

# South Australia Cooper Basin



## **Statement of Environmental Objectives:**

### **Drilling and Well Operations**

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# 1 Introduction

## 1.1 Purpose

This Statement of Environmental Objectives (SEO) has been prepared to meet the requirements of Sections 99 and 100 of the South Australian *Petroleum and Geothermal Energy Act 2000* (SA) (the Act) and Regulations 12 and 13 of the *Petroleum and Geothermal Energy Regulations 2000* (SA) (the Regulations).

The intent of this SEO is to outline the environmental objectives that are required to be achieved during drilling and well operations (referred to throughout as operation/s), and the criteria upon which these objectives are to be assessed. Environmental objectives have been developed on the basis of information provided in the Environmental Impact Report (EIR) for drilling and well operations in the South Australian section of the Cooper Basin (Santos 2003a), including the addendum to the EIR (Santos 2009a), which was prepared during the five-yearly review of this SEO.

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

## 1.2 Scope

This SEO applies to all drilling and well operations conducted by Santos on its own behalf and on behalf of the parties to its operated joint ventures in the Cooper and Eromanga Basins (the South Australia Cooper Basin parties<sup>1</sup>) (Figure 1). The operations that are covered by this SEO are:

- well site and access track construction;
- well site and access track abandonment;
- drilling;
- well completions and workovers;
- gas and oil systems on well leases;
- well and zonal abandonment; and
- waterflood / water injection activities.

These operations are described in detail in the EIR (Santos 2003a). Activities associated with Cooper Basin operations that are not discussed in the EIR or covered by this SEO, are:

- seismic exploration activities; and
- production and processing operations.

Two separate SEOs cover seismic and production and processing operations in the South Australian Cooper and Eromanga Basins. These are:

- *South Australian Cooper Basin Operators Statement of Environmental Objectives: Geophysical Operations* (Santos 2006); and
- *South Australia Cooper Basin Statement of Environmental Objectives: Production and Processing Operations* (Santos 2009b).

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<sup>1</sup> The South Australia Cooper Basin parties are the parties to joint ventures in the Cooper Basin operated by Santos

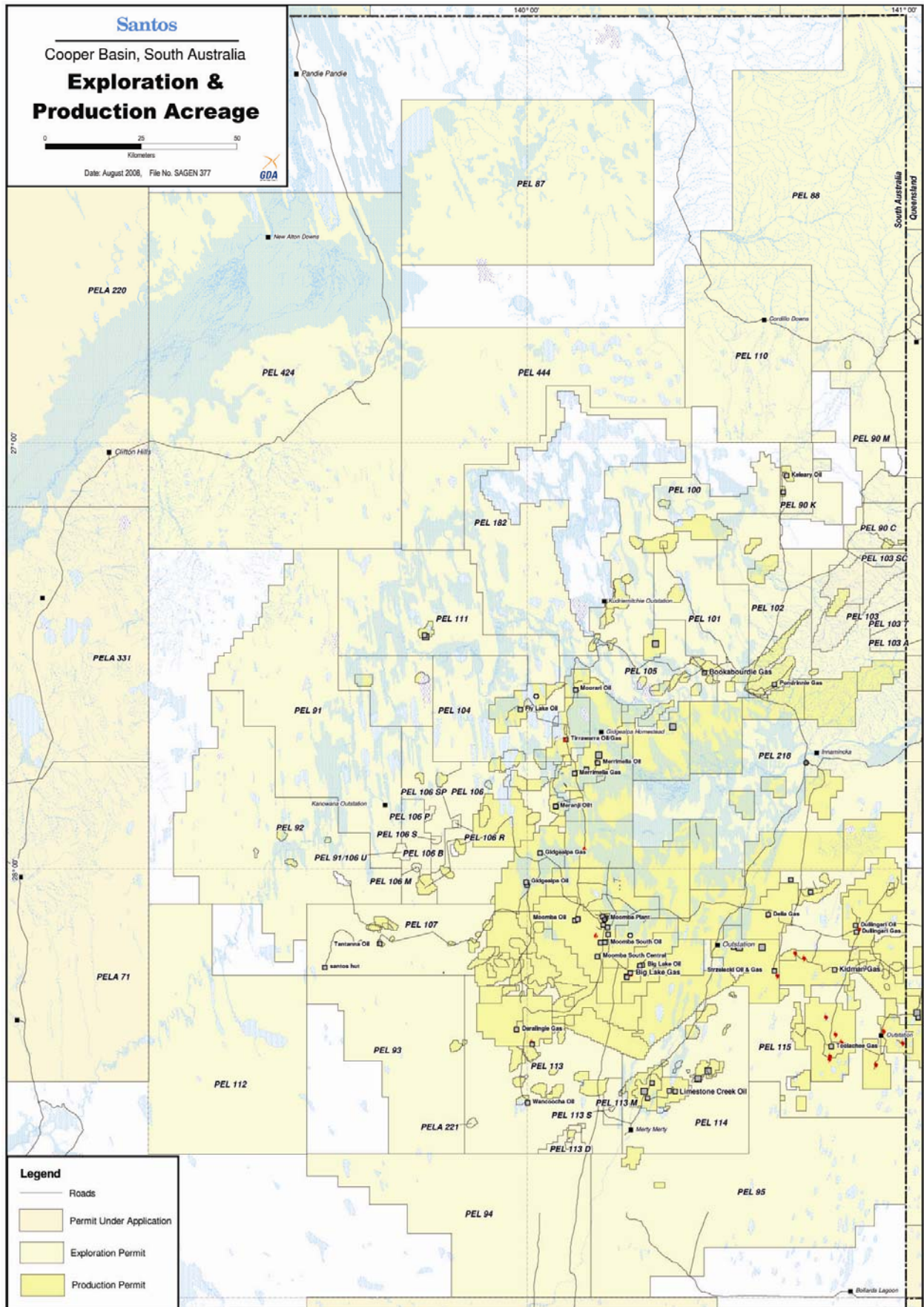


Figure 1: Exploration Acreage in the South Australian Sector of the Cooper and Eromanga Basins

## 2 Environmental Objectives

### 2.1 Objectives

The objectives of the Act include:

- to minimise environmental damage from activities involved in exploration for, or the recovery or commercial utilisation of, petroleum and other resources
- to minimise environmental damage from activities involved in drilling and well operations.

Potential hazards and consequences associated with drilling and well operations in the South Australian Cooper Basin were identified in the EIR (Santos 2003a). Under the Act, Santos is committed to achieving a range of environmental objectives with respect to these potential hazards and consequences and which are consistent with the above objectives of the Act.

The environmental objectives for drilling and well operations are:

1. Minimise risks to the safety of the public and other third parties.
2. Minimise disturbance and avoid contamination to soil.
3. Avoid the introduction or spread of pest plants and animals and implement control measures as necessary.
4. Minimise disturbance to drainage patterns and avoid contamination of surface waters and shallow groundwater resources.
5. Avoid disturbance to sites of cultural and heritage significance.
6. Minimise loss of aquifer pressure and avoid aquifer contamination.
7. Minimise disturbance to native vegetation and native fauna.
8. Minimise air pollution and greenhouse gas emissions.
9. Maintain and enhance partnerships with the Cooper Basin community.
10. Avoid or minimise disturbance to stakeholders and/or associated infrastructure.
11. Optimise (in order of most to least preferable) waste avoidance, reduction, reuse, recycling treatment and disposal.
12. Remediate and rehabilitate operational areas to agreed standards.

### 2.2 Assessment Criteria

The criteria for measuring achievement of the environmental objectives are set out in Table 1 and take one of the following forms:

- **Defined conditions** - In some cases, the achievement of an objective can be assessed through ensuring defined conditions are met or carried out. Such conditions include:
  - prohibitions to undertake a specific action (for example, to achieve the objective 'Minimise impacts to soil' during well site and access track construction, the assessment criteria may be to prevent the removal of the gibber mantle in gibber plain areas).
  - requirements to carry out certain actions in accordance with approved procedures or industry accepted standards or Australian Standards.

- **Goal Attainment Scaling (GAS) criteria** – Environmental objectives requiring visual assessment are likely to be prone to uncertainties of subjective judgement. To minimise this, GAS is used to measure such objectives against a series of criteria described by a written description and/or photographically. GAS is applicable to measuring objectives related to minimisation of disturbances to natural vegetation, soil and rehabilitation of well sites and access tracks. Goal Attainment Scaling criteria are referenced where available and presented in Appendix 1.
- **Scientific studies/monitoring** - In some cases the assessment of the environmental objectives may not be possible in the shorter term and may require longer term monitoring and scientific evaluation. In such cases, the assessment criteria may be in the form of longer term data and information gathering (for example, the objective to 'Minimise loss of aquifer pressure and avoid aquifer contamination' may require ongoing monitoring of well bore pressures).

Each objective for drilling and well operations will be assessed using a selection of the assessment options outlined above. This will enable Santos and others to determine whether the objectives are being achieved. Comments on any variances will be recorded and reported where required (Section 3).

Table 1: Environmental Objectives and Assessment Criteria

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
<p><b>1. Minimise risks to the safety of the public and other third parties.</b></p>	<ul style="list-style-type: none"> <li>▪ Reasonable measures implemented to ensure no injuries or health risks to the public or third parties.</li> </ul>	<ul style="list-style-type: none"> <li>▪ All employees and contractor personnel complete a safety induction prior to commencement of work in the field.</li> <li>▪ All employees and contractor personnel undertake a refresher induction every 2 years.</li> <li>▪ Signage in place to warn third parties of access restrictions to operational areas, with particular warnings when potentially dangerous operations are being undertaken.</li> <li>▪ Necessary measures (e.g. signage/fencing) taken to prevent the public accessing the wellhead equipment or waste relating to a given well.</li> <li>▪ Demobilisation inspections undertaken at random to ensure that backfilling and waste removal requirements are met.</li> <li>▪ Permit to work systems in place for staff and contractors in dangerous situations.</li> <li>▪ All appropriate PPE (personnel protective equipment) is issued and available as required in accordance with company operating requirements and applicable standards.</li> <li>▪ Effective Emergency Response Plan (ERP) and procedures are in place in the event of a fire or explosion; Annual exercise of ERP.</li> <li>▪ Communication of rig moves and other potential hazards to safety associated with drilling and well operations to potentially affected parties prior to commencement of operations.</li> <li>▪ Compliance with relevant speed restrictions on access roads and tracks.</li> <li>▪ Reporting systems for recording injuries and accidents in place, and annual (at minimum) review of records to determine injury trends.</li> <li>▪ Implementation of appropriate corrective actions.</li> <li>▪ Ensuring safety management plans are updated and reviewed.</li> <li>▪ Wastewater disposal in accordance with Objective 11.</li> </ul>	<p>The criteria for assessing the achievement of this objective have been developed on the basis of the current understanding of the risks associated with drilling and well operations.</p> <p>The key to achieving this objective in relation to both downhole abandonment and surface well site restoration is to ensure that the visual prominence of the abandoned well site and its access track(s) is minimised to the extent where it is difficult for third parties to detect and therefore access these sites. The backfilling of the well cellar and the removal of rubbish from the restored well site must be carried out.</p> <p>Fires or explosions at well sites 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.</p> <p>The movement of heavy equipment associated with rig moves present a risk to the safety of employees, contractors and third parties (i.e. tourists).</p>

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
<p><b>2. Minimise disturbance and avoid contamination to soil.</b></p>	<p><u>Well Site and Access Track Construction</u></p> <ul style="list-style-type: none"> <li>▪ 0, +1 or +2 GAS criteria are attained for “Minimise impacts on soil” objective as listed in Appendix 1 Table A1 and “To minimise the visual impact” as listed in Appendix 1 Table A2.</li> <li>▪ No unauthorised off-road driving or creation of shortcuts.</li> <li>▪ No construction activities are carried out on salt lakes or steep tableland slopes (as defined in EIR).</li> </ul> <p><u>Borrow pit construction and restoration</u></p> <ul style="list-style-type: none"> <li>▪ 0, +1 or +2 GAS criteria are attained for “Minimise visual impacts’, and “Minimise impact on soil” objectives as listed in Appendix 1 Table A3.</li> </ul> <p><u>Production Testing/Well Blowdowns</u></p> <ul style="list-style-type: none"> <li>▪ No soil contamination as a result of production testing or well blowdown operations.</li> </ul> <p><u>Fuel and Chemical Storage and Handling</u></p> <ul style="list-style-type: none"> <li>▪ No spills/leaks outside of areas designed to contain them.</li> <li>▪ Level of hydrocarbon continually decreasing for in situ remediation</li> </ul>	<p><u>Well Site and Access Track Construction</u></p> <ul style="list-style-type: none"> <li>▪ Consider alternate routes during planning phase to minimise environmental impacts.</li> <li>▪ Use existing routes / disturbed ground where practicable.</li> <li>▪ Gibber mantle on access tracks and well sites (excluding sumps) is not removed where possible, only rolled, in gibber and tableland land systems. Gibber mantle reinstated where appropriate during restoration.</li> <li>▪ Topsoil stockpiled (including gibber mantle) from sump construction and respread (and gibber recompacted) on abandonment.</li> <li>▪ The need to traverse sensitive land systems and the methods of managing the impacts must be justified in accordance with company procedures, recorded and available for auditing.</li> </ul> <p><u>Borrow pit construction and restoration</u></p> <ul style="list-style-type: none"> <li>▪ Existing borrow pits to be re-used where practicable.</li> <li>▪ Siting of new borrow pits to avoid sloped areas and gibber as far as practicable.</li> <li>▪ Topsoil stockpiled (including gibber mantle) and respread on abandonment (gibber to be recompacted).</li> </ul> <p><u>Production Testing / Well Blowdowns</u></p> <ul style="list-style-type: none"> <li>▪ If appropriate use:                             <ul style="list-style-type: none"> <li>- impermeable or clay lined flare pit to flare / contain hydrocarbons.</li> <li>- flare tanks.</li> </ul> </li> </ul> <p><u>Fuel and Chemical Storage and Handling</u></p> <ul style="list-style-type: none"> <li>▪ All fuel, oil and chemical storages banded in accordance with the appropriate standards and guidelines e.g. EPA guideline 080/07 <i>Bunding and Spill Management</i>.</li> <li>▪ Records of spill events and corrective actions maintained in accordance with company procedures.</li> <li>▪ Spills or leaks are immediately reported and clean up actions</li> </ul>	<p>The impacts associated with soil disturbance can potentially include wind and water erosion and dust generation. The main source of disturbance to soils is associated with lease and access track construction, creation of borrow pits, restoration activity, vehicle movement in off-road locations and sub-surface excavations (e.g. sumps, flare pits and turkey’s nests).</p>

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
	<p>of spills.</p> <ul style="list-style-type: none"> <li>▪ Soils remediated to a level as determined by the SHI process.</li> <li>▪ Also refer to Objective 12.</li> </ul> <p><u>Waste Disposal (domestic, sewage and sludges)</u></p> <ul style="list-style-type: none"> <li>▪ All domestic wastes are disposed of in accordance with EPA licensing requirements.</li> <li>▪ 0, +1 or +2 GAS criteria are attained for “Site to be left in a clean and tidy condition” objective listed in Appendix 1 Table A2.</li> <li>▪ No spills or leaks from sewage treatment processing.</li> <li>▪ Refer to Assessment Criteria for Objective 11.</li> </ul>	<p>initiated.</p> <ul style="list-style-type: none"> <li>▪ Logged incidents are reviewed annually to determine areas that may require corrective action in order to reduce spill volumes in subsequent years (and drive continual improvement).</li> <li>▪ Chemical and fuel storage procedures, including signage, are reviewed and monitored in audit process.</li> </ul> <p><u>Spill Response / Contingency Planning</u></p> <ul style="list-style-type: none"> <li>▪ Results of emergency response procedures carried out in accordance with Regulation 31 show that an oil spill contingency plan in place in the event of a spill is adequate and any necessary remedial action needed to the plan is undertaken promptly.</li> <li>▪ Oil spill contingency plan (reviewed annually) is up to date with specific scenarios relating to spills to creeks and floodplain areas.</li> <li>▪ Spill response equipment is audited annually.</li> <li>▪ Annual spill response training exercise / rehearsal is undertaken.</li> <li>▪ Spills or leaks are immediately reported and clean up actions initiated.</li> </ul> <p><u>Waste Disposal (domestic, sewage and sludges)</u></p> <ul style="list-style-type: none"> <li>▪ Covered bins are provided for the collection and storage of wastes.</li> <li>▪ All loads of rubbish are covered during transport to the central waste facility.</li> <li>▪ Approved transportable Aerated Wastewater Treatment Plants (AWTPs) used for rigs/camps (once approved AWTPs are available from a supplier suitable to Santos<sup>1</sup>). Interim controls for management of sewage effluent (developed in consultation with the Department of Health) implemented<sup>1</sup>.</li> <li>▪ Use of permanent septic systems with camps where possible</li> <li>▪ Refer to Objective 11.</li> </ul>	<p><sup>1</sup> Note: Santos is currently evaluating the suitability of an AWTP produced by a suitable supplier, and is committed to implementing these products subject to testing under field conditions</p>

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<p><b>3. Avoid the introduction or spread of pest plants and animals and implement control measures as necessary.</b></p>	<ul style="list-style-type: none"> <li>▪ No weeds or feral animals are introduced to, or spread in, operational areas as a consequence of activities.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Where appropriate a weed and feral animal management strategy is in place (avoidance and control strategies).</li> <li>▪ Rig and vehicle wash downs are initiated in accordance with the management strategy.</li> </ul>	<p>Activity associated with lease and access track construction, such as movement of vehicles and equipment, is a potential source of weed or disease introduction and spread.</p> <p>The most effective technique to prevent the introduction and spreading of weed species is to ensure that vehicles and equipment are appropriately cleaned prior to entry into a construction site on a risk-based approach.</p>
<p><b>4. Minimise disturbance to drainage patterns and avoid contamination of surface waters and shallow ground water resources.</b></p>	<p><u>Well Lease and Access Track Construction</u></p> <ul style="list-style-type: none"> <li>▪ Well sites and access tracks are located and constructed to maintain pre-existing water flows (i.e. channel contours are maintained on floodplains and at creek crossings).</li> </ul> <p><u>Drilling Mud Sumps and Flare Pits</u></p> <ul style="list-style-type: none"> <li>▪ No overflow of drill cuttings, muds and other drilling fluids from mud sumps.</li> <li>▪ No waste material disposal to sumps and flare pits.</li> </ul> <p><u>Well Heads (Oil and Gas Systems)</u></p> <ul style="list-style-type: none"> <li>▪ No leaks/spills outside of areas designed to contain them.</li> </ul> <p><u>Well Blowdown/Production Testing</u></p> <ul style="list-style-type: none"> <li>▪ No water (surface or groundwater) contamination as a result of</li> </ul>	<p><u>Well Lease and Access Track Construction</u></p> <ul style="list-style-type: none"> <li>▪ Sensitive land systems (e.g. wetlands) avoided wherever possible. Where activities are undertaken in or near these areas, appropriate review, assessment and mitigation measures are in place to ensure that surface water flows are maintained and contamination of surface water and groundwater is avoided.</li> </ul> <p><u>Drilling Mud Sumps and Flare Pits</u></p> <ul style="list-style-type: none"> <li>▪ All drill cuttings, muds and non toxic drill fluids are contained within the designated mud sumps with adequate freeboard at the completion of operations to allow for a 1m cover of clean fill at remediation.</li> </ul> <p><u>Well Heads (Oil and Gas Systems)</u></p> <ul style="list-style-type: none"> <li>▪ Where appropriate, imperviously lined well cellars are installed on oil wells.</li> <li>▪ Bunds / containment devices are installed on gas well skids.</li> <li>▪ Well heads shut in and chemicals removed prior to flood events.</li> <li>▪ Jet pumps are installed within containment device with an adequately sized containment sump.</li> </ul> <p><u>Well Blowdown/Production Testing</u></p> <ul style="list-style-type: none"> <li>▪ Activity is conducted in accordance with accepted industry</li> </ul>	<p>The main threats to drainage patterns, surface waters and shallow ground waters are considered to be interruption of natural flows as a result of earthworks and contamination.</p>

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	<p>production testing or well blowdown operations.</p> <p><u>Fuel/Chemical Storage and Handling</u></p> <ul style="list-style-type: none"> <li>▪ No water (surface or groundwater) contamination as a result of fuel or chemical storage and handling.</li> </ul> <p><u>Waste Management</u></p> <ul style="list-style-type: none"> <li>▪ Refer to Assessment Criteria for Objective 11.</li> </ul>	<p>standards / good oilfield practice.</p> <ul style="list-style-type: none"> <li>▪ If appropriate use:                             <ul style="list-style-type: none"> <li>- impermeable / clay lined flare pit</li> <li>- flare tanks</li> <li>- separators</li> <li>- supervision.</li> </ul> </li> </ul> <p><u>Fuel and Chemical Storage and Handling</u></p> <ul style="list-style-type: none"> <li>▪ All fuel, oil and chemical storages banded in accordance with the appropriate standards (e.g. AS 1940 and EPA guideline 080/07 <i>Bunding and Spill Management</i>).</li> <li>▪ Records of spill events and corrective actions maintained in accordance with company procedures.</li> <li>▪ Spills or leaks are immediately reported and clean up actions initiated.</li> <li>▪ Logged incidents are reviewed annually to determine areas that may require corrective action in order to reduce spill volumes in subsequent years (and drive continual improvement).</li> <li>▪ Chemical and fuel storage procedures, including signage, are reviewed and monitored in audit process.</li> </ul> <p><u>Waste Management</u></p> <ul style="list-style-type: none"> <li>▪ Refer to Objective 11.</li> </ul> <p><u>Spill Response / Contingency Planning</u></p> <ul style="list-style-type: none"> <li>▪ Results of emergency response procedures carried out in accord with Regulation 31 show that oil spill contingency plan in place in the event of a spill is adequate and any necessary remedial action needed to the plan is undertaken promptly.</li> <li>▪ Oil spill contingency plan (reviewed annually) is up to date with specific scenarios relating to spills to creeks and floodplain areas.</li> <li>▪ Spill response equipment is audited annually.</li> <li>▪ Annual spill response training exercise / rehearsal is undertaken.</li> </ul>	<p>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.</p> <p>The major threat of spills is the threat to soil, vegetation and watercourses directly impacted by the spill. Therefore, the achievement of this objective also consequently contributes to the achievement of Objectives 2 and 7 in relation to minimising the impacts on soil and natural habitats.</p> <p>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.</p>

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
<p><b>5. Avoid disturbance to sites of cultural and heritage significance.</b></p>	<ul style="list-style-type: none"> <li>▪ Proposed well sites and access tracks have been surveyed and any sites of Aboriginal and non-Aboriginal heritage identified.</li> <li>▪ Any identified cultural and heritage sites have been avoided.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Consultation with stakeholders (i.e. government agencies, landholders etc) in relation to the possible existence of heritage sites, as necessary.</li> <li>▪ Heritage report forms completed for any sites or artefacts identified, and report forms forwarded to the Aboriginal Heritage Branch, Aboriginal Affairs and Reconciliation Division (AARD).</li> <li>▪ Survey records are kept and are available for auditing.</li> <li>▪ Areas requiring remediation which lie outside previously surveyed sites should be surveyed in accordance with company heritage clearance procedures.</li> <li>▪ A procedure is in place for the appropriate response to any sites discovered during drilling activities.</li> </ul> <p><u>Note:</u> Where a negotiated agreement or determination for heritage clearance is in place, compliance with the negotiated agreement or determination takes precedence over the above criteria.</p>	<p>The aim of the objective is to ensure that any sites of cultural (Aboriginal or non-Aboriginal) heritage significance are identified and protected.</p>
<p><b>6. Minimise loss of aquifer pressure and avoid aquifer contamination.</b></p> <p><i>Note: This objective is subject to an ongoing review and is currently unchanged from the 2003 SEO. Refer to the addendum to the EIR (Santos 2009a) for details.</i></p>	<p><u>Drilling &amp; Completion Activities</u></p> <ul style="list-style-type: none"> <li>▪ There is no uncontrolled flow to surface (blow out).</li> <li>▪ Sufficient barriers exist in casing annulus to prevent crossflow between separate aquifers or hydrocarbon reservoirs.</li> <li>▪ Relevant government approval obtained for abandonment of any radioactive tool left downhole.</li> </ul> <p><u>Producing, Injection, Inactive and Abandoned Wells</u></p> <ul style="list-style-type: none"> <li>▪ No cross-flow behind casing between aquifers, and between aquifers and hydrocarbon reservoirs unless approved by DWLBC.</li> </ul>	<p><u>Drilling &amp; Completion Activities</u></p> <ul style="list-style-type: none"> <li>▪ A competent cement bond between aquifer and hydrocarbon reservoirs is demonstrated.</li> <li>▪ For cases where isolation of these formations is not established, a risk assessment incorporating the use of pressure / permeability / salinity data is undertaken in consultation with DLWBC &amp; SAALNRM Board to determine if lack of cement or poor bond will cause or has caused damaging crossflow which needs to be remediated.</li> </ul> <p><u>Producing, Injection and Inactive Wells</u></p> <ul style="list-style-type: none"> <li>▪ Monitoring programs implemented (e.g. through well logs, pressure measurements, casing integrity measurements and corrosion monitoring programs) to assess condition of casing and cross-flow behind casing.</li> <li>▪ Casing annulus pressures are monitored every 2 years.</li> <li>▪ The condition of the primary casing barrier is adequate.</li> <li>▪ For cases where crossflow is detected, a risk assessment incorporating the use of pressure / permeability / salinity data is</li> </ul>	<p>This objective seeks to protect the water quality and water pressure of aquifers that may potentially be useful as water supplies, and to maintain pressure in sands that may host petroleum accumulations elsewhere.</p> <p>To address this objective, the risks of cross flow between aquifer cells known to be permeable and in natural hydraulic isolation from each other, or where there is insufficient information to determine that they are permeable or in hydraulic communication, must be assessed on a case by case basis and procedures implemented to minimize the fresh water aquifer cells from contamination and isolate potential and producing formations from formations that may deplete the reservoir pressure when not on production.</p>

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
		<p>undertaken in consultation with DLWBC &amp; SAALNRM Board to determine if lack of cement or poor bond will cause or has caused damaging crossflow which needs to be remediated.</p> <p><u>Well Abandonment Activities</u></p> <ul style="list-style-type: none"> <li>▪ Isolation barriers are set in place to ensure that crossflow, contamination or pressure reduction will not occur.</li> <li>▪ Barriers will be set to meet or exceed the requirements of applicable standards for the decommissioning and abandonment of water bores and abandonment of petroleum wells.</li> <li>▪ The placement of isolation barriers will in general be to isolate the groups of formations as listed under comments. The number and placement of barriers may be varied from this standard approach on a case-by-case basis by Santos personnel using relevant available data and the SA Cooper Basin Water Pressure and Salinity Module Report (2002), and in consultation with DWLBC.</li> </ul>	<p>The following geological formations are aquifers in the Cooper-Eromanga Basins. They may contain permeable sands which may be in natural hydraulic isolation from each other (from shallowest to deepest), and in general isolation will be maintained between these groups:</p> <ul style="list-style-type: none"> <li>▪ Eyre;</li> <li>▪ Winton,</li> <li>▪ Mackunda;</li> <li>▪ Coorikiana;</li> <li>▪ Cadna-owie;</li> <li>▪ Murta (including McKinlay Member)</li> <li>▪ Namur, Adori,</li> <li>▪ Birkhead, Hutton, Poolowanna,</li> <li>▪ Cuddapan; Nappamerri Group formations, Walkandi and Peera Peera formations</li> <li>▪ Toolachee; Daralingie;</li> <li>▪ Epsilon, Patchawarra or Mt Toodna or Purni;</li> <li>▪ Tirrawarra sandstone or Stuart Range; Merrimelia; Boorthanna; Crown Point formations and Basement reservoirs.</li> </ul> <p><b>Note:</b> Crossflow (if it occurs), should not compromise the long term sustainability of a particular resource.</p>
<p><b>7. Minimise disturbance to native vegetation and native fauna.</b></p>	<p><u>Well Lease and Access Track Construction and Restoration</u></p> <ul style="list-style-type: none"> <li>▪ Any sites with rare, vulnerable and endangered flora and fauna have been identified and avoided.</li> <li>▪ 0, +1 or +2 GAS criteria are attained for "Minimise impact on</li> </ul>	<p><u>Well Lease and Access Track Construction and Restoration</u></p> <ul style="list-style-type: none"> <li>▪ Proposed well sites, camp sites, access tracks and borrow pit sites have been assessed for rare, vulnerable and endangered flora and fauna species before the commencement of construction.</li> <li>▪ Consider alternate routes during planning phase to minimise environmental impacts</li> </ul>	<p>Primary risks to native fauna include clearing of habitat and obstruction of movement through cleared areas, the presence of borrow pits, fuel and chemical storage and management, and waste management activities.</p>

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
	<p>vegetation” objective as listed in Appendix 1 Table A1 and “The revegetation of indigenous species” objective as listed in Appendix 1 Table A2, during well lease and access track site selection and construction and restoration.</p> <p><u>Borrow Pit Construction and Restoration</u></p> <ul style="list-style-type: none"> <li>▪ 0, +1 or +2 GAS criteria are attained for “Minimise impacts on vegetation” objectives as listed in Appendix 1 Table A3 during borrow pit site selection, construction, and restoration.</li> </ul> <p><u>Waste Management</u></p> <ul style="list-style-type: none"> <li>▪ Refer to assessment criteria for Objective 11.</li> </ul> <p><u>Fuel and Chemical Storage and Handling</u></p> <ul style="list-style-type: none"> <li>▪ Refer to assessment criteria for Objectives 2 and 4.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Sensitive land systems (e.g. wetlands) avoided wherever possible. Where activities are undertaken in these areas (i.e. no practicable alternative), appropriate review, assessment and mitigation measures are in place.</li> <li>▪ Facilities (e.g. borrow pits, well cellars) are designed and constructed as far as practicable to minimise fauna entrapment.</li> <li>▪ Sumps and mud pits are fenced as appropriate to minimise wildlife access</li> <li>▪ Assessment records are kept and are available for auditing.</li> <li>▪ In recognised conservation reserves (i.e. Innamincka Regional Reserve) excavations are left in a state as agreed with the responsible statutory body</li> <li>▪ Borrow pits are restored to minimise water holding capacity, where agreements are not in place with stakeholders.</li> </ul> <p><u>Waste Management</u></p> <ul style="list-style-type: none"> <li>▪ Covered bins are provided for the collection and storage of putrescible wastes.</li> <li>▪ All loads of rubbish are covered during transport to the central waste facility.</li> <li>▪ Refer to Objective 11.</li> </ul> <p><u>Fuel and Chemical Storage and Handling</u></p> <ul style="list-style-type: none"> <li>▪ Refer to Objectives 2 &amp; 4.</li> </ul> <p><u>Fauna Management</u></p> <ul style="list-style-type: none"> <li>▪ No domestic pets allowed at camps or worksites.</li> <li>▪ Feeding of wildlife (e.g. dingoes) is not permitted.</li> </ul>	
<p><b>8. Minimise air pollution and greenhouse gas emissions.</b></p>	<ul style="list-style-type: none"> <li>▪ Compliance with EPA requirements</li> </ul>	<p><u>Well Testing</u></p> <ul style="list-style-type: none"> <li>▪ Conduct well testing in accordance with appropriate industry accepted standards.</li> <li>▪ Continually review and improve operations.</li> <li>▪ Appropriate emergency response procedures are in place for</li> </ul>	<p>Atmospheric emissions occur as a result of standard practices undertaken during drilling and well operations. Emissions of particular environmental significance are:</p> <ul style="list-style-type: none"> <li>▪ combustion by-products (e.g. oxides of nitrogen, carbon</li> </ul>

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
		<p>the case of a gas leak.</p> <p><u>Well Blowdown</u></p> <ul style="list-style-type: none"> <li>▪ Blowdown carried out in accordance with industry accepted standards / good production practice.</li> <li>▪ Any well that is consistently blown down is identified for a small ID tubing or plunger lift installation to minimise blow downs on that well.</li> </ul>	<p>monoxide and sulphur dioxide);</p> <ul style="list-style-type: none"> <li>▪ organic carbon and carbon particulates (black smoke); and</li> <li>▪ flared/vented hydrocarbons (gases).</li> </ul>
<p><b>9. Maintain and enhance partnerships with the Cooper Basin community.</b></p>	<ul style="list-style-type: none"> <li>▪ No unresolved reasonable complaints from the community.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Relevant affected parties are notified and consulted on proposed activities.</li> <li>▪ Forward development plans are presented to the local community.</li> <li>▪ Local community projects and events are sponsored and supported where appropriate.</li> <li>▪ Industry membership of appropriate regional land management committees and boards.</li> </ul>	<p>The importance of liaison with and contribution to the local community is recognised by the SACB parties.</p> <p>Notification, consultation, contribution to community activities, projects and events and membership of relevant organisations are considered to be key strategies for ensuring partnerships with the local community are enhanced.</p>
<p><b>10. Avoid or minimise disturbance to stakeholders and/or associated infrastructure.</b></p>	<ul style="list-style-type: none"> <li>▪ No reasonable stakeholder complaints left unresolved.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Induction for all employees and contractors covers pastoral, conservation, tourism, legislation and infrastructure issues.</li> <li>▪ Relevant stakeholders are notified prior to survey and construction of well sites, camp sites and access tracks and undertaking of operations (pursuant to Regulations). Borrow pits left open (unrestored) if requested by landholder and upon receipt of letter of transfer of responsibility to landholder.</li> <li>▪ Gates or cattle grids are installed to a standard, consistent with pastoral infrastructure in fences where crossings are required for access.</li> <li>▪ All gates left in the condition in which they were found (ie. open/closed).</li> <li>▪ Potential sources of contamination are fenced as appropriate to prevent stock access.</li> <li>▪ Excavations are located and managed so as not to pose an unacceptable hazard to stock or wildlife.</li> <li>▪ System is in place for logging landholder complaints to ensure</li> </ul>	<p>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.</p>

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
		<p>that issues are addressed as appropriate.</p> <ul style="list-style-type: none"> <li>▪ Requirements of the Cattle Care and Organic Beef accreditation programs are complied with.</li> <li>▪ In recognised conservation reserves (e.g. Innamincka Regional Reserve) excavations are left in a state as agreed with the responsible statutory body (e.g. DEH).</li> </ul>	
<p><b>11. Optimise (in order of most to least preferable) waste avoidance, reduction, reuse, recycling, treatment and disposal.</b></p>	<ul style="list-style-type: none"> <li>▪ 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, other fluids disposed during well clean-up and wastewater (see below).</li> <li>▪ Wastewater (sewage and grey water) disposed of in accordance with the <i>Public and Environmental Health (Waste Control) Regulations 1995</i> or to the Department of Health's satisfaction.</li> <li>▪ Attainment of GAS criteria for "Site to be left in clean, tidy and safe condition" objective during well site restoration (refer Appendix 1 Table A2).</li> <li>▪ Attainment of GAS criteria for "Site left in clean and tidy condition" objective during borrow pit restoration (refer Appendix 1 Table A3).</li> </ul>	<ul style="list-style-type: none"> <li>▪ Chemicals and oil are purchased in bulk. "Bulki bins" or other storage tanks are in place for large volume items.</li> <li>▪ Covered bins are provided for the collection and storage of putrescible wastes. All loads of rubbish are covered during transport to a licensed waste facility.</li> <li>▪ Waste streams are segregated on site to maximise opportunities for waste recovery, reuse and recycling.</li> <li>▪ Coordinate covered waste transportation on backload.</li> <li>▪ Production of waste is minimised by purchasing specifying reusable, biodegradable or recyclable materials in procurement, where practical.</li> <li>▪ Drilling fluids, drill cuttings and other fluids are disposed of to sump on the Act licence area.</li> <li>▪ Waste water (sewage) disposal is where possible in accordance with the <i>Public and Environmental Health (Waste Control) Regulations 1995</i> (which require that the waste water disposal system must either comply with the <i>Standard for the Construction, Installation and Operation of Septic Tank Systems in SA</i> or be operated to the satisfaction of the Department of Health) and the <i>Environment Protection (Water Quality) Policy 2003</i>.</li> <li>▪ Grey water is disposed of to the sewage treatment system.</li> <li>▪ Secondary treated sewage wastewater is disposed of onto land well away from any place from which it is reasonably likely to enter any waters, and to minimise spray drift and ponding, in accordance with clause 11 of the <i>Environment Protection (Water Quality) Policy 2003</i>.</li> </ul>	<p>Waste reduction requires continual improvements in purchasing, efficiency of use and reuse. The geographical isolation reduces the available opportunities to recycle. However, continual review of recycling options is required and conducted to ensure that emerging opportunities are utilised.</p> <p>Bins are covered to prevent access by fauna and the spread of rubbish by wind.</p> <p>Responsible handling and disposal of waste will reduce both short-term and long-term impacts of waste on the environment.</p> <p>Refer to Objective 2 for comment on approval of transportable wastewater treatment plants and interim measures for wastewater disposal.</p>

Environmental Objectives	Assessment Criteria	Guide to How Objectives Can Be Achieved	Comments
<p><b>12. Remediate and rehabilitate operational areas to agreed standards.</b></p>	<ul style="list-style-type: none"> <li>▪ No unresolved reasonable stakeholder complaints.</li> </ul> <p><u>Contaminated Site Remediation</u></p> <ul style="list-style-type: none"> <li>▪ Contaminated sites are remediated to a level as determined by the approved SHI process.</li> <li>▪ Prior to the finalisation and approval of the SHI process, contaminated sites are remediated in accordance with criteria developed with the principles of the National Environment Protection Measure for contaminated sites, and in consultation with the EPA.</li> </ul> <p><u>Well Site and Access Track Restoration</u></p> <ul style="list-style-type: none"> <li>▪ The attainment of 0, +1 or +2 GAS criteria for the objectives (refer Appendix 1 Table A2):                             <ul style="list-style-type: none"> <li>- “To minimise the visual impact”</li> <li>- “The revegetation of indigenous species”</li> </ul> </li> </ul> <p><u>Borrow Pit Restoration</u></p> <ul style="list-style-type: none"> <li>▪ The attainment of 0, +1 or +2 GAS criteria for (refer Appendix 1 Table A3):                             <ul style="list-style-type: none"> <li>- “Revegetation of indigenous species”</li> <li>- “Minimise impact on soil”</li> <li>- “Minimise visual impacts”</li> <li>- “Site to be left in a clean and tidy condition”</li> </ul> </li> </ul> <p><u>Note:</u> Well abandonment issues are addressed under Objective 6.</p>	<ul style="list-style-type: none"> <li>▪ Rehabilitation/ abandonment plans for surface activities will be developed in consultation with relevant stakeholders.</li> </ul> <p><u>Well Site and Access Track Restoration</u></p> <ul style="list-style-type: none"> <li>▪ Compacted soil areas have been ripped (except on gibber and tablelands) and soil profile and contours are reinstated following completion of operations.</li> </ul>	

## 3 Reporting

Regulation 12(2) requires an SEO to identify events that could cause a serious incident or a reportable incident within the meaning of Section 85 of the Act.

### 3.1 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).

#### 3.1.1 Serious Incidents

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

- (a) a person is seriously injured<sup>2</sup> 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
- (d) security of natural gas supply is prejudiced or an imminent risk of prejudice to security of natural gas supply arises<sup>3</sup>.

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, 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
- any well incident or failure that threatens or poses imminent threat to security of supply or poses an imminent safety or environmental risk
- disturbance to sites of cultural and/or heritage significance without appropriate permits and approvals<sup>4</sup>
- 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 without appropriate permits and approvals<sup>5</sup>.

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<sup>2</sup> Includes an immediately notifiable work-related injury pursuant to Division 6.6 of the *Occupational Health, Safety and Welfare Regulations 1995* that results in the issuing of a Prohibition Notice by SafeWork SA.

<sup>3</sup> 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

<sup>4</sup> Pursuant to *Aboriginal Heritage Act 1988* and *Heritage Places Act 1993*

<sup>5</sup> Pursuant to *Native Vegetation Act 1991* (flora) and *National Parks and Wildlife Act 1972* (fauna)

### 3.1.2 Reportable Incidents

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

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

- (a) an unintended escape of petroleum<sup>6</sup>, a processed substance, a chemical or a fuel that affects an area that has not been specifically designed to contain such an escape
- (b) an incident identified as a reportable incident under the relevant statement of environmental objectives.

Pursuant to Regulation 12(2) and Regulation 32(1)(b), the incidents listed below are also considered to be reportable incidents:

- demonstrated presence of cross flow or flows to surface from the well bore
- a reasonable complaint from a stakeholder 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.

### 3.2 Reporting Requirements

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

**Reportable Incidents** must be reported to PIRSA on a quarterly basis within 1 month of the end of the quarter, as per Regulation 32.

### 3.3 Reporting to EPA

Where applicable, incidents causing or threatening serious or material environmental harm under the *Environment Protection Act 1993* must be reported to the EPA in accordance with section 83 of the *Environment Protection Act 1993*.

The reporting obligation under the Environment Protection Act does not apply to:

- 1) petroleum exploration activity undertaken under the Act; or
- 2) wastes produced in the course of an activity authorised by a licence under the Act when disposed of to land within the area of the licence.

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<sup>6</sup> In gaseous, liquid or solid state, as per Petroleum Act definition

## 4 List of Abbreviations

AARD	Aboriginal Affairs and Reconciliation Division, Department of the Premier and Cabinet
DEH	Department for Environment and Heritage (South Australia)
DWLBC	Department of Water, Land and Biodiversity Conservation
EIR	Environmental Impact Report prepared in accordance with Section 97 of the Act and Regulation 10.
EPA	Environment Protection Authority
ERP	Emergency response plan
GAS	Goal attainment scaling
NEPM	National Environment Protection Measure
PEL	Petroleum exploration licence
PIRSA	Primary Industries and Resources South Australia
PPE	Personal protective equipment
PPL	Petroleum production licence
SAAL NRM Board	South Australian Arid Lands Natural Resources Management Board
SACB	South Australia Cooper Basin
SEO	Statement of Environmental Objectives prepared in accordance with Section 99 and 100 of the Act and Regulations 12 and 13.
SHI	Soil Health Index Study
WAC	Work Area Clearance

## 5 References

PIRSA (2009). *Field Guide for the Environmental Assessment of Abandoned Petroleum Well Sites in the Cooper Basin, South Australia*. Prepared by the Petroleum and Geothermal Group, Division of Minerals and Energy Resources, Primary Industries and Resources South Australia.

Santos Ltd. (2003a). *South Australia Cooper Basin Operators Environmental Impact Report: Drilling and Well Operations*. Santos Ltd, Adelaide.

Santos Ltd (2006). *South Australian Cooper Basin Operators Statement of Environmental Objectives: Geophysical Operations*. Santos Ltd, Adelaide.

Santos Ltd (2009a). *Addendum to the Environmental Impact Report: Drilling and Well Operations - Five Year Review of the Statement of Environmental Objectives*. Santos Ltd, Adelaide.

Santos Ltd (2009b). *South Australia Cooper Basin Statement of Environmental Objectives: Production and Processing Operations*. Santos Ltd, Adelaide.

Wiltshire, D. and Schmidt, M. (2003). *Field Guide to the Common Plants of the Cooper Basin (South Australia and Queensland)*. Santos Ltd, Adelaide.

Appendix 1:  
Goal Attainment Scaling (GAS) Criteria

**Table A1: GAS Criteria for Assessing Well Site Construction**

Objectives	Measure Associated Goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor Shortfall - 1	Significant Shortfall - 2
Minimise impacts on soil	Roll gibber			Gibber rolled		Blading has occurred in gibber and tableland environments
	Topsoil stockpiling			Topsoil and any cleared vegetation stockpiled at well lease and campsite		No stockpiled topsoil evident
Minimise impact on vegetation	Minimise perennial vegetation clearance	No trees or vegetation removed.	No trees removed, only vegetation of priority 4 in Field Guide <sup>1</sup> cleared.	Trees and vegetation removed in area where could not have been avoided.	Vegetation of priority 2 or 3 in Field Guide <sup>1</sup> removed in area where could have been avoided.	Trees of priority 1 in Field Guide removed in area where could have been avoided.
Reduce 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.

<sup>1</sup> Field guide refers to the *Field Guide to the Common Plants of the Cooper Basin – South Australia and Queensland* (Wiltshire and Schmidt 2003)

**Table A2: GAS Criteria for Assessing Well Site Restoration**

Objectives	Measure	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor Shortfall - 1	Significant Shortfall - 2
<b>To minimise the visual impact<sup>1</sup></b>	<b>Access tracks</b>	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 is still prominent (e.g. ripping, rolling or respreading of original material).	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.
	<b>Interdune and floodplain wellsites</b>	The site 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 beginning to blend also.	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 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.
	<b>Dune wellsites</b>	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.	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.	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 face of the dune but they are not extensive or prominent.	The site has been restored into the natural contour of the dune, but the colour of foreign material contrasts with the surroundings.	Extensive gully erosion down the face of the dune and/or a steep site edge is prominent.
	<b>Gibber wellsites</b>	Site is indistinguishable from the surrounds.	Site matches adjacent contours and the gibber is uniformly spread with no imported material evident.	Site matches adjacent contours with some imported material still evident within gibber spread.	Site matches adjacent colours, but is visible due to inconsistent spreading of the gibber and some bare areas.	Site is poorly formed and predominantly bare due to incomplete spreading or loss of the gibber.
<b>The revegetation of indigenous species<sup>1</sup></b>	<b>Predictive rehabilitation on abandonment</b>	N/A	N/A	There has been appropriate preparation of the ground surface to promote revegetation.	The restored surface is inconsistent with the surroundings.	No attempt has been made to restore the wellsite.
	<b>Less than five years since wellsite abandonment</b>	The revegetation is extensive and mostly consists of annuals and biennials; perennials are beginning to establish which is consistent with the surroundings.	The revegetation is extensive and consists of annuals and biennials; in contrast to the surroundings there are no perennials.	Colonisation of the original species is starting to occur.	Revegetation with inappropriate species.	No revegetation is occurring.
	<b>At least five years since abandonment</b>	The revegetation type, density and maturity is indistinguishable from the surroundings.	The revegetation, mostly perennials, is consistent with the surroundings; but there is a 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.	There is no revegetation.
<b>Site to be left in a clean, tidy and safe condition</b>	Well marked and cellar backfilled			Cellar backfilled and marker erected	Cellar backfilled but no marker erected	Cellar not backfilled completely.
	Rubbish removed			No evidence of litter on site	Small items of litter spread over more than 50% of the site, eg. tin cans, nuts and bolts, rags, small pieces of cable and wood etc.	Large items of litter present across site, eg. drums, pieces of casing and cables etc.

<sup>1</sup> These criteria are consistent with PIRSA (2009) *Field Guide for the Environmental Assessment of Abandoned Petroleum Wellsites* which also contains photographic examples of these outcomes

**Table A3: GAS Criteria for Borrow Pit Construction and Rehabilitation**

Objectives	Goals	Goal Exceeded +2	Goal Exceeded +1	Goal Attained 0	Minor Shortfall - 1	Significant Shortfall - 2
<b>CONSTRUCTION</b>						
Minimise impacts on vegetation	Perennial vegetation clearance minimised	No trees or vegetation removed.	No trees removed, only vegetation of priority 4 in Field Guide <sup>7</sup> cleared.	Trees and vegetation removed in area where could not have been avoided.	Trees of priority 2 or 3 in Field Guide <sup>1</sup> removed in area where could have been avoided.	Trees of priority 1 in Field Guide <sup>7</sup> removed in area where could have been avoided.
Protect unknown 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 road.	Borrow pit shielded from road by utilising 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.
<b>REHABILITATION</b>						
Revegetation of indigenous species	Acceptable revegetation after rainfall	Vegetation type and density indistinguishable from surrounding landscape.		Perennial grasses and shrubs revegetated and type consistent with surroundings. Some bare patches still present. Vegetation cover is 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 are still highly visible. Topsoil and vegetation respread over disturbed area.	Pit sides battered but not ripped.	No recontouring 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 litter present on site		Litter present on site.

<sup>7</sup> Field guide refers to the *Field Guide to the Common Plants of the Cooper Basin – South Australia and Queensland* (Wiltshire and Schmidt 2003)