# Annual Report

# Licence Year 3, 10 May 2009 to 9 May 2010

# Geothermal Retention Licences 3-12

## Environmental

Document Number: ENV-FN-OT-RPT-00002
Revision No: 1.0
Date: 23 February 2011

Certified System Environment ISO 14001 SAI GLOBAL

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| Document Information |
|---|
| **Annual Report**<br>**Licence Year 3, 10 May 2009 to 9 May 2010**<br>**Geothermal Retention Licences 3-12**<br>**Environmental**<br>Document Number: ENV-FN-OT-RPT-00002<br>Date: 23 February 2011 |

| Rev | Date | Details | Prepared by | Reviewed by | Approved by |
|---|---|---|---|---|---|
| 0.1 | 07/10/2010 | First draft for review | Howard Coombes / Doone Wyborn | Howard Coombes | Doone Wyborn |
| 1.0 | 23/02/2011 | Revised following comments from PIRSA 16/2/11 | Howard Coombes / Doone Wyborn | Howard Coombes | Doone Wyborn |

| Prepared, Reviewed and Approval Details | | |
|---|---|---|
| Prepared by: Howard Coombes / Doone Wyborn | Date: 23/02/11 | Signature: |
| Reviewed by: Howard Coombes | Date: | Signature: |
| Approved by: Doone Wyborn | Date: 23/02/2011 | Signature: |

| Release Statement |
|---|
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# 1. INTRODUCTION

Geothermal Retention Licences (GRL's) 3 – 12 were granted to Geodynamics Limited on 10 May 2007 for a period of 5 years.

This report details the work conducted during Licence Year 3, of the licence (10 May 2009 to 9 May 2010) in accordance with Regulation 33 of the Petroleum Act 2000.

# 2. PERMIT SUMMARY

For the duration of the licence year, licensees for Geothermal Retention Licence (GRL's 3-12) were:

- Geodynamics Limited 70% (operator)
- Origin Energy Limited 30%

GRLs 3 - 12 have been granted without a set work programme (guaranteed or not guaranteed). The granting of these licences provides authorisation to Geodynamics to carry out operations (1) to establish the nature and extent of a discovery of geothermal energy, and (2) to establish the commercial feasibility of production and appropriate production techniques.

Licence Year 3 concluded on 9 May 2010. The following table (Table 2-1) displays the actual work completed up until the end of the current licence period.

Table 2-1: Work completed (as end of current reporting period) by licence year:

| Licence Year | Licence Dates | Actual Work |
|---|---|---|
| Year 1 | 10/05/07 to 9/05/08 | Drilling and flow testing well Habanero 3, construction of flow line between Habanero 3 and Habanero 1, and drilling well Jolokia 1. |
| Year 2 | 10/05/08 to 09/05/09 | Completed drilling of Jolokia 1<br>Commenced drilling of Savina 1<br>Completed installation of Habanero closed loop pipeline.<br>Carried out closed loop circulation testing of Habanero 3 to 1 closed loop.<br>The Habanero pilot plant commenced construction and was nearing completion by the end of the period.<br>Logs were run on Habanero 3, Jolokia 1 and Savina 1.<br>Installation of the Jolokia acoustic monitoring network.<br>Installation of the Savina acoustic monitoring network.<br>Continuous acoustic monitoring was undertaken at the Habanero, Jolokia and Savina networks. |
| Year 3 | 10/05/09 to 09/05/10 | Completion of Habanero Pilot Plant<br>Habanero 3 well control incident (24/4/09). Well brought under control 20 May 2009.<br>Commenced preparations for completion and stimulation of Jolokia 1. |
| Year 4 | 10/05/10 to 9/05/11 | |
| Year 5 | 10/05/11 to 9/05/12 | |

# 3. REGULATED ACTIVITIES

## 3.1 Drilling

### 3.1.1 Habanero

No drilling activities were performed in the Habanero geothermal field during the reporting period.

### 3.1.2 Jolokia

No drilling activities were performed in the Jolokia geothermal field during the reporting period.

### 3.1.3 Savina

No drilling activities were performed in the Savina geothermal field during the reporting period.

## 3.2 Well Operation Activities

### 3.2.1 Habanero

The key activity at Habanero during the period involved bringing the Habanero 3 well under control. This occurred on 20 May 20009. A Serious Incident Report was submitted to PIRSA on 23rd September 2009.

## 3.3 Seismic Data Acquisition

Nil.

## 3.4 Seismic Data Processing and Reprocessing

Nil.

## 3.5 Geochemical, Gravity, Magnetic and other surveys

Nil.

## 3.6 Pipeline/Flowline Construction and Operation

Nil

## 3.7 Preliminary Survey Activities

Nil.

# 4. COMPLIANCE ISSUES

## 4.1 Licence and Regulatory Compliance

There were several instances during Year 3 of the GRL's 3-12 in which Geodynamics failed to comply with the requirements of the licence, the Regulations of the *Petroleum & Geothermal Energy Act 2000* or the objectives of the SEO's under which it conducted its field operations. Refer Table 2 below.

### 4.1.1 Licence Non-Compliance

There were no instances during Year 1 of the GRL 3-12 Licence in which Geodynamics failed to comply with the conditions of the Licence.

### 4.1.2 Regulatory Non-Compliance

There were several instances during the reporting year GRL 3-12 licence where Geodynamics failed to comply with the regulations of the *Petroleum & Geothermal Energy Act 2000*. Refer Table 4-1.

Table 4-1: List of regulatory non-compliances for current reporting year

| No. | Date | Activity | Details of Non-Compliance | Rectification of Non-Compliance |
|---|---|---|---|---|
| 1 | 9/05/10 | Submission of annual report | Annual report not submitted within time. | Delay in submission of the Year 3 report was affected by the time it took to close out the Year 2 report. |
| 2 | Various | Provide copies of wireline logs to the Minister within 1 month of acquisition (Reg.n 39) | Failure to submit wire line logs in required time.<br><br>Each log is listed individually in section 4.4. | The Company is implementing procedures to ensure compliance. |
| 3 | Various | Provide quarterly cased hole well activity report (Reg.n 41) | Not all Quarterly cased hole reports submitted within required time. | The Company is implementing procedures to ensure compliance. |
| 4 | Various | Downhole diagrams must be submitted within 2 months after the installation or alteration of downhole equipment. | Downhole diagrams not submitted in accordance with regulations. | The Company is implementing procedures to ensure compliance. |

## 4.2 Compliance with Statement of Environmental Objectives

Activities carried out in GRL's 3-12 during the Licence Year were undertaken under 1 SEO as follows. A statement of performance against this SEO's is provided in Appendix A.

| Appendix No. | Activity | SEO Name |
|---|---|---|
| A | Drilling | South Australian Cooper Basin Operators Statement of Environmental Objectives: Drilling and Well Operations<br>Santos 2003<br>Gazetted November 2003 |

The following activities were carried out under the South Australian Cooper Basin Operators Statement of Environmental Objectives: Drilling and Well Operations

Jolokia 1 - Rentry and completion.

Construction of the 1 MW Power plant was carried out under the Statement of Environmental Objectives 1MW Geothermal Power Plant, August 2008.

Compliance with the applicable SEO's during the licence year is documented in Appendix A.

## 4.3 Management System Audits

During the reporting period the following audits were undertaken:

- Environmental Management System Audit - 23 September 2009
- Pre certification audit - 25 August 2009
- EMS Certification audit - 5 to 8 October 2009
- Health Safety and Environment Management System Self Assessment Audit - submitted to PIRSA 21 August 2009

All findings from these audits have been addressed and closed out.

## 4.4 Report and Data Submissions

Pursuant to Regulation 33(2) (e) under the Act, an annual report must include:

“a list of all reports and data relevant to the operation of the Act generated by the licensee during the licence year”.

Table 4-2: List of report and data submissions during current licence reporting year

| Description of Report/Data | Due Date | Date Submitted | Compliant / Non-Compliant |
|---|---|---|---|
| Well completion report Savina | ***6mths after the rig release*** | December 2009 | Non compliant |
| Activity Notification - construction of sump in SA Transport Borrow pit Habanero | ***35 days before commencement*** | 11 May 2009 | Compliant |
| Activity Notification - construction and operation of Temporary warehouse and storage yard Habanero | ***35 days before commencement*** | 12 November 2009 | Compliant |
| Activity Notification - Construction of additional holding pond | ***35 days before commencement*** | 3 November 2009 | Compliant |
| Activity Notification- Magnetotelluric Survey Jolokia | ***35 days before commencement*** | 8 April 2010 | Compliant |
| Activity Notification - Site Rationalisation Habanero | ***35 days before commencement*** | 29 June 2009 | Compliant |
| Activity Notification - Extension to drill rig camp. | ***35 days before commencement*** | 18 January 2010 | Compliant |
| Stimulation & Evaluation SEO | ***Prior to commencement of regulated activities*** | 12 April 2010 | Compliant |
| Quarterly cased hole reports for 2008 (1st, 2nd, 3rd and 4th Quarters) and 2009 1st Quarter | | 14 January 2009 | Non compliant from previous year |
| Quarterly cased hole reports for 2007 (2nd, 3rd and 4th Quarters) | | 14 January 2009 | Non compliant from previous year |
| Savina 1 Cali-GR | | 21 August 2009 | Non-compliant from previous year |

## 4.5 Incidents

Pursuant to Regulation 33(2) (f), an annual report must include:

"in relation to any incidents reported to the Minister under the Act and these Regulations during the relevant licence year –

i. an overall assessment and analysis of the incidents, including the identification and analysis of any trends that have emerged; and

ii. an overall assessment of the effectiveness of any action taken to rectify non-compliance with obligations imposed by the Act, these regulations or the licence, or to minimise the risk of recurrence of any such non-compliance".

There were 2 serious incidents pursuant to section 83 of the Act and the relevant SEO during the licence year within GRLs 3-12.

These incidents involved a small fire at the Habanero 3 well head during a welding operation in June 2009. Work was being carried out on the open topped well-head of Habanero 3 to protect the well from ingress of foreign materials.

No Injuries or property damage has occurred in either of these events.

Both of the fires occurred during the afternoon of the same day, which has been established as being between June 6th and June 11th 2009.

The fires were the result of ignited flammable gasses leaking to atmosphere from the damaged Habanero 3 wellhead.

**Determined Causal factors:**

- The casual causes were
- conducting hot-work in/impinging on a hazardous zone with inadequate controls in place
- poor / high risk work practices - using flame to test for gas

**Determined Root Causes:**

- Work Practices:
  - Insufficient training to allow PTW system adherence and prevent inadvertent poor safe work practices of workers and contractors
  - Supervision and management of hot work task was inadequate potentially due to training level of supervisor
- Risk Management:
  - There is inadequate framework for safe work in Hazardous Zones i.e. Insufficient signage, zones not shown on site maps, inadequate physical access restrictions, No Ignition Source restriction requirements included in inductions or other training materials
  - Confined Space controls lacking for Habanero 3 as per above points for Hazardous Zones
  - The Permit To Work systems were not well implemented
  - GDY did not show ownership of the Wells Permit System employed by their contractor
  - Despite site being remote from management base there was no standard management system or reporting requirements in place to check and encourage adherence to the Permit to Work system(s).
- Induction/Training:
  - No Permit System Training Modules in GDY training matrix at the time
  - Contractors not included in GDY training matrix
- Monitoring/Maintenance
  - Preventative Maintenance and Testing system not implemented for safety critical Gas Detectors

**Recommendations**:

1. Implement Ignition Source controls for all hazardous areas, including:
   a. access restriction & signage
   b. Include appropriate instruction in site Induction material

2. Determine appropriate Hazardous Zones for Wells and Dangerous Goods stores

    a. Include hazardous areas in site drawings to assist in work permit coordination

3. Review the Permit to Work procedures and ensure Hot Work definitions and rules are appropriate and contain adequate rules for precautions

4. Ensure training for both employees and contractors is appropriate for tasks prior to assignment - specifically:

    a. Develop training modules appropriate for the different user levels of the GDY PTW system - Permit Issuer, Permit Holder, Permit Working Party members

    b. Conduct PTW training for all required persons, schedule refresher training as required

    c. Arrange PTW Wells training with approved training provider / ensure contractors are appropriately trained - track both

    d. Update GDY Training matrix to include Permit to Work/Permit to Work (Wells) (with separate training for Permit Holders and Permit Authorities), Confined Space Entry, Gas Detection

    e. Update Work Permit forms to include checks for training before work is approved

    f. Review Contractor Management Procedure to ensure contractor training requirements are determined and checked for during Pre-Qualification phase prior to engagement

5. Ensure all hot work permit authorities are trained in gas detection - note that Gas Detection is included in confined space entry training and should be a minimum requirement to be a permitting authority (CS training required to identify what requires a CS Permit)

6. Completed Permits should be properly tracked, reviewed and audited by GDY

All of these recommendations have been implemented by Geodynamics.

In addition the well control incident at Habanero 3, involving uncontrolled flow of water to the surrounding environment was ongoing during the reporting year. At the end of the reporting period on 9 May 2009, the flow had not been contained. Water from the well was flowing into a borrow pit located approximately 30m from the wellhead. The wall of the pit was raised to provided additional capacity if required. This incident was reported in the previous year's annual report. The well was brought under control on 21 May 2009, and the final incident report submitted to PIRSA in October 2009.

Two environmental monitoring wells were installed during the reporting year. The objective of these wells is to determine assess underground flow of the formation water which escaped from the Habanero 3 well and subsequently infiltrated into the ground. No results were available from these wells at the completion of the licence year due to access issues associated with local rain.

## 4.6 Treat Prevention

Pursuant to Regulation 33(2) (g) under the Act, an annual report must include:

“a report on any reasonably foreseeable threats (other than threats previously reported on) that reasonably presents, or may present, a hazard to facilities or activities under the licence, and a report on any corrective action that has, or will be taken”.

HAZOP/HAZID workshops were carried out as part of the design process for the activities undertaken at Jolokia during the licence year.

### 4.7 Future Work Program

Pursuant to Regulation 33(2) (h) under the Act, an annual report must include:

“unless the relevant licence year is the last year in which the licence is to remain in force – a statement outlining operations proposed for the ensuing year”.

The expected work program has been severely affected by the well control incident at Habanero 3 in April 2009. The majority of the licence year has been spent assessing the cause of the failure and redesign for future wells.

The expected emphasis of the work program is to complete and undertake stimulation at Jolokia 1. Once this is completed it is planned to move the rig back to Habanero and commence drilling of Habanero 4, as the replacement to Habanero 3. Potentially this will then allow the 1MW Pilot Plant to be operated using either Habanero 1 or 2, and Habanero 4. It is expected that drilling of Habanero 4 will commence in April 2011.

## 5. EXPENDITURE STATEMENT

Pursuant to Regulation 33(3) under the Act, an annual report must contain:

“An annual report must be accompanied by a statement of expenditure on regulated activities conducted under the licence for the relevant licence year, showing expenditure under each of the following headings:

(a) drilling activities;

(b) seismic activities;

(c) technical evaluation and analysis;

(d) other surveys;

(e) facility construction and modification;

(f) operating and administration expenses (not already covered under another heading)”.

Below is an expenditure statement for the current reporting period.

# Appendix A Geodynamics' compliance for drilling activities

| **Geodynamics Compliance for Drilling Activities**<br>**SEO: South Australia Cooper Basin Operators Statement of Environmental Objectives: Drilling and Well Operations, Santos 2003** | | | |
|---|---|---|---|
| Environmental Objective | Comment | Guide on How objectives can be achieved | Assessment and Compliance Statement |
| **Objective 1:** Minimise the risk to public and other third parties. | 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.<br><br>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 site should be carried out.<br><br>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.<br><br>The movement of heavy equipment associated with rig moves present a risk to the safety of employees, contractors and third parties (ie. tourists). | • All employees and contractor personnel complete a safety induction prior to commencement of work in the field.<br>• All employees and contractor personnel undertake a refresher induction every 2 years.<br>• Signage in place to warn third parties of access restrictions to operational areas, with particular warnings when potentially dangerous operations are being undertaken.<br>• Permit to work systems in place for staff and contractors in dangerous situations.<br>• All appropriate PPE (personal protective equipment) is issued and available as required in accordance with company operating requirements and applicable standards.<br>• Effective Emergency Response Plan (ERP) and procedures are in place in the event of a fire or explosion.<br>• Annual exercise of ERP.<br>• 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.<br>• Reporting systems for recording injuries and accidents in place, and annual; (at minimum) review of records to determine injury trends. Implementation of appropriate corrective actions.<br>• Ensuring safety management plans are updated and reviewed. | **Compliance Statement:** GDY to its knowledge believe it has complied with all obligations required under this SEO objective. GDY employs full time field based supervisors to monitor and direct all field operations. As part of this position all field procedures are being reviewed to ensure ongoing compliance with the terms of this objective. |
| **Objective 2:** Minimise the disturbance and avoid contamination to | 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 | Well Site and Access Track Construction<br>• Consider alternate routes during planning phase to minimise environmental impacts<br>• Gibber mantle on access tracks and well sites | Well Site and Access Track Construction<br>• 0, +1 or +2 GAS criteria are attained for "Minimise visual impacts of abandoned well sites |

| Geodynamics Compliance for Drilling Activities<br>SEO: South Australia Cooper Basin Operators Statement of Environmental Objectives: Drilling and Well Operations, Santos 2003 | | | |
|---|---|---|---|
| Environmental Objective | Comment | Guide on How objectives can be achieved | Assessment and Compliance Statement |
| soil. | borrow pits, restoration activity, vehicle movement in off-road locations and sub-surface excavations (ie. sumps, flare pits and borrow pits). | (excluding sumps) has not been removed, only rolled, during construction and restoration on gibber and tableland land systems.<br>• Topsoil stockpiled (including fibber mantle) from sump construction and respread on abandonment.<br>• The need to traverse sensitive land systems and the methods of managing the impacts should be justified in accordance with company procedures, recorded and available for auditing.<br>• Production Testing/Well Blowdowns<br>• If appropriate use:<br>– Impermeable flare pit<br>– Flare tanks<br>• Fuel and Chemical Storage and Handling<br>• All fuel, oil and chemical storages bunded in accordance with the appropriate standards<br>• Records of spill events and corrective actions maintained in accordance with company procedures<br>• Spills or leads are immediately reported and clean up actions initiated<br>• 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)<br>• Chemical and fuel storage procedures, including signage, are reviewed and monitored in audit process.<br>• Spill Response / Contingency Planning<br>• Results of emergency response procedures carried out in accord with Regulation 31 show that | and access tracks" objective as listed in Appendix 4 for well lease and access track construction.<br>• No unauthorised off-road driving or creation of shortcuts.<br>• No construction activities are carried out on salt lakes, steep tableland land systems or wetlands land systems (as defined in EIR)<br>• Borrow pit construction and restoration<br>• 0, +1 or +2 GAS criteria are attained for "Minimise Visual Impacts for constructing burrow pits" objective as listed in Appendix 3, and "Minimise visual impacts" and "Minimise impact on soil" objective as listed in Appendix 5.<br>• Production Testing/Well Blowdowns<br>• Potential contamination of soil has occurred as a result of the Habanero 3 Incident. Given that the well had not been brought under controlat the end of the Licence year, monitoring and investigation is ongoing and the need for remediation is yet to be determined.<br>• Fuel and Chemical Storage and Handling |

| Geodynamics Compliance for Drilling Activities<br>SEO: South Australia Cooper Basin Operators Statement of Environmental Objectives: Drilling and Well Operations, Santos 2003 | | | |
|---|---|---|---|
| Environmental Objective | Comment | Guide on How objectives can be achieved | Assessment and Compliance Statement |
| | | oil spill contingency plan in place in the event of a spill in adequate and any necessary remedial action need to the plan in undertaken promptly.<br>• Oil spill contingency plan (reviewed annually) is up to date with specific scenarios relating to spills to creeks and floodplain areas.<br>• Spill response equipment is audited annually.<br>• Annual spill response training exercise in undertaken.<br>• Waste Disposal (domestic, sewage and sludges)<br>• Covered bins are provided for the collection of storage and wastes.<br>• All loads of rubbish are covered during transport to the central waste facility<br>• Pits are not established in locations, which pose an unacceptable hazard to stock or wildlife. | • No spills/leaks outside of areas designed to contain them.<br>• Level of hydrocarbon continually decreasing for in situ remediation of spills.<br>• Soils remediated to a level as determined by the SHI process.<br>• Compliance Statement: GDY to its knowledge and through implementing the EIR requirements believe it has complied with all obligations required under this SEO objective.<br>• All domestic wastes are disposed of in accordance with EPA requirements<br>• 0, +1 or +2 GAS criteria for domestic waste are attained<br>• No spills or leaks from sewage treatment process. |
| **Objective 3:** Avoid the introduction of spread of pest plants and animals and implement control measures as necessary. | Activity associated with lease and access track construction, such as movement of vehicles and equipment, is a potential source of week or disease introduction and spread. 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. | • Where appropriate a weed and feral animal management strategy is in place (avoidance and control strategies).<br>• Rig and vehicle wash downs are initiated in accordance with the management strategy. | No weeds or feral animals are introduced to operational areas.<br><br>Compliance Statement: GDY to its knowledge and through implementing the EIR requirements believes that it has complied with all obligations under this SEO objective. |
| **Objective 4:** Minimise disturbance to | The main threats to drainage patterns and surface waters, and shallow ground waters are considered to be interruption of natural flows as | Drilling Mud Sumps and Flare Pits<br>• All drill cuttings, muds and non-toxic drill fluids are contained within the designated mud sumps with | Well Lease and Access Track Construction<br>• Well leases and access tracks |

| Geodynamics Compliance for Drilling Activities<br>SEO: South Australia Cooper Basin Operators Statement of Environmental Objectives: Drilling and Well Operations, Santos 2003 | | | |
|---|---|---|---|
| Environmental Objective | Comment | Guide on How objectives can be achieved | Assessment and Compliance Statement |
| drainage patterns and avoid contamination of surface waters and shallow ground water resources. | a result of earthworks and contamination.<br>Access track and well site selection should aim to minimise impact to drainage systems, by avoiding sensitive areas and appropriate construction methods to avoid windrows.<br>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 (eg. corrosion inhibitors) during storage and handling.<br>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.<br>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. | adequate freeboard at the completion of operations to allow to a 1m cover of clean fill at remediation.<br>• Well Heads (Oil and Gas Systems)<br>• Where appropriate, imperviously lined well cellars are installed on oil wells.<br>• Chemical containment devices are installed on gas well skids.<br>• Well heads shut in and chemicals removed prior to flood events.<br>• Jet pumps are installed within containment device with an adequately sized containment sump.<br>• Well Blowdown/Production Testing<br>• Activity is conducted in accordance with accepted industry standards / good oilfield practice.<br>• If appropriate use:<br>– Impermeable flare pit<br>– Separators<br>– Supervision<br>• Fuel and Chemical Storage and Handling<br>• All fuel, oil and chemical storages bunded in accordance with the appropriate standards<br>• Records of spill events and corrective actions maintained in accordance with company procedures<br>• Spills or leaks are immediately reported and clean up actions initiated<br>• Logged incidents are reviewed annually to determine areas that may require corrective action in order to reduce spill volumes in subsequent | are located and constructed to maintain pre-existing water flows (ie. channel contours are maintained on floodplains and at creek crossings).<br>• Drilling Mud Sumps and Flare Pits<br>• No overflow of drill cuttings, muds and other drilling fluids from mud sumps.<br>• No waste material disposal to sumps and flare pits.<br>• Well Blowdown/Production Testing<br>• Potential contamination may have occurred as a result of the Habanero 3 Incident. Given that the well had not been brought under control at the end of the licence year, monitoring and investigation is ongoing and the need for remediation is yet to be determined.<br>• Fuel/Chemical Storage and Handling<br>• Leaks occurred outside of areas designed to contain them.<br>**Compliance Statement:** There was a non compliance in terms of the uncontrolled flow to the surface from the Habanero 3 well.<br>In addition there was a non compliance in that leaks occurred |

| **Geodynamics Compliance for Drilling Activities**<br>**SEO: South Australia Cooper Basin Operators Statement of Environmental Objectives: Drilling and Well Operations, Santos 2003** | | | |
|---|---|---|---|
| Environmental Objective | Comment | Guide on How objectives can be achieved | Assessment and Compliance Statement |
| | | years (and drive continual improvement).<br>• Chemical and fuel storage procedures, including signage, are reviewed and monitored in audit process.<br>• Spill Response / Contingency Planning<br>• 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.<br>• Oil spill contingency plan (reviewed annually) is up to date with specific scenarios relating to spills to creeks and floodplain areas.<br>• Spill response equipment is audited annually.<br>• Annual spill response training exercise is undertaken. | outside areas designed to contain them, through infiltration from the borrow pit.<br>• In addition the Savina incident where the Permian has been left open due to the drill pipe becoming stuck, resulting in non compliance. |
| **Objective 5:**<br>Avoid disturbance to sites of cultural and heritage significance. | The aim of the objective is to ensure that any sites of cultural (Aboriginal or non-Aboriginal) heritage significance are identified and protected. | • Consultation with stakeholders (ie. Govenment agencies, landholders etc) in relation to the possible existence of heritage sites, as necessary.<br>• Heritage report forms completed for any sites or artefacts identified, and report forms forward to the Department of Statement Aboriginal Affairs (DOSAA).<br>• Survey records are kept and available for auditing.<br>• Areas requiring remediation which lie outside previously surveyed sites should be surveyed in accordance with company heritage clearance procedures.<br>Note: 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. | • Proposed well sites and access tracks have been surveyed and any sites of Aboriginal and non-Aboriginal heritage identified.<br>• Any identified cultural and heritage sites have been avoided.<br>•<br>Compliance Statement: GDY to is knowledge and through implementing the EIR requirements believes that it has complied with all obligations required under this SEO objective. |

| **Geodynamics Compliance for Drilling Activities**<br>**SEO: South Australia Cooper Basin Operators Statement of Environmental Objectives: Drilling and Well Operations, Santos 2003** | | | |
|---|---|---|---|
| Environmental Objective | Comment | Guide on How objectives can be achieved | Assessment and Compliance Statement |
| **Objective 6:**<br>Minimise loss of aquifer pressures and avoid aquifer contamination. | 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.<br>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 formulations that may deplete the reservoir pressure when not in production.<br>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 maintain between these groups:<br>• Eyre<br>• Winton<br>• Mackunda<br>• Corrikiana<br>• Cadna-owie<br>• Murta (including McKinlay Member)<br>• Namur, Adori<br>• Birkhead, Hutton, Poolowanna<br>• Cuddapan; Nappamerri Group formations, Walkandi and Peera Peera formations | Drilling & Completion Activities<br>• A competent cement bond between aquifer and hydrocarbon reservoirs is demonstrated.<br>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 & AAWCMB to determine if lack of cement or poor bond will cause or has caused damaging crossflow which needs to be remediated.<br>• Producing, Injection and Inactive Wells<br>• Monitoring programs implemented (eg. through well logs, pressure measurements, casing integrity measurements and corrosion monitoring programs) to assess condition of casing and cross-flow behind casing.<br>• Casing annulus pressures are monitored every 2 years.<br>• The condition of the primary casing barrier is adequate.<br>• For cases where crossflow is detected, a risk assessment incorporating the use of pressure / permeability / salinty data is undertaken in consultation with DLWBC & AAWCMB to determine if lack of cement or poor bond will cause or has caused damaging crossflow which needs to be remediated.<br>• Well Abandonment Activities<br>• Isolation barriers are set in place to ensure that crossflow, contamination or pressure reduction will not occur.<br>• Barriers will be set to meet or exceed the requirements of applicable standards for the | Drilling & Completion Activities<br>• There was an uncontrolled flow to surface (blow out) at Habanero 3. Refer to section 4.5 above.<br>•<br>Compliance Statement: There was a non compliance in terms of the uncontrolled flow to the surface from the Habanero 3 well. In addition the Savina incident where the Permian has been left open due to the drill pipe becoming stuck. |

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| | • Toolachee; Daralingie<br>• Epsilon, Patchwarra or Mt Toodna or Purni<br>• Tirrawarra sandstone or Stuart Range; Merrimelia; Boorthanna; Crown Point formations and Basement reservoirs<br>• Note: Crossflow (if it occurs), should not compromise the long term sustainability of a particular resource. | decommissioning and abandonment of water bores and abandonment of petroleum wells.<br>• 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 SACB Operator personnel using relevant available data and the SA Cooper Basin Water Pressure and Salinity Module Report (2002), and in consultation with DWLBC. | |
| **Objective 7:** Minimise disturbance to native vegetation and native fauna. | 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. | Well Lease and Access Track Construction and Restoration<br>• Proposed well sites, camp sties, access tracks and borrow pit sites have been assessed for rare, vulnerable and endangered flora and fauna species before the commencement of construction.<br>• Consider alternate routes during planning phase to minimise environmental impacts.<br>• Facilities (eg. borrow pits, well cellars) are designed and constructed as far as practicable to minimise fauna entrapment.<br>• Sumps and mud pits are fenced as appropriate to minimise wildlife access<br>• Assessment records are kept and are available for auditing.<br>• In recognised conservation reserves (ie. Innamincka Regional Reserve) excavations are left in a state as agreed with the responsible statutory body<br>• Borrow pits are restored to minimise water holding capacity, where agreements are not in place with stakeholders. | Well Lease and Access Track Construction and Restoration<br>• Any site with rare, vulnerable and endangered flora and fauna have been identified and avoided.<br>• 0, +1 or +2 GAS criteria are attained for "Minimise impacts on vegetation" objective as listed in Appendix 2, during well lease and access track site selection and construction and for "Re-establish natural vegetation on abandoned well sites and access track" objective in Appendix 4.<br>• Borrow Pits Construction and Restoration<br>• 0, +1 or +2 GAS criteria are attained for "Minimise impacts on vegetation" objective as listed in Appendix 4 during borrow pit site selection and construction, and "Minimise Impact on |

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| | | • Waste Management<br>• Covered bins are provided for the collection and storage of wastes.<br>• All loads of rubbish are covered during transport to the central waste facility<br>• Pits are not established locations, which pose an unacceptable hazard to stock or wildlife. | Vegetation" objective in Appendix 5 for borrow pit restoration.<br>• Waste Management<br>• Refer to assessment criteria for Objective 11<br>• Fuel and Chemical Storage and Management<br>• Refer to assessment criteria for Objectives 2 and 4<br>• Compliance Statement: GDY to its knowledge and through implementing the EIR requirements believes that it has complied with all obligations required under this SEO objective. |

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| **Objective 8:**<br>Minimise air pollution and greenhouse gas emissions. | Atmospheric emissions occur as a result of standard practices undertaken during drilling and well operations. Emissions of particular environmental significance are:<br>• Combustion by-products (eg. oxides of nitrogen, carbon monoxide and sulphur dioxide);<br>• Organic carbon and carbon particulates (black smoke); and<br>• Flared/vented hydrocarbons (gases) | Well Testing<br>• Conduct well testing in accordance with appropriate industry accepted standards<br>• Continually review and improve operations<br>• Appropriate emergency response procedures are in place for the case of a gas leak<br>• Well Blowdown<br>• Blowdown carried out in accordance with industry accepted standards / good production practice<br>• Any well that is consistently blown down is indentified for a small ID tubing or plunger lift installation to minimise blow downs on that well. | • Compliance with EPA requirements.<br>•<br>• Compliance Statement: GDY to its knowledge and through implementing the EIR requirements believes that is has completed with all obligations under this SEO objective. |
| **Objective 9:**<br>Maintain and enhance partnerships with the Cooper Basin Community. | The importance of liaison with and contribution to the local community is recognised by the South Australian Cooper Basin Operators. 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. | • Relevant affected parties are notified and consulted on proposed activities.<br>• Forward development plans are presented to the local community.<br>• Local community projects and events are sponsored and supported where appropriate.<br>• Industry membership of appropriate regional land management committees and boards ie. the Lake Eyre Basin Consultative Council, Marree Soil Conservation Board and Catchment Committees. | • No unresolved reasonable complaints from the community.<br>•<br>Compliance Statement: GDY to its knowledge and through implementing the EIR requirements believes that it has complied with all obligations under this SEO objective. |
| **Objective 10:**<br>Avoid or minimise disturbance to stakeholders and/or associated infrastructure. | 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. | • Induction for all employees and contractors covers pastoral, conservation, legislation and infrastructure issues.<br>• Relevant stakeholders are notified prior to survey and construction of well sites, camp sites and access tracks and undertaking of operations (pursuant to Petroleum Regulations). Borrow pits left open (unrestored) if requested by landholder and upon receipt of letter of transfer of responsibility to landholder. | • No reasonable stakeholder complaints left unresolved.<br>•<br>Compliance Statement: GDY to its knowledge and through implementing the EIR requirements believes that it has completed with all obligations under this SEO objective. |

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| | | • Gates or cattle grids are installed to a standard, consistent with pastoral infrastructure in fences where crossings are required for access.<br>• All gates left in the condition in which they were found (ie. open/closed).<br>• Potential sources of contamination are fenced as appropriate to prevent stock access.<br>• System is in place for logging landholder complaints to ensure that issues are addressed as appropriate.<br>• Requirements of the Cattle Care and Organic Beef accreditation programs are complied with.<br>• In recognised conservation reserves (ie. Innamincka Regional Reserve) excavations are left in a state as agreed with the responsible statutory body. | |
| **Objective 11:** Optimise waste reduction and recovery. | Waste reduction requires continual improvements in purchasing, efficiency of use and reuse. Due to the distances involved, the costs of recycling a large range of products is not possible however continual review of recycling options is required to ensure that any opportunities are taken advantage of. | • Bulk chemical and oil purchasing and use of "bulki bins" or other storage tanks in place for large volume items. | • With the exception of drilling fluids, drill cuttings and other fluids disposed during well clean-up, and sewage wastes, all wastes to be disposed of at an EPA licensed facility in accordance with EPA licence conditions.<br>• Attainment of GAS criteria for "Site left in clean, tidy and safe condition after final clean-up" objective during well site restoration (refer Appendix 4).<br>• Attainment of GAS criteria for "Site left in clean, tidy and safe condition" objective during borrow pit restoration (refer Appendix 5). |

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| | | | Compliance Statement: GDY to its knowledge and through implementing the EIR requirements believes that it has complied with all obligations required under this SEO objective. |
| **Objective 12:** Remediate and rehabilitate operational areas to agreed standards. | | Rehabilitation / abandonment plans for surface activities will be developed in consultation with relevant stakeholders.<br><br>Well Site and Access Track Restoration<br>• Compacted soil areas have been ripped (except on gibber and tablelands) and soil profile and contours are reinstated following completion of operations. | • No unresolved reasonable stakeholder complaints.<br>• Contaminated Site Remediation<br>• Contaminated sites are remediated in accordance with criteria developed with the principles of the National Environment Project Measure for Contaminated sites and in consultation with the EPA.<br>• Well Site and Access Track Restoration<br>• The attainment of 0, +1 or +2 GAS criteria for (refer Appendix 4):<br>– "Minimise visual impact of abandoned well sites"<br>– "Minimise visual impact of abandoned access tracks"<br>– "re-establish natural vegetation on abandoned well sites and access tracks"<br>• Borrow Pit Restoration<br>• The attainment of 0, +1 or +2 GAS criteria for (refer Appendix 5): |

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| | | | – "Minimise impact on vegetation"<br>– "Minimise impact on soil"<br>– "Minimise visual impacts"<br>• Compliance Statement: As remediation and rehabilitation is yet to take place is not appropriate to provide a compliance statement on this issue at this time.<br>• |