident' as an incident in which:

(a) A person is seriously injured or killed

(b) An imminent risk to public health or safety arises

(c) Serious environmental damage occurs or an imminent risk of serious environmental damage arises, for example,

- Disturbance to sites of cultural and/or heritage significance without appropriate permits and approvals
- An escape of petroleum, process substance, a chemical or a fuel to a water body, or to land in a place where it is reasonably likely to enter a water body by seepage or infiltration, or onto land that affects the health of native flora and fauna species
- Detection of a declared weed, animal/plant pathogen or plant pest species that has been introduced or spread as a direct result of activities
- Any removal of rare, vulnerable or endangered flora and fauna without appropriate permits and approvals

(d) Security of natural gas supply is prejudiced or an imminent risk of prejudice to security of natural gas arises[1].

(e) An uncontrolled gas release resulting in the activation of emergency response and/or evacuation procedures of an area in or adjacent to the gas release, and/or fire or explosion.

(f) Some other event or circumstance occurs or arises that results in the incident falling within a classification of serious incidents under the regulations or a relevant statement of environmental objectives.

Pursuant to Regulation 12(2) of the *Petroleum* and Geothermal Energy *Regulations 2013*, the events listed below, that may arise from drilling and initial production testing activities, are also considered to be serious incidents:

- explosion or fire at a well or loading facility
- any spill of fuel, oil or hazardous material which enters land off the wellsite or encroaches into surface water or groundwater
- transportation accident involving oil spillage
- transportation accident resulting in fire
- disturbance to sites of Aboriginal or non-indigenous heritage significance
- removal of rare, vulnerable or endangered flora and fauna species, without appropriate permits and approvals
- Identification of crossflows in aquifers or uncontrolled flows to the surface.

Reportable Incidents

Reportable incidents are defined under Section 85(1) of the Act as an incident (other than a serious incident) arising from activities conducted under a licence that are classified under the regulations as a reportable incident.

Reportable incidents are defined under Regulation 32(1) as:

(a) an escape of petroleum, a processed substance, a chemical or a fuel that affects an area that has not been specifically designed to contain such an escape(other than a serious incident);

(b) an incident identified as a reportable incident under the relevant statement of environmental objectives.

Pursuant to Regulation 12(2) and Regulation 32(1) the following incidents are considered to be reportable incidents:

- Malfunction or failure of critical plant or equipment that has (or still has) potential to cause a serious incident.
- a reasonable complaint from a landholder in regard to drilling and initial production testing activities
- the introduction of weed species to the project area
- any detected unauthorised third party access to facilities and associated infrastructure.
- any other non-compliance with SEO objectives.

4.2 Reporting Requirements

Serious Incidents must be reported to the Minister as soon as practicable after the occurrence, as per Section 85 of the *Petroleum and Geothermal Energy Act 2000* and Regulation 32 of the *Petroleum and Geothermal Energy Regulations 2013*.

Reportable Incidents must be reported to DMITRE on a quarterly basis within 1 month of the end of the quarter, as per Regulation 32 of the *Petroleum and Geothermal Energy Regulations 2013*.

[1] Note: As administrative policy, DMITRE interprets this as follows: after taking into account relevant factors on a day and its rights and obligations under contracts, a significant curtailment of firm service to a shipper that may be necessary and may detrimentally impact upon the gas supply to a significant number of gas users.

5 References

DMS Partners LP (2007) *Statement of Environmental Objectives Drilling, Completion and Initial Production Testing. PEL 73 Stansbury Basin, Yorke Peninsula, South Australia*. January 2007.

PIRSA (2002) *Field Guide for the Environmental Assessment of Abandoned Petroleum Wellsites in the Cooper Basin, South Australia*. Petroleum Group, February 2002.

RPS Ecos (2007).*Arckaringa Basin Exploration Drilling Activities Environmental Impact Report.* Prepared for SAPEX Ltd, May 2007.

Santos (2003) *South Australia Cooper Basin Operators Statement of Environmental Objectives: Drilling and Well Operations*. Prepared for South Australia Cooper Basin Operators, November 2003.

South Australian Health Commission (1995). *Standard for the Construction, Installation and Operation of Septic Tank Systems in South Australia.* South Australian Health Commission Code, March 1995.

EPA (2007) Bunding and Spill Management. EPA Guidelines 080/07. South Australian Environment Protection Authority. Updated June 2007. http://www.epa.sa.gov.au/guidelines.html

Appendix 1:

Environmental Objectives and Assessment Criteria

Environmental Objectives and Assessment Criteria

Objective	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comment
1. Avoid disturbance to sites of Aboriginal and non-indigenous heritage significance.	A cultural heritage survey (or Work Area Clearance - WAC) has been undertaken of the proposed wellsite locations and access tracks prior to commencement of site preparation. No impact to sites of Aboriginal or non-indigenous heritage significance.	Documents and/or reports of scouting for cultural/heritage are available for review. Known heritage sites have been identified and protected from operations (e.g. temporary flagging). A procedure is in place for the appropriate response to any sites discovered during drilling activities. Reports of any accidental discoveries during drilling activities are available for review. Records of sites forwarded to the Aboriginal Heritage Branch in compliance with the Aboriginal Heritage Act. Consult with Heritage Branch, DEWNR regarding location of non-indigenous heritage sites.	The aim of this objective is to ensure that any sites of Aboriginal and European heritage significance are identified and protected. Newly discovered sites must be reported to the appropriate authorities.
2. Minimise disturbance to native vegetation and native fauna.	<u>Well Lease and Access Track Construction and Restoration</u> Any sites of rare, vulnerable and endangered flora and fauna have been identified, flagged and subsequently avoided. The attainment of either 0, +1 or +2 GAS criteria for 'Minimise disturbance of vegetation' objective for wellsite construction and for 'Minimise impacts on vegetation' objective for borrow pit construction and restoration, as listed in Appendix 2. The attainment of 0, +1 or +2 GAS criteria for 'Re-establish natural vegetation on abandoned wellsites and access tracks' objective listed in Appendix 2. <u>Drilling and Production Testing Activities</u> No fires during drilling and production testing activities. <u>Fuel and Chemical Storage and Handling</u> Refer to Assessment Criteria for Objective 4. <u>Waste Management</u> Refer to Assessment Criteria for Objective 10. No adverse effects on native fauna through any stage of construction, drilling and/or production. No unauthorized clearing of vegetation.	<u>Well Lease, Access Track and Camp Site Construction and Restoration</u> Appropriately trained and experienced personnel have scouted proposed wellsite (including sump and flare pit) and access tracks and campsites for purpose of identifying and flagging significant (or rare, vulnerable and endangered) flora and fauna. Vegetation clearance has been minimised and the conservation needs of specific species have been considered. Vegetation 'removed' for the passage of large vehicles is not left on the track or in a position to create a nuisance for visitors using the Anne Beadell Highway. Exploration activity is avoided in Vegetation Heritage Agreement areas unless there is consultation with DMITRE, Native Vegetation Council and DEWNR prior to activity approval. Documents and/or reports of scouting for flora/fauna are available for review. Facilities (e.g. borrow pits, well cellars) are designed and constructed as far as practicable to minimise fauna entrapment. Sumps and mud pits are fenced as appropriate to minimise wildlife access. Appropriate escape ramps for trapped animals will be installed. Borrow pits are restored to minimise water holding capacity where agreements are not in place with stakeholders. Leaving borrow pits capable of holding water has impacts on pastoral activities as well as native fauna and as such should involve consultation with both the pastoral board and lessee of pastoral	Where possible wellsites will be located to minimise the clearing of native vegetation.

Objective	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comment
		properties. Note: The PIRSA (2002) Field Guide provides photographic examples of GAS criteria for re-establishment of natural vegetation. Drilling and Production Testing Activities Confinement of flammable sources, restrictions on certain procedures and ready access to suitable fire fighting equipment. Where necessary, construction of a fire break around wellsite area and access track. Response to fire included in Emergency Response Plan. All personnel are fully informed on the fire danger season and associated restrictions Fire risk included in induction. Fire equipment maintained at wellsite and camp. Fuel and Chemical Storage and Handling Refer to Objective 4. Waste Management Refer to Objective 10. Fauna Management No domestic pets allowed at camps or worksites. Feeding of wildlife (e.g. dingoes) is not permitted. Implementation of an environmental incident management, recording and corrective actions system	
3. Prevent the introduction or spread of weeds and feral animals, and undertake control measures where required.	No weeds or feral animals introduced to, or spread in, operational areas as a consequence of activities	All vehicles and equipment appropriately cleaned and checked prior to entering the Arckaringa Basin in Coober Pedy or Port Augusta Vehicles and equipment are to be cleaned and checked when moving from areas within the Arckaringa Basin where weeds are present. Cleaning to be carried out in accordance with best practice guidelines. Records of vehicle and equipment cleaning are kept and available for review. The site and access will be monitored on a regular basis for new weed species and treated as necessary following discussions with the regional NRM Board and the landholder. Records of detection, monitoring or eradication of exotic weeds or noxious species introduced by industry activities are kept and are available for review.	The major potential source of weed introduction is from vehicles and equipment brought in from other regions of the state or interstate for the various well activities.

Objective	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comment
4. Minimise impacts to soil.	Wellsite and Access Track Construction Attainment of 0, +1 or +2 GAS criteria for 'Minimise impacts to soil' objective, as listed in Appendix 2. No construction activities are carried out on salt lakes, wetlands or steep breakaway/tableland/stony hills landforms (as defined in the EIR). Local erosion rates are not significantly accelerated above those of surrounding land Drilling and Production Testing No soil contamination as a result of drilling and production testing activities. Fuel and Chemical Storage and Handling Soil in areas affected by any spill is removed and/or bioremediated. No soil contamination as a result of fuel and chemical storage and handling. Contaminated soil removed from the license/lease area must be taken to an EPA licensed waste disposal facility. Level of hydrocarbons and other contaminants continually decreasing for in situ remediation of spills No spills/leaks outside of areas designed to contain them No overflow or escape of fluids from temporary ponds Waste Management Refer to Assessment Criteria for Objective 10.	Planning has been undertaken to minimise impacts of operations and records are available for review. There is no evidence of off-road driving or creation of shortcuts. Wellsite and Access Track Construction and Restoration Orientate site constructions to minimise soil removal. Separate topsoil and sump spoil stockpiles Soil removed in construction to be stored on site and returned to its original stratigraphic level upon restoration of the drill site. Oil spill areas have been ripped to an appropriate depth. Monitoring of local erosion rates in place – establish photo points. Minimal use grading/bulldozing in the Arckaringa region. Rolling and clearing is preferred in order to avoid windrows which restrict water movement across the landscape and potentially lead to water channelling and erosion. Drilling and Production Testing Sump to have sufficient capacity. Camp and drill rig generators to be located in polyethylene lined bunded areas to contain any spills. Production storage tanks to be stored in clay-lined bunded areas. Bunded areas must have sufficient freeboard (e.g. to hold a 1:25 year, 24hr rainfall event) All bunded areas will be in accordance with EPA guidelines *080/12 Bunding and Spill Management*. Initial production lines and tanks to be inspected prior to use. MSDS information readily available on the wellsite. Fuel and Chemical Storage and Handling Hazardous material stored, used and disposed of in accordance with relevant legislation on dangerous substances. All hazardous materials including fuels, oils and chemicals are to be stored in approved containers in polythene lined bunded pits or on bunded pallets. Initial production lines and tanks to be inspected prior to use. No refuelling outside designated refuelling/servicing areas. Appropriate spill response equipment is available on site Spills or leaks are immediately reported and clean up actions initiated. All contaminated soil will either be treated in-situ or removed. Records of spill events and corrective actions are maintained.	The impacts associated with soil disturbance include wind and water erosion and dust generation. The main impact to soil is caused by the removal of existing soil and/or the importation of foreign material for the construction of the site. The excavation and subsequent backfill of the sump may also lead to the inversion or mixing of topsoil and sub-soils. This creates a visual impact and can also alter the soil characteristics that can in turn impact on the effective re-establishment of native vegetation. Wellsites will be positioned and orientated to minimise soil removal. Removed soil will be stored according to its position in the ground and will be returned to the excavation in the correct order. Another potential impact to soil is soil contamination from accidental spillages of chemicals or hazardous substances during well operations. Precautions will be taken to prevent and contain spills at all sites where fuels are used or transferred (generators, vehicle refuelling). Bunds shall be used or constructed for the storage of hazardous materials (including fuel, oil and chemicals). All waste removal contractors will be licensed and will operate within EPA guidelines.

Objective	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comment
5. Minimise loss of reservoir and aquifer pressures and avoid groundwater contamination.	No groundwater and spring contamination as a result of drilling, completion or production testing activities. No unreasonable stakeholder complaints left unresolved No impact on mound spring flow rates due to water extraction activities. No impact on other groundwater users due to the water extraction activities. Drilling and Completion Activities No uncontrolled flow to surface (i.e. blow out). Sufficient barriers exist in casing annulus to prevent crossflow between separate aquifers or hydrocarbon reservoirs. Production Testing and Well Abandonment Activities No crossflow behind casing between aquifers, and between aquifers and hydrocarbon reservoirs unless approved by the Department of Environment, Water and Natural Resources.	Wellsite and water extraction points are discussed with landholders prior to use to eliminate any impact issues. SAPEX will undertake regional groundwater monitoring and sampling of the existing water bores in the area where it is possible Drilling and Completion Activities Observed volumes of cement return to surface match calculations. Where there is evidence of insufficient isolation, remedial action to be conducted. Well Abandonment Activities The identification of aquifers (stratigraphic layers) to be separated in well decommissioning activities. Isolation barriers to be set in place to ensure that crossflow, contamination or pressure reduction does not occur. Records of plug depths and intervals are kept. The decommissioning procedure for wells drilled within the 5km 'exclusion zone' surrounding springs or clusters will be established by including a stronger procedure such as complete cementing of drillholes through the GAB and connected aquifers within and external to the well casing and production zone material.	This objective seeks to protect the water quality and pressure of any aquifers and to maintain pressure in potential petroleum aquifers.
6. Minimise disturbance to drainage patterns and avoid contamination of surface waters and shallow groundwater resources.	Well Lease and Access Track Construction and Restoration Wellsites and access tracks are located to maintain pre-existing water flows (i.e. channel contours are maintained on floodplains and at creek crossings). The attainment of 0, +1 or +2 GAS criteria for 'Minimise disturbance to drainage patterns' objective listed in Appendix 2. Drilling and Production Testing Activities No contamination of surface waters and shallow groundwater resources as a result of drilling or production testing activities. No overflow or escape of fluids from temporary ponds Fuel and Chemical Storage and Handling No contamination of surface waters and shallow groundwater resources as a result of fuel or chemical storage and handling.	Wellsite and Access Track Construction and Restoration All access through watercourses areas carefully assessed to determine the locations of least impact to channels and creek banks. Any soil removed during the construction of the drill pad will be respread over the disturbed area during restoration. Any required remediation work carried out as soon as possible after completion of all activities. If any contamination from spillage of oils or fuel occurs, immediate effective clean-up procedures must be employed. Drilling and Completion Activities Information on muds and chemicals to be readily available on the rig. All drill cuttings, muds and non-toxic drill fluids are to be contained within a designated sump with adequate freeboard at completion of operations to allow for a 1m cover of clean fill at remediation. On completion of drilling the sump will be allowed to dry out and then backfilled level with the surrounding landscape. Fluid losses will be controlled during drilling. Where shallow aquifers present mud pits will be lined with impervious material e.g. polyethylene.	The main threats to drainage patterns, surface waters and shallow groundwater resources are considered to be contamination, as a result of spills, and interruption to natural drainage flows as a result of earthworks and drilling operations. Access track and wellsite selection will aim to minimise impact to drainage systems, by avoiding sensitive areas and appropriate construction methods. There is potential for the contamination of chemical and fuel storage areas, from oil and gas systems at well heads, during transportation of fuel and chemicals and during transportation of wastes. Localised contamination may result from spills or leaks of well operations chemicals (e.g. corrosion inhibitors) during storage and handling. The major threat of spills is the threat to

Objective	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comment
	Waste Management Refer to Assessment Criteria for Objective 10.	Drilling and Production Testing Sump to have sufficient capacity. Camp and drill rig generators to be located in polyethylene lined bunded areas to contain any spills. Production storage tanks to be stored in clay-lined bunded areas. Initial production lines and tanks to be inspected prior to use. Fuel and Chemical Storage and Handling Appropriate spill response equipment is available on site. Refer to Objective 4. Waste Management Refer to Objective 10	soil, vegetation and watercourses directly impacted by the spill. Avoidance of spills will be paramount in areas where the spill can be potentially spread beyond the immediate confines of the spill area into sensitive environments such as creeks and wetlands.
7. Minimise risks to the safety of the public, employees and other third parties.	No injuries to the public, employees or third parties as a result of drilling, completion and production testing activities.	Unauthorised Access by Third Parties "No Entry" signs warning of dangers associated with drilling operations placed at the entry to all site access track. Drilling and Completion Activities Drill rig, ancillary and any testing equipment to comply with Regulations, meet relevant industry standards and be "Fit for Purpose". Casing design carried out to meet worst case expected loads and environmental conditions determined for the specific geology intercepted by the well. Details of work to be performed are set out in the Drilling Program. Casing set in accordance with design parameters. Casing cemented to surface with visible return. Blow out prevention precautions / well control equipment in place in accordance with defined procedures and appropriate to the expected downhole conditions. Satisfactory kick tolerance in casing program design. Emergency Response Procedures in place. Confinement of flammable sources, restrictions on certain procedures and ready access to suitable fire fighting equipment. Well Abandonment Activities Downhole abandonment is carried out to meet worst case expected loads and downhole environmental conditions. Effective isolation maintained between any potential aquifers to prevent crossflow. Vehicle Movement	The guide to how to achieve this objective has been developed on the basis of the current understanding of the risks of wells to third party safety. Risks may span in time from immediate (e.g. unauthorised access, abandoned waste), to long term (e.g. breakdown over time of cement integrity around casing allowing crossflow). All reasonable steps will be taken to prevent unauthorised access to the site and warning signs will be appropriately located. The key to achieving the third party safety objective in relation to both downhole abandonment and surface wellsite restoration is to ensure that the visual prominence of the abandoned wellsite and access track is minimised to the extent where it is difficult for third parties to detect and therefore access the site. Fires or explosions at wellsites could result in complications resulting in a spill of production fluids (formation water and hydrocarbon), atmospheric emissions, disturbance of native vegetation and wildlife habitat, loss of reservoir pressure, and risk to employees, contractors and the public. The movement of heavy equipment

Objective	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comment
		Control production and dispersion of dust on unsealed roads and drilling lease areas. Compliance with relevant speed restrictions on access roads and tracks (including 40 km/h in Tallaringa Conservation Park). <u>Wellsite Restoration Activities</u> Assessment of the threat to third parties from well completion / downhole abandonment. Necessary measures (e.g. fencing, signage) taken to prevent the public accessing the wellhead equipment or waste relating to the well. Effective rehabilitation of the wellsite so that potentially dangerous perturbations in ground level do not remain. <u>Woomera Prohibited Area</u> Appropriate, necessary authorisations are obtained for access to the Woomera Prohibited Area.	associated with rig moves present a risk to the safety of employees, contractors and third parties (ie tourists). Abandonment plugs must be set to ensure long term isolation of any potential aquifers intersected or shallow zones may become over-pressured.
8. Minimise disturbance to stakeholders and associated infrastructure.	No adverse impact on livestock as a result of activities. No reasonable concerns raised by stakeholders are left unresolved.	Induction for all employees and contractors to cover pastoral, conservation, tourism, infrastructure and legislation issues. Gates or cattle grids are installed to a standard, consistent with pastoral infrastructure in fences where crossings are required for access. All gates left in the condition in which they were found (ie. open/closed). Potential sources of contamination are fenced as appropriate to prevent stock access. System is in place for logging landholder complaints to ensure that issues are addressed as appropriate. Requirements of the Cattle Care and Organic Beef accreditation programs are complied with. In recognised conservation reserves excavations are left in a state as agreed with the responsible statutory body. Appropriate, necessary authorisations are obtained for access to the Woomera Prohibited Area. In the event of an oil spill, contingency plan to be implemented after the spill event.	Communication and the establishment of good relations with stakeholders and community is fundamental to minimising disturbance to as low as practicably possible. Many pastoral properties are certified under the Organic Beef or CattleCare accreditation schemes and therefore may be affected by fuel and chemical storage, moving machinery and contaminated sites.

Objective	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comment
9. Minimise visual impact.	The attainment of 0, +1 or +2 GAS criteria for 'Minimise visual impact' objectives for wellsite restoration and borrow pit construction and rehabilitation listed in Appendix 2.	Compacted soil areas ripped (except in stony plains and tablelands) and soil profile and contours are reinstated following completion of operations. Soil removed in construction to be stored on site and returned to its original stratigraphic level upon restoration of the drill site. PIRSA (2002) Field Guide contains photographic examples of GAS criteria.	Fatchen and Woodburn (1997) study concluded that the predominant impacts of wellsite and access track construction are predominantly visual and not ecological. On the basis of this study a set of assessment criteria was established for assessing rehabilitation of abandoned and restored wellsites and access tracks (PIRSA 2002 Field Guide).
10. Minimise the impact on the environment of waste storage, handling and disposal.	No soil, surface water or ground water contamination as a result of waste storage and disposal. All wastes to be disposed of at an EPA licensed facility in accordance with EPA Licence conditions, with the exception of: ▪ drilling fluids, drill cuttings and other fluids disposed during well clean-up ▪ sewage and grey water ▪ putrescible domestic wastes (may be buried on-site in accordance with EPA requirements for short-term and temporary sites if transportation impractical). All wastewater disposed of in accordance with Department of Health Regulations Attainment of GAS criteria for 'Site to be left in a clean, tidy and safe condition' objective for wellsite restoration and borrow pit rehabilitation as listed in Appendix 2.	Covered bins are provided for the collection and storage of wastes. All loads of rubbish are covered during transport to an approved waste facility. Putrescible domestic wastes (e.g. food waste, paper) buried on site in accordance with EPA requirements or transported to EPA licensed facility with other waste where practical. The minimum buried depth/topsoil cover is sufficient to avoid future exposure via crows, dingo's or natural erosion. All Wastewater treatment and disposal will be via a product approved aerated wastewater treatment system and be disposed of in accordance with the *South Australian Public Health (Wastewater) Regulations 2013* and the *SA Health On-site Wastewater Systems Code April 2013.* Treated sewage wastewater disposed of onto land should not pool, and disposal should be well away from any place from which it is reasonably likely to enter any waters (through seepage or runoff). Production of waste is minimised by purchasing reusable, biodegradable or recyclable materials where practical.	Bins are covered to prevent access by fauna and the spread of rubbish by wind. Waste reduction requires continual improvement in purchasing, efficiency of use and reuse. Due to the distances involved, the cost of recycling a large range of products may be prohibitive. Ongoing review of recycling options is required to ensure that improvements are implemented as far as practical. Responsible handling and disposal of waste will reduce both short-term and long-term impacts of waste on the environment.

Objective	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comment
11. Remediate and rehabilitate operational areas to agreed standards	Well Lease and Access Track Restoration The attainment of 0, +1 or +2 GAS criteria for 'Minimise visual impact', 'Re-establish natural vegetation on abandoned wellsites and access tracks' and 'Site to be left in a clean, tidy and safe condition' objectives listed in Appendix 2. No reasonable stakeholder complaints left unresolved Borrow Pit Restoration The attainment of 0, +1 or +2 GAS criteria for 'Minimise impacts on vegetation', 'Minimise impact on soil', 'Minimise visual impacts' and 'Site to be left in a clean and tidy condition objectives listed in Appendix 2. No reasonable stakeholder complaints left unresolved	Refer to Objectives 2, 4, 5, 6, 7, 8, 9, 10. Rehabilitation/abandonment plans for surface activities will be developed in consultation with relevant stakeholders.	Refer to Objectives 2, 4, 5, 6, 7, 8, 9, 10.
12. Minimise air pollution and greenhouse gas emissions:	No reasonable stakeholder complaint left unresolved. No unplanned gas releases.	Well production diverted to flare as soon as practicable. Well testing curtailed when test objectives are satisfied.	

Appendix 2:

Goal Attainment Scaling Criteria

GAS Criteria for Wellsite Construction and Restoration

Objectives	Measure Associated Goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor Shortfall - 1	Significant Shortfall - 2
CONSTRUCTION						
Minimise impacts to soil	Topsoil stockpiled and separated from sump/trench spoil			Separate topsoil, cleared vegetation and spoil stockpiles present at well lease and campsite	Topsoil and spoil stockpile mixing evident	No stockpiled topsoil evident
	Stony/gibber pavement rolled			Stony/gibber pavement rolled		Blading has occurred in tablelands & stony plains
Minimise disturbance of vegetation	Impact on vegetation	No trees or vegetation removed	No trees removed, only vegetation of Priority 4 cleared.	Trees and vegetation removed in area where could not have been avoided	Vegetation of Priority 2 or 3 removed in area where could have been avoided	Trees of Priority 1 removed where could have been avoided
Minimise disturbance to drainage patterns	No obstruction of water flows	No obstruction of channels of any dimension		No obstruction of water flows or flows diverted around the well lease if required	Minor channels only obstructed during well lease and access track construction	Water flows obstructed as a result of earthworks
RESTORATION						
Minimise visual impact	Wellsite restoration	The site contours and colour blend with the surroundings and earthwork disturbance is indistinguishable from the surroundings.	The earthwork disturbance is beginning to blend into the surroundings	The site contours and colour blend with the surroundings; but earthwork disturbance (eg ripping or respreading of original material) is still prominent.	The site surface and edge have been contoured into the surrounding landscape, but the colour of foreign material contrasts with the surroundings.	The site remains as a prominent consolidated surface with a distinct edge.
	Wellsite restoration on dunes or slopes	The edge and colour of the site blend with the surroundings. The site contours are indistinguishable, whether viewed from the top or base of the slope.	The edge and colour of the site blend with the surroundings. The site contours are visible only when viewed from the top of the slope. They cannot be seen from the base. There are no erosion gullies down the face of the slope.	The edge and colour of the site blend with the surroundings. The site contours are visible only when viewed from the top of the slope. They cannot be seen from the base. Erosion gullies are present down the face of the slope but they are not extensive or prominent.	The edge of the site has been restored into the natural contour of the dune/slope, but the colour of foreign material contrasts with the surroundings.	Extensive gully erosion down the face of the slope and/or a steep site edge is prominent

Objectives	Measure Associated Goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor Shortfall - 1	Significant Shortfall - 2
	Access track restoration	The track contours and colour blend with the surroundings and the earthwork disturbance is indistinguishable.	The track contours and colour blend with the surroundings and the earthwork disturbance is beginning to blend also.	The track contours and colour blend with the surroundings, but the earthwork disturbance (eg. ripping, rolling or respreading of original material) is still prominent.	The track surface has been contoured into the surrounding landscape, but the colour of foreign material contrasts with the surroundings.	The track is prominent because of a scraped surface, windrows along its edges or gully erosion.
Re-establish natural vegetation on abandoned wellsites and access tracks	For wellsites where it has been less than 5 years since restoration	The revegetation is extensive and mostly consists of annuals and biennials. Perennials which are consistent with the surroundings are beginning to establish.	The revegetation is extensive and consists of annuals and biennials. In contrast to the surroundings, there are no perennials.	The site surface has been appropriately restored to facilitate revegetation (eg. ripping or respreading of original material).	The colour of foreign material contrasts with the surroundings. Re-vegetation with inappropriate species	The site remains as a consolidated surface.
	For wellsites where it has been more than 5 years since restoration	The revegetation type, density and maturity is indistinguishable from the surroundings.	The revegetation, mostly perennials, is consistent with the surroundings, but there is contrast in maturity between them.	The revegetation consists of annuals, biennials and perennials, but there are some bare patches which are inconsistent with the surroundings.	The revegetation mostly consists of annuals and biennials. In contrast to the surroundings, there are few perennials.	No revegetation evident.
Site to be left in a clean, tidy and safe condition	Well marked and cellar backfilled			Cellar backfilled and marker installed.	Cellar backfilled but no marker installed.	Cellar not completely backfilled.
	Rubbish removed			No evidence of litter on site.	Small items of litter spread over more than 50% of the site (eg. tin cans, nuts & bolts, rags, small pieces of cable, wood etc.).	Large items of litter present across site (eg. drums, pieces of casing, cables etc.).

GAS Criteria for Borrow Pits

Objectives	Goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor Shortfall - 1	Significant Shortfall - 2
CONSTRUCTION						
Minimise impacts on vegetation	Perennial vegetation clearance minimised	No trees or vegetation removed	No trees removed, only vegetation of Priority 4 cleared	Trees and vegetation removed in area where could not have been avoided	Trees of Priority 2 or 3 removed in area where could have been avoided	Trees of Priority 1 removed in area where could have been avoided
Protect sites of natural, scientific, or heritage significance	Avoid sites	Sites identified, flagged and avoided by 100m		Sites identified, flagged and avoided		Sites disturbed
Minimise visual impacts	Site pit appropriately	Borrow pit not visible from roads	Borrow pit shielded from road by utilizing screening vegetation or landform	Borrow pit more than 50m from road Visible from road due to lack of screening vegetation	Borrow pit less than 50m from road	Borrow pit less than 20m from road
REHABILITATION						
Minimise impacts on vegetation	Acceptable revegetation after rainfall	Vegetation type and density indistinguishable from surrounding landscape		Perennial grasses and shrubs revegetated, type consistent with surroundings. Some bare patches still present Vegetation cover uniform over base and sides of pit	Revegetation localised on the base of the pit but none or very little on the sides of the pit	No revegetation evident
Minimise impact on soil	Minimise erosion	No erosion anywhere on the pit		Minor erosion along the sides of the pit	Moderate erosion	Severe erosion evident
Minimise visual impacts	Borrow pit effectively recontoured and ripped	Pit contours indistinguishable from surrounding landscape. Access ripped	Pit contours blend well into surrounding landscape, although still evident	Pit sides battered and ripped along the contour, but is still highly visible Topsoil and vegetation respread over disturbed area	Pit sides battered but not ripped	No re-contouring of pit has occurred – pit sides are very steep Topsoil and vegetation not respread
Site to be left in a clean and tidy condition	Rubbish removed			No evidence of litter	Small items of litter present on site	Large items of litter present

Notes:

(a) Priority classification refers to Priority Plant species as described in the *Arckaringa Basin Exploration Drilling Activities Environmental Impact Report* (RPS Ecos 2007).

(b) Windrows in this context refer to the mounding of soil or gibbers through the action of wheel trafficking and associated dispersal of soil/gibbers away from wheel tracks.

(c) All vertical measurements to be measured from normal ground surface.

(d) If any criterion (dot point) within a -1 or -2 cell occurs, then a score of -1 or -2 will be allocated.

(e) For 0, +1 and +2 cells, all relevant criteria (dot point) within the cell must be satisfied to score at that level.

(f) Some criteria at -2 levels may also be subject to defined conditions, but are included in this table to ensure that they are clearly identified.

(g) The *Field Guide for the Environmental Assessment of Abandoned Petroleum Wellsites in the Cooper Basin, South Australia*. (PIRSA Petroleum Group, 2002) provides photographic outcomes for some of the Land Systems found in the Arckaringa Basin.