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AHAVA
ENERGY

STATEMENT OF ENVIRONMENTAL OBJECTIVES

Exploration Drilling Activities in the Anangu Pitjantjatjara Yankunytjatjara Lands Region of the Officer Basin

Five Year Review: November 2015 / Ahava_SEO_v6_rev

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Exploration Drilling Operations in the Anangu Pitjantjatjara Yankunytjatjara Lands Region of the Officer Basin.

Five Year Review: November 2015 / Ahava_SEO_v6_rev

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Coffey Environments Australia Pty Ltd ABN 65140765902
(formerly Coffey Natural Systems)
Level 1, 2–3 Greenhill Road Wayville SA 5034 Australia
T (+61) (8) 7221 3588 F (+61) (8) 7221 3567
coffey.com

coffey environments
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

Project director	Danielle Martin		
Project manager	Justin Rowntree		
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1. EXECUTIVE SUMMARY

This Statement of Environmental Objectives (SEO) for exploration drilling activities in the Ananngu Pitjantjatjara Yankunytjatjara Lands region of the Officer Basin has been prepared in accordance with the requirements of Sections 99 and 100 of the *Petroleum and Geothermal Energy Act 2000*.

The environmental objectives outlined in this SEO have been developed based on the Environmental Impacts Report (EIR) for the Ananngu Pitjantjatjara Yankunytjatjara Lands region of the Officer Basin (Coffey Natural Systems, 2009).

The SEO describes the environmental objectives to be achieved whilst undertaking exploration drilling activities and specifically on the Ananngu Pitjantjatjara Yankunytjatjara Lands within Petroleum Exploration Licences (PELs) 138, 147 and 148. It also details defined conditions, assessment methods and criteria by which performance can be gauged and the required compliance auditing and reporting process.

This SEO originally has been developed by Coffey Natural Systems on behalf of Ahava Energy and has been subject to a rigorous process of consultation and feedback to ensure that all issues of concern among landowners and stakeholders have been adequately addressed. Subject to Regulation 14 of the *Petroleum and Geothermal Energy Regulation 2013*, this SEO and associated EIR has been reviewed and revised. Ahava has reviewed thoroughly the SEO document following discussions with the Department of State Development (DSD), Energy Resources Division (ERD). All the comments and feedback received from DSD –ERD have been addressed within the document and consultation with the primary stakeholders, the APY Lands Management Unit, Traditional Land Owners and Executive Board has been carried out. The new SEO document has been approved by the APY Executive Board during an Executive meeting on 12 May 2015.

Conditions of access have been negotiated with Ananngu Pitjantjatjara Yankunytjatjara Executive Board and the relevant Traditional Owners regarding petroleum operations on the Ananngu Pitjantjatjara Yankunytjatjara Lands. These conditions of access to the Lands are described in the conjunctive land access agreement for petroleum operations in Ahava Energy's operated PELs signed on 14 July 2009. If any of the conditions of this agreement are breached, it will also be deemed to be a breach of this SEO. This is an active commitment and is a regulatory stipulation of the Department of State Development (DSD).

The land access agreement applies to PELs 138, 147 and 148. However, section 7 of the *Ananngu Pitjantjatjara Yankunytjatjara Land Rights Act 1981* requires that Ananngu must first obtain consent from the Traditional Owners prior to finalising any agreement in respect of those lands. The traditional owners have agreed to grant the licences on 14 July 2009 for PEL 138 and on 18 November 2010 for PELs 147 and 148.

Consequently the land access agreements have been drafted so that the terms apply immediately to PELs 138, 147 and 148.

2. INTRODUCTION

Ahava Energy currently operates PELs 138, 147 and 148 in the Ananngu Pitjantjatjara Yankunytjatjara Lands region of the Officer Basin. A requirement of the *Petroleum and Geothermal Energy Act 2000* and *Petroleum and Geothermal Energy Regulations 2013* is that no regulated activity (such as exploration drilling for petroleum) under a licence can be carried out unless an approved statement of environmental objectives (SEO) has been developed and approved.

Exploration drilling is defined as a regulated activity under the *Petroleum and Geothermal Energy Act 2000* and therefore requires an approved SEO for the area or land system in which the activity is to be carried out. The *Petroleum and Geothermal Energy Regulation* No. 12 details that an SEO must contain:

- Environmental objectives relating to the relevant activity.
- Criteria to be used to measure and assess the achievement of the environmental objectives.

This SEO describes Ahava Energy's environmental objectives and the defined conditions that will be used to measure the achievement of the environmental objectives of exploration drilling activities within the Ananngu Pitjantjatjara Yankunytjatjara Lands region of the Officer Basin. This SEO outlines the auditing requirements of Ahava Energy, as well as other methods that may be applied by Ahava Energy, the government, landowners or other stakeholders to evaluate the level to which the described environmental objectives are achieved. These objectives reflect the findings of the EIR, prepared by Coffey Natural Systems (2009), for this regulated activity.

For the purpose of this document, 'environmental objectives' include objectives for the protection of the way of life of Ananngu Pitjantjatjara Yankunytjatjara people. Throughout this document, peoples belonging to the Ananngu Pitjantjatjara Yankunytjatjara Lands are referred to as, 'Ananngu', meaning 'people'.

This document has also been prepared in the context of a broader program of environmental and social planning on the Ananngu Pitjantjatjara Yankunytjatjara Lands, driven by the Ananngu Pitjantjatjara Yankunytjatjara Executive Board. In anticipation of future resources development, the Executive Board has taken active steps to ensure such activities on the Ananngu Pitjantjatjara Yankunytjatjara Lands act as a stimulus for broader improvement of the social situation on the Ananngu Pitjantjatjara Yankunytjatjara Lands. It is understood both parties, Ananngu Pitjantjatjara Yankunytjatjara and Ahava Energy, have agreed to collaborate to ensure such exploration and other future activities are conducted in a way which is aligned to the aspirations and needs of the Ananngu Pitjantjatjara Yankunytjatjara Lands communities and helps maximise the benefits for those communities.

2.1 Scope

PELs 138, 147 and 148 are entirely within the Ananngu Pitjantjatjara Yankunytjatjara Lands (as defined by the *Ananngu Pitjantjatjara Yankunytjatjara Land Rights Act* 1981), an area of cultural and environmental importance in north-western South Australia. Specific conditions relating to exclusion zones on the basis of indigenous cultural significance are considered of high importance and will be determined through appropriate consultation and clearance surveys.

This SEO is applicable to exploration drilling activities within PELs 138,147 and 148 (see Figure 2.1) within the Ananngu Pitjantjatjara Yankunytjatjara Lands region of the Officer Basin. Ahava Energy will not undertake any exploration drilling activities in the active Mintabie opal mining area.

The southern portions of PEL 138, 148 and 500 are located within the Woomera Prohibited Area (WPA) (see Figure 2.1). Ahava Energy will not undertake any drilling activity within the Woomera Prohibited Area.

The Walalkara Indigenous Protected Area (IPA) exists within the boundaries of PELs 147 and 148. The Walalkara IPA is an area of indigenous-owned land where the Traditional Owners have entered into an agreement with the Australian Government to protect and enhance the biodiversity of the areas of unique conservation significance through traditional management techniques.

Vegetation clearance resulting from the exploration drilling activities discussed in this SEO are exempt from clearance controls under Regulation 5 of the *Native Vegetation Act 1991* when prepared in accordance with an approved SEO. Although vegetation clearance will be avoided where possible, where vegetation clearance is unavoidable, it will be conducted in accordance with accepted industry environmental management practices.

Activities associated with exploration drilling activities that are covered by this SEO are as follows:

- Wellsite and access track construction.
- Petroleum 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 activities are not covered by this SEO.

- Seismic exploration activities.
- Fracture stimulation activities.
- Production and processing operations beyond initial production testing.

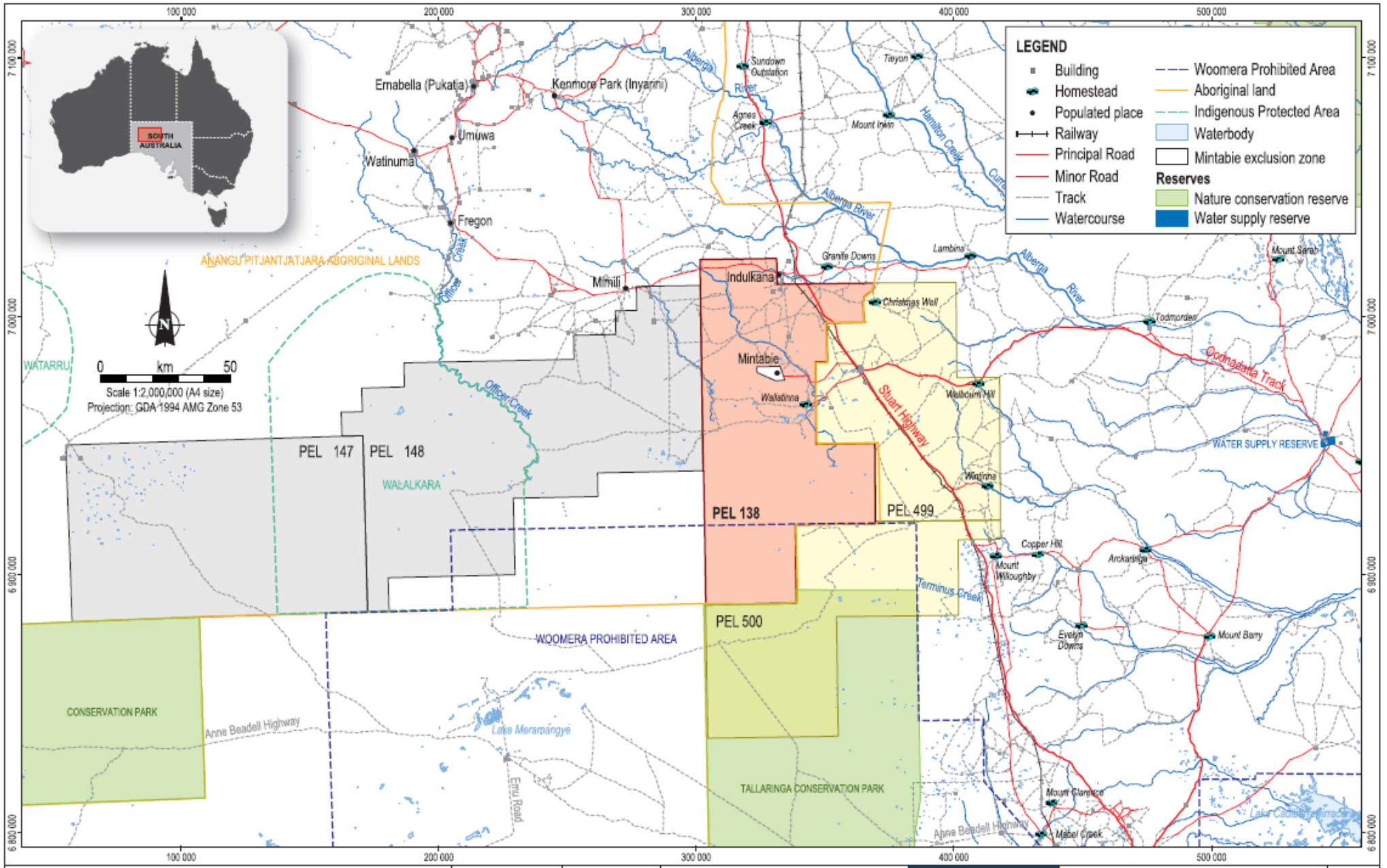
These activities are discussed in detail in the companion EIR document (Coffey Natural Systems, 2009).

2.2 Definition

Section 4(1) of the *Petroleum and Geothermal Energy Act 2000*, provides the definition of *environment* as encompassing:

- Land, air, water (including both surface and underground water), organisms and ecosystems.
- Buildings, structures and cultural artefacts.
- Productive capacity or potential.
- The external manifestations of social and economic life.
- The amenity of an area.

The environmental objectives outlined in this SEO aim to incorporate all aspects of this definition.



coffey environments	Job No: 5038	Ahava Energy	AHAVA ENERGY	Location of Ahava Energy's PELs in the Anangu Pitjantjatjara Yankunytjatjara Lands Region of the Officer Basin	Figure No: 2.1
	File Name: 5038_02_F02.01_HB	Statement of Environmental Objectives			

3. ENVIRONMENTAL OBJECTIVES

The *Petroleum and Geothermal Energy Act 2000* sets out important environmental objectives under which regulated activities such as exploration drilling must operate, these include:

- All activities under the Act that may adversely impact the environment should be managed to reduce those impacts.
- Elimination as far as possible of long-term adverse environmental impacts.
- Rehabilitation of land adversely impacted by regulated activities.

Environmental objectives for exploration activities must:

- Outline criteria to be applied to determine whether the environmental objectives have been achieved for each case.
- Include conditions and requirements to be complied with to achieve the objectives.
- Impose reporting obligations on persons carrying out exploration or geophysical activities.

The environmental objectives for exploration drilling activities in the Ananngu Pitjantjatjara Yankunytjatjara Lands region of the Officer Basin are to:

- Maintain stakeholder relationships and minimise disturbance to Ananngu Pitjantjara Yankunytjatjara infrastructure and social / economic ways of life.
- No disturbance to indigenous and non-indigenous heritage sites, remains and places unless prior approval under relevant legislation obtained.
- No unauthorised impacts to native flora and fauna (including terrestrial and aquatic) due to regulated activities or escape of petroleum, processes, substance, chemical or fuel.
- Minimise disturbance to drainage patterns and avoid contamination of surface waters.
- No impacts to existing or future groundwater users and groundwater dependent ecosystems.
- No injuries, deaths or health impacts to the public or third parties and air quality from regulated activities that could have been reasonably prevented by the operator.
- No introduction of new species of weed, plant or pathogen or pests (feral animal) and implement control measures as necessary.
- Remediate and Rehabilitate operational areas to agreed standards

The environmental objectives are outlined in more detail in Attachment A, along with defined conditions and how these objectives may be met. Adhering to the environmental objectives will also assist Ahava Energy in maintaining and enhancing its relationship with the Traditional Owners of the Ananngu Pitjantjatjara Yankunytjatjara Lands.

Adhering to the environmental objectives during the proposed exploration drilling activities will also conform with the national strategy for ecologically sustainable development which includes the principle of *'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'* (Ecological Sustainable Development Steering Committee, 1992).

4. ASSESSMENT METHODS

It is a mandatory requirement under the *Petroleum and Geothermal Energy Act 2000* that the environmental objectives, outlined in Section 3 Environmental Objectives of this document, are measured and reported on. The following methods were developed to facilitate the realisation of these objectives. These methods apply to the activities involved in exploration drilling activities and one or more of the methods may be used.

4.1 Defined Conditions for Exploration Drilling Activities

Defined conditions are one criteria used to ensure that the environmental objectives set out in this document have been met.

Ahava Energy and associated contractors are obliged to operate under the defined conditions and any other criteria placed upon their operations as part of the approvals process. Defined conditions associated with exploration drilling activities on the Anangu Pitjantjatjara Yankunytjatjara Lands may be set as a part of assessment criteria (as detailed in Appendix A) or as conditions on an activity approval.

Defined conditions are also interpreted as being the requirement to carry out certain actions in accordance with approved procedures, relevant legislation (such as the Environment Protection Act 1993, Aboriginal Heritage Act 1988 and Fire and Emergency Services Act 2005), industry standards and with particular respect to the conjunctive land access agreement for petroleum operations in Ahava Energy's license areas.

An audit, pursuant to section 6.1 of this SEO, will be conducted to assess the level to which these conditions have been met.

4.2 Goal Attainment Scaling

Goal attainment scaling (GAS) was adapted by the South Australian government agency, Department of State Development (DSD) to act as a tool to provide an equitable and transferable means of assessing the attainment of environmental objectives (see Attachment B). Descriptions provide a series of criteria that can be used to rate environmental disturbance from exploration drilling activities. This tool is particularly useful in monitoring the impacts on natural vegetation and soil.

4.3 Industry Standards

The Australian Petroleum Production and Exploration Association (APPEA) has established industry standards and procedures that may be adopted to guide and plan activities. These include the Code of Environmental Practice (APPEA, 2008) and the APPEA Principals of Conduct (APPEA, 2003). Ahava Energy may adopt the APPEA standards to provide an additional means of assessment of operations.

4.4 Scientific Studies

Surveys and monitoring programs (including ecological, social, cultural and any other specific relevant subjects) may not be possible in the shorter term and may require longer-term monitoring and/or scientific evaluation. In such cases, the assessment criteria may be in the form of longer-term data and information gathering and scientific studies. The results of such work could then be used to further develop or refine existing GAS criteria and environmental objectives.

4.5 Stakeholder Liaison

Periodic liaison with Traditional Owners and other interested stakeholders as described in the Conjunctive Land Agreement may further assist in the identification of additional issues of importance. The SEO was reviewed by Ahava and has incorporated all the comments and feedback from the Department of State Development (DSD), Energy Resources Division (ERD) within the document. A consultation with the APY Lands Management Unit, the Traditional Land Owners and the Executive Board has been carried out. The new SEO has satisfied the priority stake holders above.

4.6 Other Techniques as Appropriate

Other methods of assessment and/or monitoring that prove to be useful may be developed as activities commence and the potential impacts to this land system become realised.

5. ASSESSMENT CRITERIA

Each environmental objective contained within this SEO will be assessed using a selection of the assessment methods detailed in Section 4, Assessment Methods. The use of different assessment options as described in Section 4 will enable Ahava Energy, regulators and others to determine the level to which the defined objectives are met. Criteria relevant to each environmental objective are presented in Attachment A.

6. OPERATIONAL REPORTING

Regulation 33 of the *Petroleum and Geothermal Energy Regulations 2013* details that a licensee must submit annual reports to DSD (formerly PIRSA) detailing activities conducted within each licence area during the respective licence year, as well as the activities proposed for the ensuing licence year. An important part of this reporting is to ensure that each licensee regularly reviews, assesses and reports on their performance and compliance with the *Petroleum and Geothermal Energy Act 2000*, *Petroleum and Geothermal Energy Regulations 2013* and this SEO. The licensee must also provide:

- Daily drilling reports on exploration drilling activities in accordance with Regulation 38 under the *Petroleum and Geothermal Energy Act 2000.*
- Well completion reports within six months after rig release in accordance with Regulation 40 of the *Petroleum and Geothermal Energy Act 2000.*
- Well test analysis reports within six months after the well test is completed in accordance with Regulation 42 of the *Petroleum and Geothermal Energy Act 2000.*

6.1 Government Auditing

DSD may conduct random audits of exploration drilling activities both in the field and in the office, using the assessment techniques defined in Section 4, Assessment Methods. The aim of these audits is to confirm if the environmental objectives are being achieved and verify the accuracy of the licensee's audit reports, the effectiveness of the licensee's Environmental Management System (EMS) and provide feedback to company personnel. The selection of sites to be audited will be random, to ensure vigilance on behalf of the licensee and contractors. However, the more environmentally sensitive land systems would be amongst the most likely sites for Department of State Development (DSD) audits.

Results from DSD audits will be summarised for inclusion into DSD's reporting on environmental management of petroleum operators and made public in DSD's annual report.

6.2 Third Party Audits

Third parties may undertake audits of the field outcomes of exploration drilling activities. The audits may be commissioned by DSD, or the licensee, or by any independent parties (e.g., Ananngu). If the findings of third party audits are to be compared with the operator and/or licensees, the same assessment criteria must be used. Items of note from these reports can be included in DSD's reporting on environmental management.

7. INCIDENT REPORTING

Under the Regulation 12(2) an SEO must identify events arising from regulated activities, which may cause serious or reportable incidences, within the meaning of Section 85 of the Act.

7.1 Definitions

The following descriptions have been provided to help clarify and elaborate on the definitions given in Section 85(1) of the Act and Regulation 32(1).

7.1.1 Serious Incidents

Section 85(1) of the Act defines a 'serious incident' as an incident in which:

- A person is seriously injured or killed[1].
- An imminent risk to public health or safety arises.
- Serious environmental damage occurs or an imminent risk of serious environmental damage arises.
- Security of natural gas supply is prejudiced or an imminent risk of prejudice to security of natural gas supply arises[2].
- Some other event or circumstance occurs or arises that result in the incident falling within a classification of serious incidents under the regulations or relevant statement of environmental objectives.

Pursuant to Regulation 12(2), the incidents listed below are also considered to be serious incidents that may arise from drilling and well operations:

- An escape of petroleum, processed 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.
- Disturbance to sites of cultural and/or heritage significance without appropriate permits and approvals[3].
- Any well incident or failure that threatens or poses an imminent risk to safety or the environment.
- Explosion or fire at any facility or pipeline (i.e. well site).
- Identification of cross flows in aquifers, or uncontrolled flows to the surface.
- 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 or threatened ecological community without appropriate permits and approvals[4].

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[1] includes an immediately notifiable work-related injury pursuant to Division 6.6 of the *Occupational Health, Safety and Welfare Regulation 1995* that results in the issuing of a Prohibition Notice by SafeWork SA.

[2] That is, after taking into account relevant factors on a day and rights and obligations under contracts, a significant curtailment of firm service that detrimentally impacts or is likely to impact upon the security of

electricity supply to South Australia or to gas supplies to a significant number of commercial and/or domestic gas users in SA.

[3] Pursuant to *Aboriginal Heritage and Act 1988* and *Heritage Places Act 1993*.

[4] Pursuant to *Native Vegetation Act 1991* (flora) and *National Parks and Wildlife Act 1972* (fauna).

7.1.2 Reportable Incidents

Section 85(1) of the Act defines reportable incidents as incidents (other than a serious incident) arising from activities conducted under a license that are classified under the Regulations as a reportable incident.

Regulation 32(1) classifies the following as reportable incidents:

- An unintended escape of petroleum[5], a processed substance, a chemical or a fuel that affects an area that has not been specifically designed to contain such an escape.
- An incident identified as a reportable incident under the relevant statement of environmental objectives.

Pursuant to Regulation 12(2) and Regulation 31(1)(b), the incidents listed below are also considered to be reportable incidents:

- An escape of petroleum, 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).
  - An event that has the potential to compromise the physical integrity of an asset or facility. For example:
    - An unapproved excursion outside of critical design or operating conditions/parameters.
    - Failure of a critical procedural control in place to reduce a credible threat to low or as low as reasonably practicable (ALARP).
- Unresolved reasonable complaints from a stakeholders as a result of operations.
- Unauthorised third party access to facilities.
- Malfunction or failure of critical plant or equipment that had (or still has) potential to cause a serious incident.
- Any regulated activity or vehicle movement that occurs outside an area that has been surveyed.

7.2 Reporting requirements

The *Petroleum and Geothermal Energy Act 2000* requires that all serious incidents are reported to the Minister as soon as practical. The incident must be reported by telephone, facsimile or email in the first instance followed by a written report within three months. In practical terms this means that Ahava Energy is to notify the Minister (or a delegate of the Minister) as soon as possible following an incident. A written report must then be provided to the relevant agencies including details of:

- The name and business address of the licensee.
- The name and telephone number of a person who can be contacted about the matter.
- The time and date of the occurrence of the incident.
- The place where the incident occurred (using appropriate coordinates or distances from significant topographical features).
- In a case involving a spillage, the approximate quantity of the spillage.
- The approximate size of any area affected by the incident (if relevant).

[5] In gaseous, liquid or solid state, as per Petroleum Act definition.

- The nature and extent of any injury to a person and, if death has occurred, the cause and place of death.
- The steps that have been taken to control minimise or address any damage to any area affected by the incident.

Regulations under the *Petroleum and Geothermal Energy Act 2000* require that reportable incidents will be reported on a quarterly basis, within one month of each quarter. The details reported must include:

- The time and date of the occurrence of the incident and the time and date of detection.
- The place where the incident occurred (using appropriate coordinates or distances from significant topographical features).
- In the case of a spillage the approximate quantity of the spillage.
- The approximate size of any area affected by the incident (if relevant).
- The cause of the incident.
- The steps that have been taken, or are proposed to be taken, to clean up and rehabilitate any area affected by the incident.
- The steps that have been taken, or are proposed to be taken, to prevent a recurrence of the incident.

Records of all incidents are the responsibility of the licensee and will be held by Ahava Energy and available to the relevant authorities upon request.

8. DOCUMENT REVISION

This document will be subject to review within five years of its date of gazettal as per the requirements set out in Regulation 14 under the *Petroleum and Geothermal Energy Act 2000*. The original SEO was gazetted on 15 April 2010. The SEO has been reviewed since November 2014 to comply with the Regulation 14 under the *Petroleum and Geothermal Energy Regulations 2000.*

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Attachments

Attachment A

Attachment A Environmental objectives and assessment criteria

Environmental objective	Assessment criteria	Guide to achieving objectives
Objective 1. Maintain stakeholder relationships and minimise disturbance to Anangu Pitjantjatjara Yankunytjatjara infrastructure & social / economic ways of life.	• No unresolved Anangu and/ or stakeholder complaints. • Any breach/es of the conjunctive land access agreement will also be deemed a breach of this SEO. o No disturbance to Anangu and/or landholder activities as a result of regulated activities unless by prior arrangement. o Where disturbance is unavoidable or accidental, infrastructure or land use is restored to the satisfaction of the Anangu and/or landholder/owner. • 0, +1 or +2 GAS criteria are attained for Well Site Restoration (Visual Impact, Revegetation, Clean and Tidy). • 0, +1 or +2 GAS criteria are attained for Management and Rehabilitation of Borrow Pits (Soil, Vegetation, Water Retention, Clean and Tidy).	• All crew working on site will be inducted regarding the requirements of the Conjunctive Land Access Agreement. • Local Anangu should be given a safety briefing regarding exploration drilling activities from the operator prior to the commencement of any activities. • Ahava Energy and its contractors will obey all Anangu Pitjantjatjara Yankunytjatjara local customs and laws, including: alcohol prohibition and other conditions as defined in the conjunctive land access agreement. • All vehicles will be highly visible and travel at safe speeds to avoid collisions with persons and livestock. • Anangu will be notified of the locations of exploration drilling activities prior to the commencement of pad construction and drilling activities as to ensure that these areas can be avoided by Anangu to ensure their safety. • All incidents relating to the health and safety of Anangu as a result of exploration drilling activities will be reported to the APY Lands Executive Board on the same day that the incident has occurred. • All incidents relating to Anangu, infrastructure or which have disrupted Anangu social or economic way of life will be reported as an incident to the APY Lands Executive Board on the same day that the incident has occurred. • Ahava Energy personnel and contractors will be inducted on cultural, conservation and legislative issues. • Any infrastructure will be avoided during exploration drilling activities. • Where Anangu are sufficiently skilled for assistance on tasks associated with exploration drilling activities (e.g., land clearance, cultural heritage clearances, environmental clearances or other) they may be employed by the contractor. Where they are not sufficiently skilled, the contractor may decide to provide training to enable Anangu to be employed for tasks associated with exploration drilling activities. • Periodic meetings should be held with Anangu to identify unresolved issues. • Damage to tracks will be avoided and any track damaged as a result of exploration drilling activities will be repaired. • Any groundwater flows (artesian) will be plugged and then monitored unless

Environmental objective	Assessment criteria	Guide to achieving objectives
		otherwise advised by Anangu and through consultation and appropriate water licencing requirements through DEWNR under the *NRM Act 2004*. • Landholders are consulted where activities may affect pastoral (or other) operations, including but not limited to the use and/or modification of fences, gates, cattle grids, the location and management of excavation activities etc. in order to avoid or minimise disruption to pastoral activities and address stock and wildlife safety, property certification conditions and other concerns applicable. Gates will be left in the condition they are found. Fences should be restored to the satisfaction of land owners. • Noise levels are to remain within appropriate acceptable limits and compliance with Clause 18 of the *Environment Protection (Noise) Policy 2007* and EPA Information Sheet *EPA 424/1General Environmental Noise.'*
Objective 2. No disturbance to indigenous and non-indigenous heritage sites, remains and places unless prior approval under relevant legislation obtained.	• Sites of indigenous and non-indigenous heritage have been identified and avoided. • All operations in the Walalkana IPA should be done in accordance with the IPA Management Plan.	• During track, drill pad and associated facility site clearance all identified sites will be flagged and avoided. • Add data from environmental heritage site clearances should be supplied to APYLMU. • Anangu-appointed anthropologists who are accompanied by senior Traditional Owners will survey the proposed exploration drilling sites and access tracks, flagging sites of cultural significance prior to the clearing and preparation of tracks and exploration drilling pads and associated facilities. This process has been built into the conjunctive land access agreement between Ahava Energy and Anangu Pitjantjatjara Yankunytjatjara. • On-ground personnel are to be trained to identify and report unmarked cultural or heritage sites. • All crew working on site should be inducted in the significance of cultural and Aboriginal heritage sites as appropriate. • All identified sites should be reported using an environmental report form. • All environmental report forms pertaining to Indigenous cultural or heritage sites will be forwarded to the Anangu Pitjantjatjara Yankunytjatjara, DSD, Department of Premier and Cabinet's Aboriginal Affairs and Reconciliation (AARD) and where appropriate to the South Australian Police. • All documents relating to sites of cultural or heritage significance should be available for audit.

Environmental objective	Assessment criteria	Guide to achieving objectives
Objective 3. No unauthorised impacts to native flora and fauna (including terrestrial and aquatic) due to regulated activities or escape of petroleum, processed substance, chemical or fuel.	• Areas of high sensitivity have been identified and avoided where practicable. • No native fauna casualties that could have reasonably been prevented through management measure described in guide. • 0, +1 or +2 GAS criteria are attained for 'Minimise land disturbance (including impacts to soil, Vegetation and Drainage Patterns)' and Well Site Restoration (Revegetation, Clean and Tidy) objectives, as listed in Attachment B. • No uncontrolled fires resulting from regulated activities. • Any escape of petroleum, processed substance, chemical or fuel outside an area designed to contain it is confined to pre-disturbed operational area. • 0, +1 or +2 GAS criteria are attained for Construction, Management and Rehabilitation of Borrow Pits (Soil, Vegetation, Water Retention, Clean and Tidy) (Attachment C). • Where soil is affected by an escape of petroleum, processed substance, chemical or fuel outside of an area designed to contain it, an assessment and if required rehab is undertaken in accordance with NEPM guidelines (Schedule B, 1999). • All wastes to be disposed of at an EPA licensed facility in accordance with EPA Licence conditions, with the exception of: o drilling fluids, drill cuttings and other fluids disposed during well clean-up. o putrescible domestic wastes (may buried on-site in accordance with EPA requirements if transportation impractical). o No camp litter is left in the operations area upon closure.	**Wellsite, Access Track and Camp Site Construction and Restoration** • Anangu are consulted on the locations of the drill sites, camps and access roads. • APYLMU should assist in the contracting of appropriately qualified people to assist with environmental clearance surveys. • Environmental clearance surveys may be undertaken at the time of heritage clearance surveys to identify habitat of great desert skink where possible, so that it can be mapped using GPS avoided where possible to minimise disturbance of such habitats. Identification of these habitats should make use of Anangu trackers. • Records of vegetation and habitat clearing will be kept and available for auditing. • All reports regarding listed flora and fauna sightings (when and if recognised), land clearance and restoration must be supplied to APYLMU and DEWNR. • Areas with records of state and nationally listed flora and fauna species will be avoided where possible by providing contractors with maps and GPS coordinates of these records. • If avoidance of known locations is not possible, an onsite assessment of the potential to impact scheduled species on a case-by-case basis may occur (based on vegetation mapping, descriptions of species as detailed in section 5.6 of the EIR and in some cases in consultation with relevant experts). • All state and nationally listed fauna deaths as a result of regulated activities are reportable incidents, and the location of the fauna death should be recorded using GPS and photographed. • Any sightings of listed fauna (especially malleefowl and their mounds and great desert skinks) will be reported to DEWNR and APYLMU, GPS coordinates collected and where possible photographs taken. • Creeks lined with river red gums, in particular, are important breeding habitat for many bird species, including scheduled species. Measures for minimising disturbance and access to these areas should be adopted, with known raptor nest-sites avoided during the breeding season. • Native vegetation clearance should be minimised especially for significant and/or sensitive vegetation and/or habitat.

Environmental objective	Assessment criteria	Guide to achieving objectives
	• All solid wastes and foreign material to remain contained onsite within the well lease/operational area boundaries until disposed of at an EPA licensed facility, with the exception of drilling muds and cuttings to be disposed of in drilling sump.	• Removal of mature trees should occur only when unavoidable, and when weaving, detours and other mitigation strategies do not afford practical access. • A mature tree can be defined as, a single-trunked plant with a sufficient, recognisable girth with numerous secondary branches definably clear of the ground and above three metres in height. Some mulgas, red gums, iron woods, weeping pittosporum and mallees on the Lands are likely to fit into this definition. • A priority tree means any tree, or species of tree, that has known cultural or ecological significance, or has significance by virtue of its location or distribution. • Avoid priority species. • 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. • 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. • All construction should be designed and located to minimise soil disturbance. • Terrain, land system type and potential impacts are considered in the planning stages of activities. • No construction activities are carried out on salt lakes, wetlands or steep breakaway/salt lakes/clay pans/stony hills landforms (as defined in the EIR). • The impacts associated with soil disturbance can potentially include wind and water erosion, wheel rutting, soil compaction and dust generation. • No unauthorised off-road driving or creation of shortcuts. • Another potential impact to soil is soil contamination from accidental spillages of chemicals or hazardous substances during well operations. • All sumps and pits will be fenced to prevent access by fauna.

Environmental objective	Assessment criteria	Guide to achieving objectives
		• Post survey monitoring and auditing will utilise monitoring points to enable long term trends to be assessed. • Compacted soil areas ripped (except in stony plains and tablelands) and soil profile and contours are reinstated following completion of the operations. • Oil spill areas have been ripped to an appropriate depth. • Soil removed in construction to be stored on site and returned to its original stratigraphic level upon restoration of the drill site. • DSD (2009) Field Guide contains photographic examples of GAS criteria. **Drilling and Production Testing Activities** • Sump to have sufficient capacity to contain mud discharges (drill cuttings, muds and non toxic drill fluids) and shall be located so as not to impede surface drainage. Sumps will also be of sufficient depth to have adequate freeboard at the completion of operations to allow for at least 1m cover of clean fill. Refer to EIR Figure 4.1 (standard sump dimension 21m x 24.5m and 2.5m depth). • MSDS information readily available on the wellsite. • All bunded areas will be in accordance with EPA guidelines *080/07 Bunding and Spill Management*. • 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. • Avoid driving at night where possible. • Reduce speed of vehicles, particularly when fauna is known to be present. • All areas are to be rehabilitated as soon as practical, either during or after the conclusion of operations. **Borrow Pits Construction and Restoration** • Existing borrow pits to be re-used where practicable. • Siting of new borrow pits to avoid sloped areas and gibber as far as practicable. • Separate topsoil and sump spoil stockpiles.

Environmental objective	Assessment criteria	Guide to achieving objectives
		• Topsoil stockpiled (including gibber mantle) and re-spread on abandonment (gibber to be recompacted). **Fuel and Chemical Storage and Handling** • 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). • 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. • No refueling outside designated refueling/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. **Waste Management** • All waste removal contractors will be licensed and will operate within EPA guidelines. • The production of waste or litter should be reduced by the use of biodegradable or recyclable materials where possible. • Covered bins will be provided for waste materials. 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. • 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

Environmental objective	Assessment criteria	Guide to achieving objectives
		accordance with EPA requirements or transported to EPA licensed facility with other waste where practical. • All wastewater disposed in accordance with the *Public Health (Wastewater) Regulations 2013* and the *Environment Protection (Waste to Resources) Policy 2010* (i.e., the waste water disposal system must either comply with the *On-site Wastewater Systems Code* or be operated to the satisfaction of the Department of Health). • Campsite wastewater will be disposed of in an approved manner, e.g., EPA guidelines. • EPA's Waste Hierarchy model (avoid, reduce, reuse recycle, recover, treat, dispose) should be complied with- all other wastes will be disposed of at an EPA licensed facility, licensed to accept the waste. • Chemical spills will be contained with bunding. • Spill response equipment should be available on site e.g activate alarm, close off source of discharge, conduct head count, use sand or absorbent to absorb spill material, shut down rig and auxiliary engines. Refer to Ahava's standard Emergency Response Plan (ERP) for environmental incident. • All spills will be reported as an incident. • All equipment should be well serviced and maintained. • All bunded areas will be in accordance with EPA guidelines *080/07 Bunding and Spill Management*. • Rehabilitation of all exploration drilling activity sites will be done inline with industry best practice. • All rehabilitation will meet the environmental and rehabilitation requirements detailed in the conjunctive land access agreement. • Relevant stakeholders will be consulted.
Objective 4. Minimise disturbance to drainage patterns and avoid contamination of surface waters.	• Well sites and access tracks are located and constructed to maintain pre-existing water flows. • No water affecting activities as defined under the NRM Act undertaken unless relevant permits have been obtained. • No unlicensed discharge of water (or other liquids) or	**Wellsite and Access Track Construction and Restoration** • Access track and wellsite selection will aim to minimise impact to drainage systems, by avoiding sensitive areas and appropriate construction methods. • Wellsites and access tracks are located to maintain preexisting water flows (i.e., channel contours are maintained on floodplains and at creek crossings). • All access through watercourses areas carefully assessed to determine the

Environmental objective	Assessment criteria	Guide to achieving objectives
	solid wastes to waterways.	locations of least impact to channels and creek banks. **Drilling and Completion Activities** • 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. • Camp and drill rig generators to be located in bunded areas to contain any spills. **Initial Production Testing and Well Abandonment Activities** • Production storage tanks (100-300 barrels) to be stored in clay-lined bunded areas in accordance with EPA guidelines *080/07 Bunding and Spill Management.* • Initial production lines and tanks to be inspected prior to use. **Fuel and Chemical Storage and Handling** • The major threat of spills is the threat to soil, vegetation and watercourses directly impacted by the spill. • Appropriate spill response equipment is available on site including spill kits. • All bunded areas will be in accordance with EPA guidelines *080/12 Bunding and Spill Management.* • Localised contamination may result from spills or leaks of well operations chemicals (e.g. corrosion inhibitors) during storage and handling. • 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
Objective 5. No impacts to existing or future groundwater users and groundwater dependent ecosystems.	• No contamination of groundwater/aquifer resources as a result of drilling, or production testing activities. • No change in the capacity of third-party groundwater users to undertake their respective activities. • No uncontrolled flow to surface (e.g blow out). • No impact on ground water dependent ecosystems as a result of groundwater extraction (i.e. aquifers that	**Wellsite and Access Track Construction and Restoration** • If any contamination from spillage of oils or fuel occurs, immediate effective clean-up procedures must be employed. • Any soil removed during the construction of the drill pad will be re-spread over the disturbed area during restoration. • Any required remediation work carried out as soon as possible after completion of all activities.

Environmental objective	Assessment criteria	Guide to achieving objectives

	may provide base flow to nearby waterholes).
	• No cross-flow between formations as a result of drilling or production testing operations, unless approved by the Department of Environment, Water and Natural Resources (DEWNR).
	  • Sufficient barriers exist in casing annulus (cement) to prevent cross-flow between separate aquifer systems or formations with the potential to flow.
	  • Relevant government approval obtained for decommissioning of radioactive tool left downhole from the EPA Radiation Protection Branch.
	• No contamination of shallow groundwater resources as a result of fuel or chemical storage and handling.
		Drilling and Completion Activities
		• 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.
		• Camp and drill rig generators to be located in bunded areas to contain any spills.
		• Casing and wellhead designed to meet pressure, temperature, operational stresses and loads.
		• Aquifers isolated behind multiple casing strings. Casing to be cemented to surface with visible return.
		• Observed volumes of cement return to surface match calculations.
		• 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.
		• Fluid losses will be controlled during drilling.
		• Where shallow aquifers are present as determined through desktop assessment or drilling of waterbores, mud pits will be lined with impervious material e.g. polyethylene.
		• Will use wireline logs to identify aquifers of significantly different salinity and isolate those.
		• Where there is evidence of insufficient isolation, remedial action to be conducted.
		• On completion of drilling the sump will be allowed to dry out and then backfilled level with the surrounding landscape.
		Initial Production Testing and Well Abandonment Activities
		• Production storage tanks (100-300 barrels) to be stored in clay-lined bunded areas in accordance with EPA guidelines *080/07 Bunding and Spill Management.*
		• Initial production lines and tanks to be inspected prior to use.
		• Well abandonment program to be submitted to DSD with wireline logs for prior approval.

Environmental objective	Assessment criteria	Guide to achieving objectives
		• Isolation barriers (cased and cemented, cement plug) to be set in place to ensure that crossflow, contamination or pressure reduction does not occur. • Records of plug depths and intervals are kept. **Fuel and Chemical Storage and Handling** • The major threat of spills is the threat to soil, vegetation and watercourses directly impacted by the spill. • Appropriate spill response equipment is available on site including spill kits. • All bunded areas will be in accordance with EPA guidelines *080/12 Bunding and Spill Management.* • Localised contamination may result from spills or leaks of well operations chemicals (e.g. corrosion inhibitors) during storage and handling. • 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.
Objective 6. No Injuries, deaths or health impacts to the public or third parties and air quality from regulated activities that could have been reasonably prevented by the operator.	• All reasonable measures implemented to ensure no injuries / health risks to the public or third parties. • Sewage water to be managed in accordance with the *South Australian Public Health (Wastewater) Regulations 2013* and comply with the SA Health on-site Wastewater Systems Code or to be to the satisfaction (written approval) of the Department of Health and Ageing. • Compliance with the relevant legislation regarding noise and air quality. • No unnecessary venting during well operations.	**Unauthorised Access by Third Parties** • "No Entry" signs warning of dangers associated with drilling operations placed at the entry to the site access track. **Drilling and Completion Activities** • All employees and contractor personnel complete a safety induction prior to commencement of work in the field. • Permit to work systems in place for every staff and contractor working in the field. • All appropriate PPE (personnel protective equipment) is issued and available as required in accordance with HSE policy and standards. • Effective Emergency Response Plan (ERP) and procedures are in place. • 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. • Communication of rig moves and other potential hazards to safety associated with drilling and well operations to potentially affected parties prior to

Environmental objective	Assessment criteria	Guide to achieving objectives
		commencement of operations. • Drill rig, ancillary and any testing equipment to comply with Regulations, meet relevant industry standards and be "Fit for Purpose". • Details of work to be performed are set out in the Drilling Program. • Surface casing to be cemented to surface with visible returns. Subsequent casing strings to be cemented from casing shoe to 50 m inside the previous casing string. • Blow out prevention precautions in place in accordance with defined procedures and appropriate to the expected downhole conditions. • Confinement of flammable sources, restrictions on certain procedures and ready access to suitable fire fighting equipment. • Treatment and disposal of wastewater generated from drilling activities will be in compliance with the relevant legislation. Treated sewage wastewater disposed 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 run-off). • Noise levels are to remain within appropriate acceptable limits and compliance with Clause 18 of the *Environment Protection (Noise) Policy 2007* and EPA Information Sheet *EPA 424/1General Environmental Noise.* **Well Testing** • Conduct well testing in accordance with appropriate industry accepted standards. **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. • Ensure that the visual prominence of the abandoned wellsite and access track is minimized to the extent where it is difficult for third parties to detect and therefore access the site. **Vehicle Movement** • Control production and dispersion of dust on unsealed roads and drilling lease

Environmental objective	Assessment criteria	Guide to achieving objectives
		areas. • Compliance with relevant speed restrictions on access roads and tracks. **Wellsite Restoration Activities** • 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.
Objective 7. No introduction of new species of weed, plant or pathogen or pests (feral animal) and implement control measures as necessary.	• Presence/absence or abundance of pest, plant and animals are consistent with pre-existing conditions &/or adjacent land or where pest plants or animals identified in operational areas, management plan is implemented immediately. • Declared plants or animals reported and managed in accordance with the NRM Act and regional NRM plans. • 0, +1 or +2 GAS criteria are attained for Wellsite, Access Track and Borrow Pits construction and restoration (Soil, Vegetation, Water Retention, Clean and Tidy).	• A baseline investigation into the presence of exotic weeds will be done in advance of any disturbance activities. • All vehicle clean down should occur in consideration of the DEWNR standard operating procedures for the prevention of the spread of Buffel grass. • The license holder must take all reasonable and practical endeavours to minimise the impacts of introducing exotic species into the licence areas. • All vehicles and equipment will be inspected and assessed for the risk of contamination and if, required, cleaned prior to entering the licence area. • All records of vehicle or equipment cleaning will be kept for auditing purposes. • All vehicles and equipment should be cleaned when moving from weed infested areas to non-affected areas. • Cleaning should be conducted in accordance with relevant procedures and accepted practices. • Environmental clearance surveys may be undertaken at the time of heritage clearance surveys to identify baseline predator numbers and the presence of noxious weeds (especially the presence of Buffel Grass (*Cenchrus ciliaris*)). Such clearance surveys should consult APYLMU to ensure that methodologies are consistent with those already used on the Lands. • Minimise land and soil disturbance as detailed in Objective 4, as disturbed soils can provide habitats to enhance the colonisation of weeds and pathogens. • Ongoing monitoring to assess the presence of invasive species, particularly weeds, pathogens and non-native predators such as foxes and cats should be conducted during rehabilitation

Environmental objective	Assessment criteria	Guide to achieving objectives
Objective 8. Remediate and rehabilitate operational areas to agreed standards.	• 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 Attachment B. • No reasonable stakeholder complaints left unresolved • 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 Attachment C.	• Refer to Objectives 1, 2, 3, 4, 5, 6. • Rehabilitation/abandonment plans for surface activities will be developed in consultation with relevant stakeholders.

Attachment B

Attachment B Goal attainment scaling (GAS) criteria for the Environmental Assessment of Abandoned Petroleum Wellsites.

Score	Objective 1				Objective 2		
	To minimise the visual impact				The revegetation of indigenous species		
	Access Tracks	Interdune and floodplain wellsites	Dune wellsites	Gibber wellsites	Predictive rehabilitation on abandonment	Less than five years since wellsite abandonment	At least five years since abandonment
-2	The track is prominent because of a scraped surface, windrows along its edges or gully erosion.	The site remains as a prominent consolidated surface with a distinct edge.	Extensive gully erosion down the face of the dune and/or a steep site edge are prominent.	Site is poorly formed and predominantly bare due to incomplete spreading or loss of the gibber.	No attempt has been made to restore the wellsite.	No revegetation is occurring.	There is no revegetation.
-1	The track surface has been contoured into the surrounding landscape; but the colour of foreign material contrasts with the surroundings.	The site surface and edge have been contoured into the surrounding landscape; but the colour of foreign material contrasts with the surroundings.	The site has been restored into the natural contour of the dune; but the colour of foreign material contrasts with the surroundings.	Site matches adjacent colours, but is visible due to inconsistent spreading of the gibber and some bare areas.	The restored surface is inconsistent with the surroundings.	Revegetation with inappropriate species.	The revegetation mostly consists of annual and biennials; in contrast to the surroundings there are few perennials.
0	The track contours and colour blend with the surroundings; but the earthwork disturbance is still prominent (e.g. ripping, rolling or respreading of original material).	The site contours and colour blend with the surroundings; but the earthwork disturbance is still prominent (e.g. ripping, rolling or respreading of original material).	The edge and colour of the site blend with the surroundings. The site contours are visible only when viewed from the top of the dune; they cannot be seen from the base. Erosion gullies are present down the	Site matches adjacent contours with some imported material still evident within gibber spread.	There has been appropriate preparation of the ground surface to promote revegetation.	Colonisation of the original species is starting to occur.	The revegetation consists of annuals, biennials and perennials; but there are some bare patches which are inconsistent wit the surroundings.

Score	Objective 1				Objective 2		
	To minimise the visual impact				The revegetation of indigenous species		
	Access Tracks	**Interdune and floodplain wellsites**	**Dune wellsites**	**Gibber wellsites**	**Predictive rehabilitation on abandonment**	**Less than five years since wellsite abandonment**	**At least five years since abandonment**
			face of the dune, but they are not extensive or prominent.				
+1	The track contours and colour blend with the surroundings and the earthwork disturbance is beginning to blend also.	The site contours and colour blend with the surroundings and the earthwork disturbance is beginning to blend also.	The edge and colour of the site blend with the surroundings. The site contours are visible only when viewed from the top of the dune; they cannot be seen from the base. There are no erosion gullies down the face of the dune.	Site matches adjacent contours and the gibber is uniformly spread with no imported material evident.	N/A	The revegetation is extensive and consists of annuals and biennials; in contrast to the surroundings there are no perennials.	The revegetation, mostly perennials, is consistent with the surroundings; but there is a contrast in maturity between them.
+2	The track contours and colour blend with the surroundings and the earthwork disturbance is indistinguishable.	The site contours and colour blend with the surroundings and the earthwork disturbance is indistinguishable.	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 dune.	Site is indistinguishable form the surrounds.	N/A	The revegetation is extensive and mostly consists of annuals and biennials; perennials are beginning to establish which is consistent with the surroundings.	The revegetation type, density and maturity is indistinguishable from the surroundings.

Source: 'Summary of criteria for assessing the restoration of abandoned wellsites in the Cooper Basin, South Australia' DSD (2009)

Attachment C

Table 1. GAS criteria for Borrow Pit Construction

Objectives	Goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor Shortfall - 1	Significant Shortfall -2
Minimise impacts on soil	**Pit sited and designed to minimise erosion and facilitate rehabilitation**	**Gibber plain and tableland**				
		-	Pit located on flat terrain	Pit located on low sloping terrain but constructed with erosion control measures evident (e.g. contour banks or bunds above the batter slope) Gibber mantle around pit intact (rolling only) No wind rows on tracks	Pit located on low sloping terrain and constructed with no erosion control measures evident Gibber mantle around pit intact (rolling only) No wind rows on tracks	Pit located on sloping terrain or: Pit located in any terrain where gibber mantle around pit removed and/or wind rows on tracks
		Dunefields				
		-	Pit located on flat terrain	Pit located on low sloping terrain	Pit located on moderate sloping terrain and constructed with no erosion control measures evident	Pit located on high sloping terrain
		Floodplain				
		-	**-**	Pit located a suitable distance away from any creek channel, waterhole, terrace or levee so as not likely to cause erosion or flow impediment	Pit located within a distance from any creek channel, waterhole, terrace or levee that is potentially likely to cause erosion or flow impediment	Pit located within a distance form any creek channel, waterhole, terrace or levee that is likely cause erosion or flow impediment
Minimise impacts on vegetation	**Perennial vegetation clearance minimised**	Pit located in bare (including previously disturbed) area – no clearance required	No trees or shrubs removed	Trees or shrubs removed where clearance could not have been avoided No trees or shrubs with hollows removed	Medium trees or shrubs (between 15 and 30cm diameter) removed where clearance could have been avoided	Large trees (over 30 cm diameter) removed and/or Trees or shrubs with hollows removed

Objectives	Goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor Shortfall - 1	Significant Shortfall -2
	Topsoils and seed source retained			Topsoil and vegetative material stockpiled and stable (i.e. unlikely to present erosion issues)		No topsoil and vegetative material stockpile evident
Protect sites of natural, scientific or heritage significance	**Avoid sites**	Heritage surveys undertaken, significant sites identified, flagged, recorded and avoided		Heritage surveys undertaken, significant sites avoided		Heritage surveys not undertaken or significant sites disturbed
Minimise visual impacts – public roads (e.g. Strzelecki Tracks, Della Rd, Dillon's Hwy, Cordillo Rd, Walkers Crossing, 15 Mile Track, Merty – Cameron Cnr, etc.)	**Pits sited appropriately**	Pit not visible from public road	Pit not clearly visible from public road due to some screening by vegetation or other landform	Pit more than 50m from public road	Pit less than 50m from public road	Pit less than 20m from public road

Table 2. GAS Criteria for Borrow Pit Management

Objectives	Goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor Shortfall - 1	Significant Shortfall -2
Minimise water retention in pit	**Minimal or no water retention in pit footprint**	No evidence of water retention	-	Minor retention - pit retains water for less than 1 month following rainfall event or drawdown of floodwaters (as a guide - max. water depth up to 0.2 metres)	Pit retains water for up to 3 months following rainfall event or drawdown of floodwaters (as a guide - max. water depth < 1 metre)* And	Pit holds water for more than 3 months following rainfall event or drawdown of floodwaters (as a guide - max water depth > 1.0 metre)*

Objectives	Goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor Shortfall - 1	Significant Shortfall -2
				Or Water retention in pit consistent with surrounding land	Water retention in pit inconsistent with surrounding land	And Water retention in pit inconsistent with surrounding land
Minimise impacts on soil	**Minimise soil erosion**	**Gibber plain and tableland**				
		Gibber layer in situ (apart from pit base and sides) Pit footprint soil surfaces stable No accelerated erosion on pit footprint	-	Gibber layer in situ Run-off controlled (e.g. contour banks or bunds above the batter slope) Localised minor erosion (typically pit sides)*	Gibber layer disturbed or removed in areas Run-off uncontrolled Minor gullying around pit and/or access tracks*	Widespread disturbance of gibber layer Run-off uncontrolled Moderate to severe gullying around pit and/or access tracks*
		Other land units				
		Soil surfaces stable No accelerated erosion on pit footprint	-	Run-off controlled (e.g. contour banks or bunds above the batter slope) Minor erosion of pit sides or up-slope from pit*	Areas of pit footprint unstable with some uncontrolled runoff Moderate erosion*	Uncontrolled run-off Large areas of pit footprint unstable Active severe erosion*
Minimise impacts on vegetation	**No weed** infestations on pit footprint**	No weeds on pit footprint	-	Presence of weeds** on pit footprint consistent with pre-disturbance conditions and	Weeds** present on pit footprint which is inconsistent with pre-disturbance conditions and	Declared weeds*** present on pit footprint which is inconsistent with pre-disturbance

Objectives	Goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor Shortfall - 1	Significant Shortfall -2
				adjacent land	adjacent land	conditions and adjacent land

Table 3. GAS Criteria for Borrow Pit Rehabilitation

Objectives	Goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor Shortfall - 1	Significant Shortfall -2
Minimise water retention in pit	**Predictive** **Minimal or no water retention in pit footprint**	-	-	Measures to minimise water retention implemented (e.g. upslope runoff diverted by contour banks or bunds, rip base, etc.)	-	No measures to minimise water retention evident
	Ongoing **Minimal or no water retention in pit footprint**	No evidence of water retention	-	Minor retention - pit retains water for less than 1 month following rainfall event or drawdown of floodwaters (as a guide - max. water depth up to 0.2 metres) or Water retention in pit consistent with surrounding land	Pit retains water for up to 3 months following rainfall event or drawdown of floodwaters (as a guide - max. water depth < 1 metre)* and Water retention in pit inconsistent with surrounding land	Pit holds water for more than 3 months following rainfall event or drawdown of floodwaters (as a guide - max water depth > 1.0 metre)* and Water retention in pit inconsistent with surrounding land
Minimise impacts on soil	**Predictive** **Minimise soil erosion**	-	-	Measures to minimise erosion implemented (e.g. upslope runoff diverted by contour banks or bunds)	-	No measures to minimise erosion evident

	Ongoing **Minimise soil erosion**	Soil surfaces stable No accelerated erosion	-	Minor erosion of pit sides or up-slope from pit*	Moderate erosion* Areas of pit footprint unstable with some uncontrolled runoff	Active severe erosion* Large areas of pit footprint unstable Uncontrolled run-off
Minimise impacts on vegetation	**Pit footprint revegetated with indigenous species (subject to time and preceding climatic conditions)**	Vegetation community re-established with species and cover typical for land unit	Pit footprint revegetated with perennial species mix and cover levels typical for land unit	Pit footprint revegetated with species mix similar to surrounding area, some bare patches still present	Revegetation confined to base of pit, pit sides bare, species mix differs from surrounding area, annual species dominate	No revegetation evident
	No weed infestations on pit footprint**	No weeds on pit footprint	-	Presence of weeds** on pit footprint consistent with pre-disturbance conditions and adjacent land	Weeds** present on pit footprint which is inconsistent with pre-disturbance conditions and adjacent land	Declared weeds*** present on pit footprint which is inconsistent with pre-disturbance conditions and adjacent land
Minimise visual impacts	**Borrow pit effectively contoured and ripped**	Pit contours indistinguishable from surrounding landscape Access tracks ripped	Pit contours blend in with surrounding landscape, although still evident	Pit sides battered and ripped along contours but pit still highly visible Topsoil and vegetative material re-spread over disturbed area	Pit sides battered but not ripped	No re-contouring of pit has occurred – pit sides very steep Topsoil and vegetative material not re-spread
Site to be left in a clean and tidy condition	**Litter and other foreign materials removed**	-	-	No litter and other foreign materials on pit footprint or surrounds	Scattered litter and/or other foreign materials on pit footprint or surrounds	Litter and/or other foreign materials common on pit footprint or surrounds

***** As described in Appendix B – Descriptive and Photographic Standards for GAS Criteria - of Review of Current Goal Attainment Scaling (GAS) criteria for borrow pit construction, use and rehabilitation within the Cooper Basin (Jacobs SKM, March 2014). See: http://www.pir.sa.gov.au/petroleum/environment/research_projects.

****** Weeds are defined in these tables as any invasive plant that threatens native vegetation in the local area or any species recognised as invasive in South Australia.

******* Declared weeds are defined in these tables as any exotic plant species that are currently declared under the *Natural Resources Management Act 2004*.