

# **REPORT OF THE 2012 HAZARD AUDIT OF THE SANTOS OPERATIONS ASSOCIATED WITH THE NARRABRI PEL 238 PROJECT**

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**Report of the 2012 Hazard Audit of the Santos  
Operations Associated with the Narrabri PEL 238  
Project**

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## EXECUTIVE SUMMARY

This report constitutes the results of the second formal Hazard Audit, in accordance with the NSW Department of Planning's requirements, for the operations associated with developments which form part of the Narrabri PEL 238 Project, operated by Energy NSW EABU Santos Limited's since November 2011.

The first Hazard Audit was conducted in 2009. The approval of the 2009 Hazard Audit Report required a repeat Hazard Audit to be conducted and the report submitted to the Department by December 2012. An extension of time was obtained in October 2012 to January 2013.

The operations include the gathering lines from the off-take at the coal seam gas wells, the gas compression facility at Bibbiwindi, the flow line up to the Wilga Park Power Station and the power station itself.

The systems used to manage plant and equipment as well as health and safety have, have up until the point where the operations were taken over by Santos, been elementary, possibly in keeping with the extent of the development at the early operation.

Since their takeover in 2011, Santos has identified a need to expand on the management systems used for the PEL238 plant and equipment to match the expansion of the operation and Santos' internal health, safety and environmental requirements.

A major improvement project is underway to upgrade the systems in use for operations and maintenance and the majority of the plants and process associated with PEL238 are shut down in anticipating the implementation of this upgrade project.

The Hazard Audit 2012 therefore covered largely shut down plants and the audit focussed both on the systems currently in place and on the systems proposed after implementation of the upgrade project.

The hazards are characterised flammable nature of the coal seam gas, which is essentially natural gas. The toxic risk of the facilities is very small and managed through use of work permits as coal seam gas is not toxic and combustion products consist of carbon dioxide and water.

The present development is as yet very small as only four out of ten generators have been installed at the power station and the compressor at Bibbiwindi compressor station never having been commissioned. The equipment is relatively new and in good repair.

A number of actions for improvement were identified, as listed in Table E1 below. Where these actions correspond to actions already underway as part of

the upgrade project, these were formulated as *Proceed with the implementation of...* so as not to double up on actions. The actions were prioritised as following:

- High (H) - To be commenced immediately and completed as soon as practicable
- Medium (M) - To be completed by 30 June of 2013 or as per Improvement plan
- Low (L) - To be completed by 31 December 2013

**Table E1 – Management Action Plan**

Recommendation	Priority
Action 1: Determine requirement for Confined Space warning sign inside WPPS (near the oily water separator) and at the tanks outside the WPPS compound (near the entry gate).	HIGH
Action 2: Ensure spillage containment is provided at the oily water truck loading location (both BCS and WPPS), in accordance with AS1940 (Para 8.6.2), during removal of oily water from the tanks.	MEDIUM
Action 3: Proceed with the implementation of the agreed roll out of Competency Based Training modules for Operations and Maintenance representatives.	MEDIUM
Action 4: Proceed with the implementation of the preventative / corrective maintenance testing and inspection program (MAXIMO). Include contractor managed tests and inspections of critical protective systems (e.g. fire protection equipment).	MEDIUM
Action 5: Ensure Pressure Vessel and Pressure Safety Valve inspection and testing are carried out as per Legal requirements (minimum) and any Santos requirement.	HIGH
Action 6: Determine whether any spare emergency repair equipment are required in the Gunnedah operations facilities, example may be the flare ignitor at WPPS.	LOW
Action 7: Determine whether safety shower/eye wash station and flare ignitor are critical protective systems (and need to be included in the Critical Function Testing Program).	LOW
Action 8: Proceed with the implementation of the bridge register and implementation procedure (for bypassing of trips during testing).	MEDIUM
Action 9: Establish out-of-service equipment protocol for critical items equipment (e.g. gas detectors etc.). Communicate system to technical staff.	MEDIUM
Action 10: Proceed with implementation of outstanding actions identified during the High Voltage audit.	MEDIUM

Recommendation	Priority
<p><u>Opportunity for improvement 1:</u> Check corrosion at the gas line at ground entry location at wells (e.g. Bibbiwindi well #25 showed signs of external corrosion and the ground was pushed up over the wrapping).</p>	
<p><u>Opportunity of improvement 2:</u> Check the external corrosion at BCS (corroded bolts etc.) to ensure that this does not represent a loss of mechanical integrity of the plant.</p>	
<p><u>Opportunity for improvement 3:</u> Evaluate requirement for second E-stop button to be located outside of the offices at BCS (currently only one button located inside offices).</p>	

The Gunnedah Basin Operations Manager has many years of experience with Santos in various roles within the oil and gas field. The Supervisor and many of the Operators have worked at the Narrabri operations also when managed by Eastern Star Gas. Health and Safety and Environment Advisors are permanently present on site. An Environment, Health and Safety & Security Team Leader is available from Brisbane, including overseeing the management of the implementation of the improvement project.

While there were many major shortcomings identified in the past audit of the management systems in use compared with those currently implemented, it is emphasised that the operations associated with the Narrabri PEL 238 is currently largely shut down and there is a major improvement project underway to fill the gaps.

The open philosophy of the staff taken during the audit was noted and commendable. A full disclosure attitude was shown which enhanced the purpose and outcomes of the audit.



## **GLOSSARY AND ABBREVIATIONS**

BCS	Bibblewindi Compressor Station
CBT	Competency based training
CCTV	Closed Circuit Television
CSG	Coal Seam Gas
DC	Direct current
DoPI	Department of Planning and Infrastructure
DG	Dangerous Goods
EABU	Eastern Australia Business Unit
EHS	Environment, Health and Safety
EHSMS	Environment, Health and Safety Management System
ERP	Emergency Response Procedure
ESG	Eastern Star Gas
ESD	Emergency Shut Down
EPA	Environment Protection Authority NSW
E&I	Electrical and Instrument
HAZOP	Hazard and operability
H&S	Health and Safety
HS	Health and Safety
IR	Infra-Red
JHA	Job Hazard Analysis
LOC	Loss of containment
MAXIMO	A preventative and corrective maintenance system which is currently being implemented
MW	Mega Watt
NPI	National Environmental Pollutant Inventory
P&IDs	Piping and Instrument Diagrams

PAL	Petroleum Assessment Lease
PEL	Petroleum Exploration Licence
PM	Preventative Maintenance
PPE	Personal Protective Equipment
PV	Pressure Vessel
PTW	Permit To Work
SCADA	Supervisory Control And Data Acquisition, used to monitor, control and alarm plant operating systems from a central location
SHSMS	Safety, Health and Security Management System
SH&E	Safety, Health and Environment
SMS	Safety Management System
SOPs	Standard Operating Procedures
TRACESS	Database used for training purposes
UPS	Uninterruptible Power Supply
WPPS	Wilga Park Power Station Expansion

# REPORT

## 1 Introduction

### 1.1 Background and Scope

This report constitutes the results of the second formal Hazard Audit, in accordance with the NSW Department of Planning's requirements, for the operations associated with developments which form part of the Narrabri PEL 238 Project, operated by Energy NSW EABU Santos Limited's since November 2011.

The requirement for a hazard audit forms part of the Project Approval, which specifies that the Applicant shall carry out a comprehensive hazard audit of the proposed development and submit a report on the audit to the Director-General. The first Hazard Audit was conducted in 2009. The approval of the 2009 Hazard Audit Report required a repeat Hazard Audit to be conducted and the report submitted to the Department by December 2012. An extension of time was obtained in October 2012 to January 2013.

The report is written in accordance with the guidelines used by the Department of Planning for Hazard Audits as set up in their Hazardous Industry Planning Advisory Paper No 5, *Hazard Audit Guidelines* (Ref 1).

### 1.2 OBJECTIVES AND AIM OF THE AUDIT

The objective of the Hazard Audit is to assess the operations associated with Energy NSW EABU Santos Limited (Santos) developments which form part of the Narrabri PEL 238 and PAL 2 Project against the requirements for safety management by the Department of Planning and Infrastructure (DoPI). The fundamental objectives of the hazard audit are:

- To assess whether the operations are being conducted and managed in a manner such that all the terms of the Ministerial Consent document relevant to the safety of the site are being met;
- To identify areas where improvements to operational and organisational safeguards are required with respect to safety, health and the environment;
- To recommend appropriate measures required to improve safety, health and environment deficiencies in the areas identified.

The scope of the audit encompassed:

- The above ground tie-in's located at Bibblewindi, Bohena and Wilga Park Power Station.
- The gas collection plant (and associated emergency flare) located at Bibblewindi Compressor Station (BCS).
- Gathering lines and gas flow lines.
- The Wilga Park Power Station Expansion (WPPS).

The Hazard Audit was undertaken by Karin Nilsson, Principal Risk Consultant with Planager Pty Ltd.

The audit was conducted over two full days (4-5 December 2012). Planning and preparation for the audit was conducted in the weeks leading up to the audit (including a pre-audit and document gathering meeting conducted on the 19 November 2012).

### **1.3 REQUIREMENTS OF THE AUDIT**

The audit conducted included both the hardware and software aspects of the site. The term "hardware" covers facility and equipment, instrumentation and control systems, protection systems etc. The term "software" is used to denote people systems and people factors and covers the following items:

- Organisation (formal, emergency, tasks and roles)
- Methods and procedures
- Knowledge and skills (operator and maintenance employee training; ability to recognise faults and take corrective action)
- Attitudes towards tasks (reflecting whether the software systems are functioning effectively).

It is essential that the hardware and software aspects complement each other. For example, elaborate control and protection systems may be built into the installation based on rigorous hazard analysis. However, without regular inspection and testing their performance would deteriorate so that they would be ineffective when a demand is placed upon them. The performance of the management system of safety controls is a key element in effective risk management.

## 2 METHODOLOGY

The Hazard Audit covers a critical examination of the systems and procedures, which exist in order to operate and maintain the facility for the purpose for which it was designed. This requires a review of the documentation systems at the plant and records of the facility's operational history since the last audit. In particular, it requires a review of the degree and frequency with which operating conditions vary from the design intent.

The audit covered the following topics:

- Plant and Process Systems
- Process Operator Training
- Maintenance Procedures
- Safety Training of Employees
- Plant Modification Control
- Testing of Protection Systems
- Electrical Equipment Handling
- Unusual Incident Reporting
- Injury/Accident Reporting
- Fire Protection and Training
- Emergency Procedures
- Management Safety System
- Security of Premises
- Environmental Protection

Details of the topics covered are listed in Appendix 1.

### 2.1 BASIC APPROACH

This hazard audit has been conducted in compliance with the guidelines in the Department in the Hazardous Industry Planning Advisory Paper No. 5 (Ref 1).

The remit of the audit was discussed with the Environment, Health and Safety & Security Team Leader and the Environmental Compliance Coordinator prior to the audit, and the outline of the scope of the audit was presented prior to the audit proper.

This outline was then communicated with the people involved in the audit, including the Narrabri Operations Manager, the Health and Safety (H&S) Advisors and Operations Supervisor. This allowed the requirements of the audit

to be canvassed within the facility, which in turn allowed planning of the appropriate people to be available during the audit.

In broad terms, the methodology used was that of conducting detailed discussions with key operations, safety, engineering and maintenance personnel. A site tour was also conducted. Personnel within a “vertical cross-section” of the operation were interviewed. Documents obtained or sighted, which were deemed to be of particular interest with respect to the present audit, have been listed in Appendix 2.

## **2.2 METHOD OF ASSESSMENT**

For the purposes of this hazard audit the method of assessment of safety in operation and management, in broad terms, was based on seeking answers to the following questions, applied to each of the topics listed in the scope:

- Were all assumptions made in previous hazard analyses and associated hazard and operability studies incorporated into the final design?
- Do all the assumptions embedded in the facility hardware or software remain effective and are they still relevant to the present operation?
- Do all management policies and procedures set in place regarding plant operation and maintenance remain adequate to ensure compliance with all relevant regulatory authorities (as well as the Conditions of Approval)?
- Are the internal management controls sufficient to ensure policies and procedures are carried out and records kept that demonstrate this performance?
- Have the procedures and controls been operating effectively throughout the period under consideration?

## **2.3 PERSONNEL INTERVIEWED**

The following personnel were interviewed during the hazard audit:

- |                   |   |
|-------------------|---|
| ▪ Kym Bailey      | Operations Manager, Gunnedah Operations |
| ▪ John Higgins    | Supervisor Narrabri Operations          |
| ▪ Nick Vanmali    | EHS & Security Team Leader              |
| ▪ Frank Dal Santo | HS Advisor                              |
| ▪ Rob Demaine     | Operator / Maintenance technician       |
| ▪ Burt Evans      | Operator / Maintenance technician       |
| ▪ Scott Thurn     | Operator / Maintenance technician       |
| ▪ Terry Coker     | Operator / Maintenance technician       |
| ▪ David McFarland | Operator / Maintenance technician       |
| ▪ Shane Rily      | Environmental Advisor                   |
| ▪ Andrew Johnston | Senior Environmental Advisor            |

## **3 SITE OVERVIEW**

### **3.1 SITE LOCATION, SURROUNDING LAND USES**

In early 2007, Eastern Star Gas (ESG) submitted a Major Project Application to the NSW Department of Planning and Infrastructure (NSW DoPI) for the construction and operation of a 32km gas pipeline to supply Coal Seam Gas (CSG) from the Bibblewindi and Bohena CSG Pilots into the existing WPPS. The project involves the collection and delivery of CSG to the Wilga Park facility.

The above ground facilities referred to in the approval conditions include:

- The above ground tie-in's located at BCS, Bohena and Wilga Park Power Station.
- The gas collection and compression facility (and associated emergency flare) located at BCS.
- Gathering lines and gas flow lines.
- The WPPS Expansion.

The gas gathering system traverses the Pilliga East State Forests incorporating the Bibblewindi State Forest.

The BCS is located at the Bibblewindi CSG Pilot, within the Pilliga East State Forest incorporating the Bibblewindi State Forest.

The gas flowline consists of a 33 km long flowline. The first 15 km from the gas plant is in the Bibblewindi and Pilliga East State Forest, the balance is in >95% cleared grazing land.

The WPPS is located in >95% cleared grazing land.

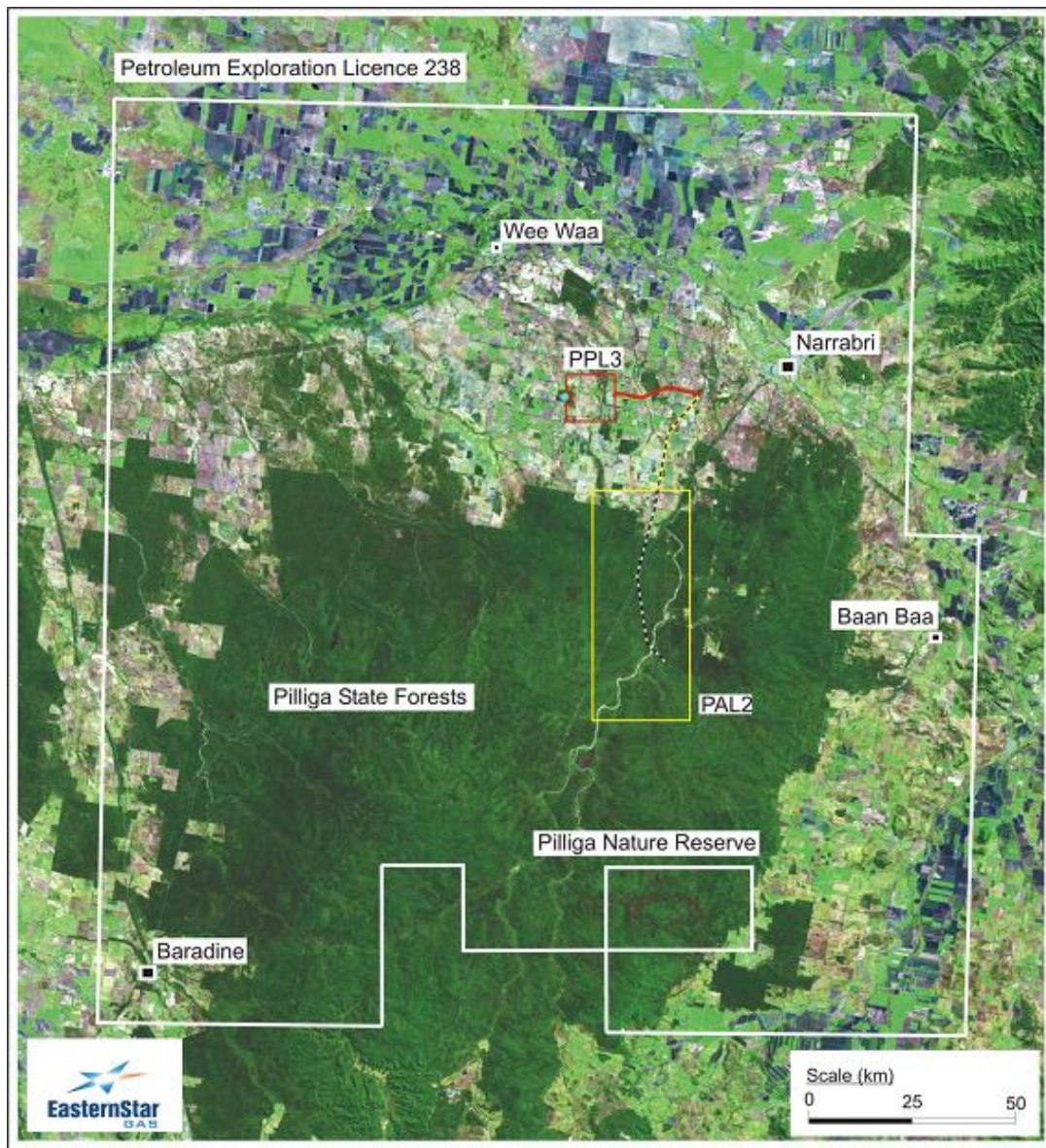
A map of the area showing the location of the above development is presented below.

### **3.2 STAFFING**

**One to five persons during normal operating hours (7am to 4pm, 7 days) and maximum 2 persons outside operating hours (security).**



**Figure 1 - Location of Exploration, Assessment and Production Titles**



### 3.3 ACCESS AND SECURITY

#### 3.3.1 Site

The plant is set up to operate 24 hours/day, 365 days per year. The WPPS and the BCS are surrounded by a six foot high security fence topped with barbwire.

There are at least two points of entry to each one of the enclosures. The gates are locked.

A project is underway to install Closed Circuit Television (CCTV) at WPPS, BCS and Narrabri offices.



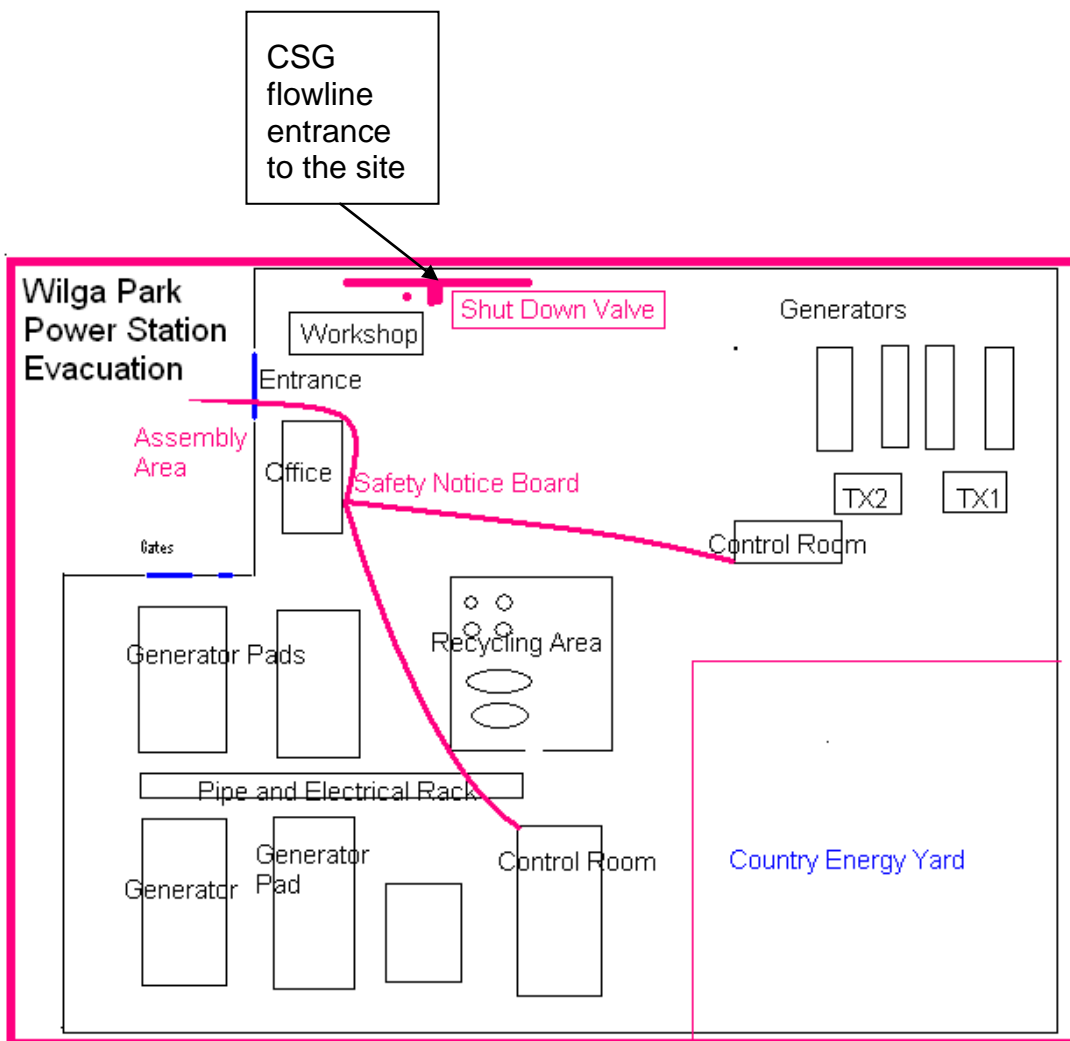
### 3.3.2 Road Tanker Unloading and Loading

Tanker loading and unloading is limited to the occasional topping up of spent oil and delivery of coolant (actually a corrosion inhibitor) and the removal of either once spent as well as produced oily water from the oily water separator. This happens about quarterly. Any tanker transfer would be supervised by the WPPS or BCS operator.

### 3.4 SITE LAYOUT

The site includes the original Power Station A as well as Power Station B. Power Station A has four generators. Power Station B is set up to have a maximum of 10 generators (each of 3MW capacity). Only four are installed at this point in time. The site layout is presented in Figure 2 below. This schematic also shows the evacuation paths from the site.

**Figure 2 - Site Layout**



## 4 STATUS OF IMPLEMENTATION OF ACTIONS FROM 2009 HAZARD AUDIT

The table below details the status of implementation of the actions and opportunities for improvements identified and committed to by Eastern Star Gas, former operators of the Narrabri Operations of PEL 238 during the 2009 Hazard Audit.

**Table 1 – Status of Implementation of 2009 Hazard Audit Actions**

Recommendation	Status
1. Valve in lube oil bund was left open during the audit. This valve needs to be closed at all times except during operator assisted draining to the oil separator.	Done
2. As-built checks required for the P&IDs.	As part of Santos Pre-Start-up procedure
3. Control systems changes “outside operating safe limits” to be managed, e.g. through the Change Management system for the Power Station.	Done
4. SOPs to be established for plant operations (including for start-up and shut-down/purging).	In progress
5. Determine requirement for reviews of procedures (consider use of Job Cycle Checks system for this where one or two operators checks the written procedure while observing the procedure being carried out by another operator.)	Done
6. Develop training modules for Power Station operators and other critical activities as required.	In progress
7. Training needs analysis required. Determine gaps.	Done
8. Formalise operator job-training requirements, including formal sign-off, formalising buddy system, possibly several levels for Power Station operator.	Done
9. Determine what further refresher training is required (over and above the induction training) for staff and contractors.	Done
10. Formalise training requirements for Work Permit issuer.	Done
11. Review and upgrade the Change Management System (also include a sheet with prompts for hazards).	Done
12. Training required in Change Management requirements (e.g. awareness training for all staff; more detailed training for people likely to implement change).	Done
13. Internal monitoring/auditing of Control of Change to be done regularly (checklists required). This requirement needs to be included in management plan.	Done
14. Approvals signature needs formalising on the Change Management form.	Done
15. Develop formal maintenance and inspection programs for both mechanical and instrumented (trips/alarms) systems. Determine inspection frequencies and checks required (include vendor requirements).	In progress
16. Develop list and inspection schedule for pressure vessels.	In progress
17. Develop list and inspection schedule for critical valves.	In progress

Recommendation	Status
18. Initiate testing of earthing systems.	In progress
19. Trip testing protocol to be established (including ensuring that any defeated trips are re-activated).	In progress
20. Establish out-of-service equipment protocol for critical items equipment (e.g. Gas detectors etc.). Communicate system to technical staff.	Refer action 9
21. Incident investigation process to be reviewed for serious incidents.	Done
22. Standardise the risk matrix on the incident form.	Done
23. Review management of incident records to ensure that the final (signed off) document is available.	Done
24. Dematching system at the Power Station to be initiated (i.e. matches and lighters to be retained at entry to the site). Also retain mobile phones for people likely to access restricted areas (all people, including staff).	Done
25. Inspections of fire protection systems (extinguishers) and gas meters to be included in the ESG preventative maintenance system (even if the inspections are also initiated by the contractors performing the inspection/test).	Done
26. Establish Site Specific ERPs for Power Station, Compressor Station and other critical activities as required. Include plans showing location of emergency shut-down (ESD) buttons, evacuation points, fire plan.	Done
27. Update the existing drawings in the ERP.	Done
28. Regular emergency drills/training in emergency response to be conducted and scheduled in the ERP.	Done
29. Bomb threat emergency response to be included in the ERP.	Done
30. Pre-arrangements with outside services police/ambulance/fire brigade required.	Done
31. Establish management system to update the emergency procedures. This should include updating of telephone numbers.	Done
32. Health and Safety Management Plan to include schedule of audit requirements (internal and external).	Done
33. Formalise Health and Safety management training for technical staff and other staff as required.	Done
Opp. for improvement 1: link in with requirement to conduct HAZOP, risk assessment used in the change evaluation to be included on the Change Management form	Done
Opportunity for improvement: Internal monitoring/auditing of Permit to Work to be done regularly (checklists required)	Done

## 5 HAZARD AUDIT OF PLANT EQUIPMENT AND OPERATIONS

### 5.1 PLANT, MATERIALS AND PROCESS SYSTEMS

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
1a. Any changes to the site since the last hazard audit	Y	Discussion	<p>Bibbiwindi Compressor Station (BCS): No changes. Station is not commissioned. However, the gas separation facility and the Dangerous Goods (DG) store are operating.</p> <p>Wilga Park Power Station (WPPS): Station is shut down since Santos take-over from Eastern Star Gas (ESG). Three new gensets have been installed since the last Hazard Audit, bringing the total number of gensets up to four.</p>	
1b. The nature and quantity of material stored	Y	Plant tour. Discussion	<ul style="list-style-type: none"> <li>- CSG is piped from the gas wells to the BCS where the gas is separated from water and then onwards to WPPS where the gas is used as fuel to produce electricity which is put into the grid (when WPPS is operational - not at this time).</li> <li>- BCS: Diesel is stored in double containers and an oily water separator is located within a bund. Also small amounts of DGs in cabinet.</li> <li>- WPPS: Glycol used in process. Oily water separator in bunded area. There is also an underground tank associated with the oil separator.</li> </ul>	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
2. Physical condition of equipment, storage, pipelines, buildings and structures. Standard of maintenance.	Y	Plant tour. Discussion	<p>- BCS: Station appears well maintained but is showing signs of external corrosion particularly on bolts. No visible signs of spills or leaks. No accumulated debris. No evidence of mechanical impact, corrosion or overstressing of plant equipment.</p> <p>- WPPS: There are no visible signs of leaks or oil spills. The ground is clean and well maintained. The bund (oily water tank) is clean. No accumulated debris. No evidence of mechanical impact, corrosion or overstressing of plant equipment. Conditions of valves, gaskets &amp; other components good.</p> <p>- Flow line: Unable to inspect underground line. Checked ground entry at Bibbiwindi Well #25 which showed some sign of corrosion above wrapping.</p>	<p><u>Opportunity for improvement 1:</u> Check corrosion at the gas line at ground entry location at wells (e.g. Bibbiwindi well #25 showed signs of external corrosion and the ground was pushed up over the wrapping).</p> <p><u>Opportunity of improvement 2:</u> Check the external corrosion at BCS (corroded bolts etc.) to ensure that this does not represent a loss of mechanical integrity of the plant.</p>
3. Warehouses – adequacy of the stacking height, aisle spacing, fixed fire protection and equipment	Y	-"	<p>Workshop at the Narrabri office (centre) is well organised. Stack height appears adequate. Racks are in good condition.</p> <p>No warehousing at BCS or WPPS.</p>	
4. Labelling and identification of equipment/ valves/instruments/pipes	N	-"	Pipelines and vessels at the WPPS are labelled.	<u>Action 1:</u> Determine requirement for Confined Space warning sign inside WPPS (near the oily water separator) and at the tanks outside the WPPS compound (near the entry gate).
5. Are all items of equipment and control functioning satisfactorily	Y	-"	<p>- BCS: Compressor was never commissioned. The gas:water separation operates satisfactorily.</p> <p>- WPPS: Currently shut down.</p>	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
6. Is the plant operating as designed	Y	-"	Plant is designed for 10 generators at 3MW each. Currently only four are installed. WPPS is shut down. BCS is running at low pressure without the compressor being commissioned.	
7. Is rotating equipment 8. guarded	Y	-"	- Pre-chamber gas compressor and generators at WPPS are guarded. - BCS compressor is not commissioned. Pumps for oily water separator are guarded.	
8. Support structures	Y	-"	Support structures at the WPPS and BCS appear sturdy and in good condition. No corrosion apparent. They are visually inspected by operators.	
9. General housekeeping of premises	Y	-"	Housekeeping is good at WPPS, BCS and the Narrabri Centre (also at the workshop). The DG store at BCS is in good condition and clean.	
10. Asbestos register	N/A	-"	No asbestos.	
11. Adequacy of containment systems	N	-"	- Oily water separator is bunded both at WPPS and at BCS. Valve in oily water bunds were closed during the audit. - Diesel storage (x2 tanks) at BCS are "double containment" type. - DG storage appears adequate and to regulatory requirements. - Removal of oily water from the oil:water separator is done on an infrequent schedule using a truck. No spillage containment is provided at the truck loading location (both BCS and WPPS) in accordance with AS1940 (Para 8.6.2).	<u>Action 2:</u> Ensure spillage containment at is provided at the oily water truck loading location (both BCS and WPPS), in accordance with AS1940 (Para 8.6.2), during removal of oily water from the tanks.

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
12. Siting of storage vessels and storage areas	Y	-"	<p>- BCS: Separation distance between oily water separator and processing areas appears adequate. DG storage cabinet is provided, complete with segregation chart available on the wall of the cabinet.</p> <p>- WPPS: Site is well spaced. Hazardous Area classified site is clearly shown using chain.</p>	
13. Assess effects of fires on control rooms, off-site facilities to determine any layout issues	Y	-"	<p>- BCS: A bush fire would affect people working on site. First step in the emergency procedure would be to evacuate people from the site. Office area is well separated from process plant and equipment, particularly taking into account the low gas pressures currently operating on site.</p> <p>- WPPS: Generators are well separated from the Control Room. An incident at the generator enclosures is unlikely to affect the Control Room. An incident at one genset may affect adjacent gensets, causing damage.</p>	
14. Adequacy of access and egress points, roadways for emergency vehicles	Y	-"	<p>- BCS: Access to through gates available in opposite directions of the site. Road in/out of site is in good condition and sized about 6 m wide, adequate for emergency vehicles. The road is used by County Fire Services. Currently, work in conjunction with Fire &amp; Rescue NSW to set up assembly points.</p> <p>- WCS: Access through gates in opposite directions. Access to site is via main roads, which is in good condition.</p>	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
15. Adequacy of emergency stop button locations. Fire alarms. Location, audible, visual. 16. Any sirens?	Y	-"	<p>- BCS: There is only one E-stop button available on site, located inside the site-office. A second E-stop button located in the open (possibly near the exit) would be useful / recommended in an emergency when people are to evacuate the site as a first step (rather than potentially first having to climb the stairs to the site-office)</p> <p>- At least three E-stops were sited at WPPS (plus several local to equipment). Appear to be adequately located in case of an emergency. Strobe light inside generator enclosures. Siren out in the yard. Fire panel available outside the generators, showing gas detectors.</p>	<u>Opportunity for improvement 3:</u> Evaluate requirement for second E-stop button to be located outside of the offices at BCS (currently only one button located inside offices).
Possible to reduce storage volumes	Y	-"	<p>- BCS: Project has been completed to minimise DG storage volumes at BCS, current volumes are very small. Natural gas (CSG) is not stored.</p> <p>- WPPS: Very small DG volumes on site.</p>	
17. Loading/unloading operations (consider overfill, drive-away and hose rupture etc.)	Y	-"	Refer # 11.	
18. Transport routes minimise off-site risk?	Y	-"	Minimal transporting of material to and from the sites (only lube oil, coolant, oily water).	



Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
19. Number of operators adequate	Y	-"	- BCS: During normal operation the site is unmanned. - WPPS: During normal operation the site is manned by two operators. Currently site is shut down. Critical alarms would be SMSed (priority escalation) though the SCADA is also shut down. Possible to log onto SCADA remotely using laptops.	
20. Assumptions in hazard analysis study incorporated in plant hardware	Y	-"	- WPPS: Gas detectors and IR detectors installed in generator enclosure. Smoke detector close to the fire panel (electrical cabelling in this area). Gas detectors initiate pre-alarm at 20% with start-up of fan in enclosure. Gas detectors initiate shut-down alarm at 40% with closure of louvers and shut-down of fan. No blow-out panel available (low pressures, low voltage). ESD on gas inlet pipe. ESG on wells initiated by high and low P. Also Pressure relief (x2) downstream of ESD and well structure designed to max pressure upstream of ESD. HAZOPs conducted for gathering line, flowline and Power Station; actions closed out.	

## 5.2 PROCESS SAFETY INFORMATION

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
21. Identify materials harmful to the environment and what controls are installed / needed	Y	-"	Flammable Coal Seam Gas (natural gas) is the predominant component. Environmentally pollutant material (brine, glycol water mix, oil, diesel).	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
(materials to include toxics, flammables, explosives, radioactives, oxidisers and biologicals)				
22. Identification of Hazards and Risk Assessment	Y	Induction L3. Significantly Risk Register	Significant Risk Register Energy NSW, covering all operations within the Gunnedah Basin. Workshops run 1-3 May 2012 to establish the register. Team included Operators, Supervisors, Team Leaders, Environment Advisors and H&S Advisors. Hazards and risks identified include H&S, environment, and process safety type incidents.	
23. Materials inventory system and records	Y	DG Cabinet Discussion	Materials list on BCS and WPPS. Also list on ChemWatch, including maximum volume and weight. Quantities are managed through the Narrabri Operations Store Manager.	
24. Pre Start-up Safety Review	Y	Discussion SHSMS 12.1 Control of Change Section 4 Technical Assessment (pre start up review)	Pre-start up meeting conducted each morning 7am-7.20am, attended by all. The Santos SHSMS 12.1 <i>Control of Change</i> includes a Pre-Start up review requirements (upfront in Section 4 Technical Assessment).	
25. Master P&IDs and process flow diagrams available an up-to-date	Y	Master P&ID folder	A comprehensive set of P&IDs are available at Narrabri Centre and at WPPS. P&IDs are of adequate quality and appear to use standard terminology	

### 5.3 PLANT MONITORING AND PROCESS CONTROL

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
26. Adequacy of control systems in control room, field panels etc.	Y	Discussion. Existing SCADA screens.	SCADA representation at WPPS appears adequate and well presented. Remote SCADA control system is not operable at this stage with WPPS shut down. An overpressure at a well could cause the well to shut in - this would normally be transmitted to the laptop and picked up by Operators (however not at this point in time).	
27. Adequacy of protective systems (Alarms and Trips, Need for redundancy)	Y	Plant tour. Discussion	- WPCS: Trips on high voltage "spikes", essential energy "spikes", over temperature and over pressure. Also pressure relief valves available. - Wells: Critical trips are: high and low gas and water pressure and separator level, and high water pump torque. Pressure relief on the well heads, separator and manifold gathering line provide 2nd level of defence.	
28. Manual control available	Y	Discussion	In case of loss of SCADA control (and remote control is lost), live WPPS site control would be initiated. WPPS would go into emergency shutdown (automatically) in case of major operational upset (through the trips in #27) and in case of loss of utilities. This is a safe situation. The well system is fail-safe and can shut in (a shut in well is considered to be in a safe condition).	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
29. Coping with Loss of Utilities	Y	Discussion	<p>Utilities are: electricity (for running rotating equipment), gas (for holding valves open) and water (for safety shower / eye wash stations).</p> <ul style="list-style-type: none"> <li>- WPPS power failure: UPS (Uninterrupted Power Supply) available for critical control functions. Loss of power initiates safe shut-down.</li> <li>- Wells: SCADA is backed up by UPS for DC supply (solar batteries). Loss of gas causes valves to shut and well to shut in (a safe condition).</li> <li>- Communication failure: If communication systems go down it does not affect the safe shutdown mode of the plant. Data-logger (indep. from SCADA, hard drive), can hold 30 days of data.</li> </ul>	
30. Process systems monitoring records, e.g. operator logs, alarms and trips – review to determine plant history	Y	Daily morning report Discussion	No remote monitoring of process conditions available. Manual reading of ops. Conditions carried out at gas wells. The automatic isolation of gas wells on major operational upset (refer #27) is still working. Daily morning report covers dam levels, gas produced, flare and water production as well as operational issues.	
31. Maintenance Workers Logs	Y	-"	Maintenance of plant and equipment is carried out by operators. Operator logs are used.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
32. Response on power failure (UPS available and tested)	Y	Discussion	See item number 29 above.	
33. Fail safe response (also on restart)	Y	Discussion	See item number 29 above.	
34. Failure history recorded	Y	Discussion	Electronic historian in SCADA system (currently unavailable)	
35. Records of spurious and real trips	Y	Discussion	Electronic historian in SCADA system (currently unavailable)	
36. Operator knowledge (and training) of control systems	Y	Discussion	Operators and Supervisor are trained in the Control System. Operators and Supervisors on plant have many years of experience as operators at BCS and WPPS.	
37. Control system changes documented	Y	Santos EHSMS 12.1 <i>Critical Drawings and Control System</i>  EHSMS 12 <i>Management of Change</i>	Formal control of change to the control system through Santos EHSMS 12.1 <i>Critical Drawings and Control System</i> which forms part of EHSMS 12 <i>Management of Change</i> . EHSMS includes requirements for control of changes to hardware, software, procedures, organisational structures, feed / product specifications and legislation / statutory requirements.	
38. Documentation on the installation and testing of both hardware and software systems	Y	-"	Control system set up as per vendor guides. Testing etc. as per vendor guides.	

## 6 OPERATIONAL CONTROLS

### 6.1 OPERATING PROCEDURES

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
39. Do they exist	Y	Discussion	- Operations procedures used for high risk operations, e.g. High Voltage maintenance work. - Lower risk operations are covered by work instructions and Standard Operating Procedures (SOPs).	
40. How often are they reviewed	Y	EHSS 18.8	Santos requirement is for a set % of operations procedures to be reviewed on a three yearly rotation	
41. Who is authorised to make changes	Y	EHSS 18.8	Operators can recommend a change. Peer review to determine whether change should be made. Approval of change depend on the level of risk. Change to operations procedure follows requirements in EHSMS 12 <i>Control of Change</i>	
42. Do Safe Work Practices exist. Are they different to actual work practices. Are the different to Operating Procedures.	Y	SOPs	Work on low risk activities is performed during Work Instructions	
43. Method sheets with quick summaries or checklists used / required	N/A	-"	Refer item number 39.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
44. How does the Supervisor know how well the procedure is working out	Y	Production meeting minutes 15/10/12, 5/11/12, 23/10/12, 8/10/12)	Weekly production meeting, chaired by Supervisors, involving all Operators from all areas and the Maintenance Coordinator. Supervisor reviews the procedures highlighted by the operators if deemed to be required. Includes issues re permits, work instructions, area requirement etc.	
45. How do Managers keep informed about satisfactory operation of the procedures	Y	-"	Refer item number 44 above - Operations Manage attend the meeting	
46. Back-up systems (e.g. trip systems) on procedural failures	Y	Discussion	Gas wells, gathering lines etc. is largely automatic. Very little manual operation. Fail-safe response ensures wells are shut-in in case of procedural failures. See item number 29 above.	
47. Are abnormal situations included, e.g. start-up, shutdown, filling, transferring	Y	-"	Simple transfer operations, e.g. emptying of sumps or oil from the oily water separators, would require a PTW, including Job Hazard Analysis (JHA). Shutdown and purging of a gas line would also be done under PTW requirements, incl. JHA. Very unusual operation may require Control of Change procedure to be initiated.	
48. Are process hazards included in the procedures	Y	Discussion	Refer item number 39.	

## 6.2 PROCESS OPERATOR TRAINING

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
49. Training modules (why and what of operation)	N	Equipment Isolation (#50), Vessel Inspection & Maintenance (#51), Work Safety (#53), Work Permit Guidelines	Competency based training (CBT) system is in the process of being developed, refer also #146. Includes areas of Leadership & People, Transition & Integration, EHS etc. Includes modules for operators. Critical modules have been developed, including Equipment Isolation (#50), Vessel Inspection & Maintenance (#51), Work Safety (#53), Work Permit Guidelines.	<u>Action 3:</u> Proceed with the agreed roll out of Competency Based Training modules for Operations and Maintenance representatives.
50. Training methods and records	Y	Operator Score Cards	Operator Score Cards used to track training needs and training completed. Includes personal objectives and indicators / measures for the year.	
51. What restrictions on operator who has not completed training	Y	Competency based training (CBT) system	Only trained operators are allowed to work independently (without a buddy). Supervisor / Ops Manager would set the tasks and activities to be performed. The Gunnedah Basin operation (Santos) is a relatively small operation with only a handful of operators, all which are known to the Supervisor / Operations Manager.	
52. Methods used to evaluate training	Y	-"	Qualified person (e.g. Supervisor or External specialist) evaluate competency. Assessment carried out is a "competency based assessment".	



Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
53. Personal precautions in handling flammable or toxic materials	Y	Discussion Inductions L1, 2 and 3	Induction training for all operations and maintenance personnel, including visitors includes appreciation of hazards associated with plants and materials used and produced as well as PPE requirements. Contractors and staff are specifically required to wear correct PPE before arriving on-site, as defined during Inductions levels 1-3. Further, requirement for the Operators to complete a Chemical Awareness training program (/course).	
54. Appreciation of hazards, identification and control	Y	Discussion Inductions L1, 2 and 3	Refer #53 above	
55. Refresher training	Y	TRACESS database for training, Santos Permit to Work (PTW) system	New version of Santos Permit to Work (PTW) system requires refresher training. Any need for refresher training is determined / documented in the TRACESS database. TRACESS system has a re-training flag (about one month before expiry).	

### 6.3 SAFETY TRAINING OF STAFF AND CONTRACTORS

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
56. Personal safety training and records (view records)	Y	Induction training program. Discussion	Induction training includes appreciation of hazards associated with plants and materials used and produced. PPE requirements are included in the induction training.	
57. Induction training of new employees	Y	Induction training program. Discussion	Refer #56	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
58 Work permit procedures	Y	CBT Module #52 Permit to Work. File of Permits completed by two operators. Corporate EHSMS Audit Schedule.	CBT Module #52 <i>Permit to Work</i> includes Cold Work, Hot Work, Confined Space, Excavation. Training carried out by Snr Trainer (Santos) from Adelaide. Once theoretical training completed the trainee is mentored by the Supervisor for a minimum of 20 permits before being issued with a Certificate for permit issuing. Santos Corporate audits the PTW system implementation within all Santos Operating Groups. Corporate EHSMS Audit Schedule shows evidence of PTW audits being carried out in Oct, Nov and Dec 2012.	
59. Appreciation of inherent hazards in plant and during maintenance	Y	Induction training program. Safety Register. Discussion	Induction training includes appreciation of hazards associated with plants and materials used and produced. It is a requirement for staff and contractors to undergo Induction training. A Hazard Register exists, which is reviewed and discussed 12-monthly at Safety Meeting. The document review is attended by the Safety & Environment Advisors, Operations Supervisor, and HS Reps.	
60. Protective clothing	Y	Induction training program. Safety Register. Discussion	Induction training includes PPE requirements. Refer discussion above.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
61. Equipment to be used (e.g. non sparking tools)	Y	Discussion	Hazardous Area Classification defined for BCS and WPPS. Precautions to take when using hand held equipment in Hazardous Areas is covered in the PTW (including JHA). Induction training includes information and need for the Permit in case of work within Hazardous Area zone. All operators /maintenance workers have trade background. Contractor supervision.	
62. Control of electrical equipment in classified hazardous areas	Y	EHSMS 12 Hazardous Area compliance standard	Control of electrical equipment in classified hazardous areas forms part of engineering reviews. Include need for initiation of Control of Change procedure (Santos EHSMS 12), potentially requiring Hazard and Operability HAZOP) study. Hazardous Area compliance standard requires equipment to be designed in accordance with hazardous area requirements.	
63. Procedure for outside contractor working on premises	Y	EHSMS 10 Contractor Management Induction training	Santos EHSMS 10 <i>Contractor Management</i> sets pre-qualifications requirements. Induction training sets requirements for working outside (heat stress etc.)	

## 7 CONTROL OF CHANGE

### 7.1 PLANT MODIFICATION CONTROL

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
64. How is this documented (view records)	Y	EHSMS 12 <i>Control of Change</i> Bibbiwindi water manifold take-off #9046-5.	Plant modification control is managed following the requirements under EHSMS 12 <i>Control of Change</i> . Bibbiwindi water manifold take-off #9046-5, used as an example for implementation of the requirements under the standard, shows the inclusion of a hazard identification step to evaluate the change. A plant modification would require endorsement of the Supervisor as well as Ops Manager approval.	
65. Who approves modification	Y	-"	Final approval depends on the risk level. Gunnedah Basin Operations Manager approves a Level 2 modification. A Level 3 modification requires Energy NSW Operations Manager approval.	
66. Who screens and reviews the proposal	Y	-"	A change proposal is reviewed by the nominees listed on the Change request, as identified by the change initiator. The nominees use the checklist to screen the impact of the change. The initiator and the nominees sign and date the Technical Approval page in Section 6 of the procedure.	
67. How is updating of drawings and operating/maintenance procedures co-ordinated	Y	-"	The Change Management form includes a checklist for requirements to update documentation including drawings and operating and maintenance procedures.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
68. Are HAZOP techniques employed	Y	-"-	Section 4 - <i>Technical Assessment</i> in the Control of Change procedure requires evaluation of whether a HAZOP, risk assessment or pre-start-up review is required.	
69. What documentation exists	Y	-"-	Control of change request is prepared as a formal document. Documentation produced appear adequate.	

## 8 CONTROL OF SAFE PLANT PERFORMANCE

### 8.1 MAINTENANCE PROCEDURES

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
70. Do formal procedures exist (preventative as well as 71. corrective?)	Y	Discussion. Inspection report for High Voltage.	SOP or work instructions used for common operations and maintenance activities (refer #39 and #42). Uncommon activities would be covered under a Permit (including a JHA). Existing maintenance program is being reviewed by Santos. It appears adequate for the level of operation at the plant and the age of the equipment, bearing in mind that WPPS is shut down and BCS is only partly operational.	
71. Frequency of maintenance	N	Discussion. Inspection report for High Voltage. MAXIMO preventative and corrective maintenance system.	A preventative and corrective maintenance system is currently being implemented (MAXIMO). It will include critical function testing, mechanical pressure vessel valve / protective systems testing, vessel integrity testing,	<u>Action 4:</u> Proceed with the implementation of the preventative / corrective maintenance testing and inspection program (MAXIMO). Include contractor managed tests and inspections of critical protective systems (e.g. fire protection equipment).
72. Pressure vessel testing schedule. Relief valve installation and testing schedule. - Frequency of testing - Is there a test schedule	N	-"	The preventative and corrective maintenance system (MAXIMO), currently being implemented will include critical functions testing. Pressure vessels and relief valves are defined as critical functions.  Initial pressure vessel (PV) surveys and piping integrity surveys have been finalised.	<u>Action 5:</u> Pressure Vessel and Pressure Safety Valve inspection and testing to be carried out as per Legal requirements (minimum) and any Santos requirement.

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
73. List of critical valves checked regularly	N	Discussion. Inspection report for High Voltage. MAXIMO	See above. Relief valves are defined as critical valves. No other critical valves were identified during the Hazard Audit (a final decision of what constitutes a critical function will be determined by Santos for the operation).	

## 8.2 WORK PERMIT SYSTEM

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
74. Work permit system – cold work	Y	Cold work permit form. Filled in forms.	Permit to Work includes Cold Work, Hot Work, Confined Space, Excavation. Corporate EHSMS Audit Schedule shows evidence of PTW audits being carried out in Oct, Nov and Dec 2012.	
75. Vessel entry (independent sheet per confined space)	Y	Confined space permit form	Refer #74 above. Only infrequent requirement for preparation of a Confined Space permit for BCS and WPPS. Confined Space issuer need to come from external to Narrabri.	
76. Hot work clearance system	Y	Hot work permit form and procedure. Filled in forms.	A Hot work permit and procedure exists. Form includes need for gas testing, authorisation + acceptance of permit, sign-offs (both issuer and holder). Procedure includes definition of hot work; when a permit is required; and need for stand-by person (evidence that stand-by person is used).	
77. Excavation authority (hand-digging vs. machinery)	Y	Excavation permit form	An Excavation permit and procedure exists.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
78. How are correct materials of construction verified	Y	EHSMS10 <i>Materials Quality Capability Assurance Statement</i>	The <i>Control of Change</i> procedure requires material of construction to be specified. EHSMS10 <i>Materials Quality Capability Assurance Statement</i> defines requirements to ensure correct materials are managed.	
79. Emergency repair equipment/spares available	N	Santos procedure for stores inventory	Repair equipment and spares are available. No emergency repair equipment/spares have been identified.	<u>Action 6:</u> Determine whether and spare emergency repair equipment are required in the Gunnedah operations facilities, example may be the flare ignitor at WPPS.
80. Isolation procedures	Y	Bibbiwindi well #25. Discussion	Bibbiwindi well #25 is locked out and tagged using personal coloured locks. WPPS and BCS can be double-blocked-and bleed. Some positive isolations (spading) have been done.	
81. Line venting/depressuring/purging procedures	Y	Discussion	Refer Item number 39 and 42.	

### 8.3 ELECTRICAL EQUIPMENT HANDLING

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
82. Maintenance procedures	Y	Refer item number 70.	Refer item number 70.	
83. Defining areas in plant where portable electrical equipment are prohibited	Y	Hazardous Area Drawings; Discussion	- BCS and WPPS: Hazardous Area drawing displayed in offices. Use of portable electrical equipment requires Hot Work Permit to be issued if work is to be performed inside the Hazardous Area zone. Induction training includes information on precautions to take.	



Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
			Portable electrical equipment is registered, including testing of power lines.	
84. Use of earthing straps	Y	Discussion	Design and installation appears adequate: Earth grid all around the Power Station; fences are linked in to this grid. All generators (all skids) are earthed and earth stakes were tested at installation. No evidence of testing provided.	Refer action 4.
85. Hazardous area classification drawings	Y	Hazardous Area Drawings	Hazardous Area Classification drawings available at BCS and WPPS. Zones physically shown through use of chains on the plant.	
86. Calibration and set point testing facilities for instruments	Y	Gas detectors	Gas detectors have online testing and calibration	
87. SCADA system servicing and maintenance	Y	Discussion	No servicing required for the SCADA system. SCADA can fail without it having an adverse safety conditions (it is currently not operating). Data logger is available at wells (2-3 days' worth of data recorded).	

## 8.4 PROTECTIVE SYSTEMS

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
88. Are all protection systems listed (e.g. PSVs, security, safety showers, BA sets, cathodic protection)	N	Refer items #70 - 73.	Protective systems include gas detectors, pressure relief (/safety) valves, fire detectors, safety shower/eye wash stations, flare ignitor, trips & alarms and SCADA. Refer items #70 - 73.	<u>Action 7:</u> Determine whether safety shower/eye was station and flare ignitor are <i>critical protective systems</i> (and need to be included in the Critical Function Testing Program).  Also Refer action 4.

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
89. Records (view) for testing of critical equipment (e.g. pressure vessels, pipelines, relief systems)	N	-"	Refer items #70 - 73	Refer action 4.
90. Do the processes fail safe	Y	Discussion	See item #29 above.	
91. Testing of trips/alarms/emergency valves procedures documented	N	Refer items #70 - 73.	Documentation of testing will occur in MAXIMO, refer items #70 - 73. Failure of any critical function is monitored by Santos Process Safety Group (Adelaide)	Refer action 4.
92. Where are records kept (view records)	N	-"	Records will be kept in MAXIMO, refer items #70 - 73	Refer action 4.
93. Authority to bypass trips during testing	Y	Discussions	Bridge register and implementation procedure exists. Bridge register exists in Energy NSW - Link to documentation and procedure	<u>Action 8</u> : Proceed with bridge register and implementation procedure (for bypassing of trips during testing).
94. Work permit for testing	Y	PTW system	Permits required for critical functions testing of protective systems inside the restricted areas.	
95. Check whether trip re-activated after testing	Y	Refer item #93.	Refer item #93.	Refer action 7.
96. Procedure if protection system taken out of service temporarily (i.e. an override list for hardware, bridges, and software)	N	-"	There is currently no formal system in place for out-of-service equipment. There is a risk that critical equipment or instruments (e.g. a gas detector) is taken out of service, for example by an operator, without the required communication (Permit / Control of Change	<u>Action 9</u> : Establish out-of-service equipment protocol for critical items equipment (e.g. gas detectors etc.). Communicate system to technical staff.

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
			documentation) and safety checks.	
97. Ventilation air flows	Y	Plant tour, Discussion	Relevant for the generator enclosure. Ventilation air flow automatically established on initiation of the 20% pre-alarm condition of gas detector. Automatic shut-down of air ventilation in case of initiation of IR detector or initiation of 40% gas detector. Also shut-down of process and ESD of WPPS.	
98. Earthing of equipment and electrical continuity	N	Discussion	A High Voltage audit of WPPS has been performed by Santos, identifying a number of outstanding requirements.	<u>Action 10</u> : Proceed with implementation of outstanding actions identified during the High Voltage audit.
99. Corrosion protection systems tested	Y	Plant tour, Discussion	No corrosion protection system installed. Fibreglas flow line; polythene gathering line; galvanised separator etc. Very little external corrosion at WPPS due to dry climate and distance from sea. Refer Opportunities for Improvements 1 and 2.	

## 9 ACCIDENTS AND INJURIES

### 9.1 UNUSUAL INCIDENT REPORTING

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
100. Reporting system (view records since previous audit)	Y	Hazard and Injury Procedure. EHSMS15 <i>Incident Investigation</i> . List of incident records since last 2009 Hazard Audit. Incident register.	EHS Toolbox includes incident management and auditing tool. A total of 316 incident reports were issued in NSW in 2012. These include proactive and reactive incident reporting. 42 incidents were reported Nov 2011 to 31 Dec 2011.	
101. Any recurring types of incidents	Y	Incident register Nov 2011 to Nov 2012.	Wildlife (snake, spider, wasp), road / travel hazards, chemical handling (in Q2 2012). The response to the Q2 chemical handling incidents was to remove non-essential chemicals from site and tighten up MSDSs and risk assessment management. A central point in Narrabri now controls the chemical inventory (stores manager)	
102. Any significant incidents	Y	Incident register.	Incidents are ranked in accordance with 5 defined levels. Highest level in database is, at the time of the Hazard Audit (Nov '11 - 'Nov '12), level 3. The L3 incidents include an environmental spill of an unmarked gas and water flow line and a gas leak. Both were classified as minor equipment leaks.	
103. Investigation procedure. Who chairs the investigation team	Y	Incid. Investigation and Reporting Procedure	All incidents are discussed at the pre-start meeting (refer #24) (daily) attended by all.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
104. Follow up action	Y	Incident register.	Actions are entered as notifications in EHS Toolbox. If action close-out has not been completed within 14 days, escalation starts happening, to higher and higher levels within Santos management.	
105. Record maintenance	Y	Incident database, Discussion	Records are held on the EHS Toolbox. Records are kept for 10 years for general incidents and for 40 years for injury incidents.	
106. Is an Unusual Incident defined by management (record the major types)	Y	EHSMS15 Incident Investigation	Incidents include injury, damage to equipment, near misses, third party complaints.	
107. Are transport incidents (include off-site) recorded (view records)	Y	Procedure and register.	Yes if they occur as part of work. There have been none involving DGs in the Nov 2011 - Nov 2012 period	
108. Publicity for report and action	Y	Procedure and register.	Every employee receives incident reports Santos wide. Discussed at pre-start meeting (daily), refer #103.	
109. Safety targets set by management	Y	EHSMS03 Objectives and Targets, Gunnedah Basin Improvement Plan, 2012 EHS Improvement Plan Rev Feb 1/2012	Safety targets are set by Santos, refer discussion #142.	
110. Re-training program	Y	EHSMS Retraining program	EHS Team reviews EHSMS Retraining program on a 6-monthly basis in consultation with the Gunnedah Ops Mgr.	

## 10 EMERGENCIES

### 10.1 FIRE PROTECTION AND TRAINING

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
111. Adequacy of fixed and portable protection systems (view test tags)	Y	Plant tour	Fire extinguishers checked twice yearly. External contractor carries out the checks. Extinguishers on site (BCS, WPPS) appear to be in good working order, protected by plastic. Metal tags confirm testing schedule.	
112. Types of extinguishers	Y	Plant tour, extinguisher register	A project has been carried out by an external contractor (FireTalk) to review the fire protection equipment on site (BCS, WPPS). This review includes location, type, number etc. Gaps to requirements are being implemented as part of the improvement plan for the sites.	
113. Number and location	Y	-"	Refer #112	
114. Labelling	Y	-"	Refer #112. Fire extinguishers checked twice yearly. Labelling appears adequate	
115. Accessibility	Y	-"	Refer #112	
116. Adequacy of fire protection system.	Y	Fire Safety Study, plant tour	The philosophy for fire protection is to isolate pipelines and let the fire burn out. Fire protection is limited to extinguishers. The philosophy was accepted by the NSW Fire Brigades (now Fire & Rescue NSW) in their review of the Fire Safety Study.	
117. Rematching system	Y	Discussion. Plant tour. Induction L3	Box available at WPPS where matches and lighters are to be placed. Signposting at gate. Induction L3	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
118. Who maintains and repairs fire protection equipment	Y	-"	Outside contractors (FireTalk). They initiate the inspections.	
119. Inspection and testing frequency (view records)	Y	-"	Inspection of extinguishers appears adequate.	
120. Adequacy and reliability of firewater	Y	Refer #112.	Refer #112.	
121. Is all critical equipment protected	Y	-"	Refer #112.	
122. Fire training/drill for employees	N	Records of course 2.8 <i>Undertake First Response</i> 31/1/12 conducted by Fire Protection Coordinator	Records of course 2.8 <i>Undertake First Response</i> 31/1/12 conducted by Fire Protection Coordinator. Shows 15 attendees out of 21 totals. Both theoretical and practical training included in training.	
123. Fire protection manual (does a FSS exist)	Y	<i>Fire Safety Study for Eastern Gas Ltd's Proposed Gas Gathering, Gas Plant and Sales Flowline</i> (19 Nov 2008).	A fire safety study was compiled in conjunction with the Project Approval stage	
124. Plan or register of fire protection equipment	Y	Extinguisher register	Refer #112	

## 10.2 EMERGENCY PROCEDURES

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
125. Is there an emergency plan	Y	Gunnedah Basin Emergency Response Manual 12/11/12, Energy NSW ERP 6/1/12, Incident Mgt Plan Activation Pack (Duty Manager) 6/1/12	All personnel and contactors receive a copy of the Gunnedah Basin ERP as part of the Induction L3. It provides information on emergency response, including muster points, phone numbers, maps and plans. ERPs are reviewed at PTW issuing.	
126. Who gets copies	Y	-"	Refer #125	
127. Does everyone know who is in charge	Y	Emergency response kits	The ERP specifies in Para 8.1 that the overall responsibility for the emergency response is with the Emergency Response Team.  Kits are available for Planning officer, Operations Officer, ERP Coordinator, Log keeper, Logistics officer, On Scene Commander, Public Affairs Advisor, Engineering Advisor, Communications Advisor	
128. Emergency drills conducted regularly	Y	Improvement Plan, Desktop chem spill report 27/7/12, Exercise shed fire report 21/2/12. Bush fire emergency Log Sheet 28/1/12 and debrief 29/11/12	Improvement Plan shows the planned drills and exercises for the area. The emergency response exercises are reported and kept in the EHS Toolbox. The Training Register shows training 24/10/12 of 2 on scene commanders and log keeper. There was also an actual incident involving evacuation from all sites following a lightning strike and subsequent bushfire.	



Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
129. Emergency lighting adequate	Y	Plant tour	External lighting available at WPPS.	
130. Are the following situations covered: - Fire - Explosion - Loss of utilities (power, water, instrument air, nitrogen) - Bomb threat - Flood - Toxic leaks and spills - Computer systems/transponder failure	Y	Emerg. resp. plan.	The following situations are covered: - Fire / Explosion - Gas / oil leak - Bomb threat - Missing personnel - Civil disobedience Loss of utilities, flood and computer systems / transponder failure are not considered emergencies.	
131. Are off-site effects included and how to handle them	Y	Emerg. resp. plan.	Adequate information on off-site effects included and how to handle them. Bush fire incident are included.	
132. Outside services police/ambulance/fire brigade - pre-arrangements with the above	Y	Exercise report, Blowout 4/3/12	An exercise was carried out 4/3/12, including Santos, Fire & Rescue NSW, NSW Rural Fire Service, District / Local Emergency Management Personnel, NSW Ambulance and NSW Police.  Emergency assembly points are being signposted in conjunction with Forestry NSW. Next step is to develop an ERP in conjunction with Forestry NSW.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
133. Are duties clearly defined for: - Fire fighting - Security - Safety - Medical contact - Evacuation and roll call - Communications - Media contact	Y	Kits for Planning officer, Operations Officer, ERP Coordinator, Log keeper, Logistics officer, On Scene Commander, Public Affairs Advisor, Engineering Advisor, Communications Advisor	All personnel participating in an emergency event use their specific kits developed for their needs. Kits for the Planning officer, Operations Officer, ERP Coordinator, Log keeper, Logistics officer, On Scene Commander, Public Affairs Advisor, Engineering Advisor, Communications Advisor and Legal Advisor.	
134. System to update emergency procedures	Y	EHSMS 13 <i>Emergency Procedures</i> . Gunnedah Basin Emergency Response Manual 12/11/12, Energy NSW ERP 6/1/12	Santos EHSMS 13 Emergency Procedures requires ERPs to be updated yearly. Gunnedah Basin Emergency Response Manual dated 12/11/12, Energy NSW ERP dated 6/1/12 shows compliance with this requirement.	
135. Whose telephone numbers listed and where	Y	Gunnedah Basin Emergency Response Manual 12/11/12, Energy NSW ERP 6/1/12	Telephone number listing includes off-site emergency contacts, hospitals, Narrabri operations office, Santos operations on-call, Operations Manager and Duty Manager	
136. Procedure to update telephone numbers	Y	-"	Tel numbers are updated as per EHSMS 13, at least yearly	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
137. Updating of the emergency plan.	Y	EHSMS 13 <i>Emergency Procedures</i> . Gunnedah Basin Emergency Response Manual 12/11/12, Energy NSW ERP 6/1/12	Refer item #134 above.	
138. Is an area specific ERP needed	Y	-"	The Gunnedah ERP provides information on muster points and local phone numbers. Summary pack distributed as part of Induction L3 at BCS and WPPS.	

## 11 SAFETY MANAGEMENT SYSTEM

### 11.1 DOCUMENTATION

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
139. Quality and availability of documents	Y	EHSMS	EHSMS available on the internet (over the well). Divided up into EHS Policies, Management Standards, H&S Hazard Standards, and Environmental Hazard Standards. The available document are of good quality.	

### 11.2 COMMITMENT AND LEADERSHIP

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
140. Commitments by senior management (ISO, local resident and industrial groups)	Y	Gunnedah Basin Improvement Plan, 2012 EHS Improvement Plan Rev Feb 1/2012, Performance overview May, June, July, August 2012	An improvements plan has been prepared by Santos for the operations carried out from Narrabri (as documented in Gunnedah Basin Improvement Plan, 2012 EHS Improvement Plan Feb 2012. Evidence of the plan being implemented. Santos also closed down most of it's operation at this location pending satisfactory implementation of critical safety / environmental improvements. EHS Stewardship meetings are held monthly, where the progress against Scorecard Targets set in the Improvement Plan are reviewed. Attendees include Energy NSW Ops Mgr, Gunnedah Basin Ops Mgr, EHS&S Team Leader. A performance overview is provided to the Santos GM.	
141. HS&E Vision	Y	The well	Vision is included in the Policies. Covered in all levels of the Induction training.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
142. HS&E Strategy	Y	EHSMS03 <i>Objectives and Targets</i> , Gunnedah Basin Improvement Plan, 2012 EHS Improvement Plan Rev Feb 1/2012	EHSMS03 <i>Objectives and Targets</i> (Nov 2011) sets the overall objectives for developing targets. The improvements plan for the area, as documented in Gunnedah Basin Improvement Plan, 2012 EHS Improvement Plan Rev Feb 1/2012, sets the HS&E strategy for the area.	
143. Policy Available		H&S, Env. Climate Change Policies. Procedure EHSMS01 <i>EH&amp;S Policy</i>	Policies are available on wall in BCS, WPPS and Narrabri Ops office. Includes H&S, Env. And Climate Change Policies.	
144. Policy Maintenance and Review	Y	Procedure EHSMS01 <i>EH&amp;S Policy</i> . Email 10/8/12 Cheryl Ormond	Policies are required to be reviewed on an annual basis (Procedure EHSMS01 <i>EH&amp;S Policy</i> ). Policies are available and somewhat overdue for updating. Evidence shown that Policies are in the progress of being updated (email set 10/8/12).	
145. Audits (internal/external)	Y	EHSMS16 <i>Management System Audit and Review</i> (Jan 2012). EHSMS Project Tracker (latest revision) Sept 2012	EHSMS16 <i>Management System Audit and Review</i> (Jan 2012) includes requirements for the following types of audits: Internal (Santos) Corporate EHS Audits and Progress reviews, Self EHS Audits, Environment Statutory Compliance Audits, Unscheduled EHSMS Audits. Energy NSW are currently exempt from the Self EHS Audit requirements. An EHS Gap Analysis was conducted for the area in February 2012 and an Improvement Plan was prepared. Time frame for closing the gaps have been set to between 2.5 and 3 years.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
146. Process operator training	N	Equipment Isolation (#50), Vessel Inspection & Maintenance (#51), Work Safety (#53), Work Permit Guidelines	Competency based training (CBT) system is in the process of being developed, refer #51. Includes areas of Leadership & People, Transition & Integration, EHS etc. Includes modules for operators. Critical modules have been developed, including Equipment Isolation (#50), Vessel Inspection & Maintenance (#51), Work Safety (#53), Work Permit Guidelines.	Refer Action 3.
147. Safety organisation and meetings (including minutes)	Y	Discussion. EHS Part B meetings dated 14/11/12, 12/10/12, 25/9/12	EHS Part B meetings have been run to-date, includes reps from whole of Santos (including representation from Gunnedah). Chaired by Vice President. Safety Committee (Gunnedah Basin) due to start up end 2012. Have only met once at the time of the Hazard Audit 2012. Representatives have been elected and a Constitution signed off. There is no longer any legal requirement for Safety Committee unless specifically requested.	
148. Who is responsible for safety organisation	Y	Discussion	Operations Manager has overall responsibility of the safety organisation at Energy NSW. Santos CEO has overall responsibility of the safety organisation across Santos Company.	
149. Hazard Identification, Risk Assessment and Control	Y	EHSMS 09 Hazard Identification, Risk Assessment and Control	EHSMS 09 <i>Hazard Identification, Risk Assessment and Control</i> defines the tools, techniques, criteria, recording, monitoring and review requirements. Defines need for hazard identification to take place in 5 areas including during change, acquisition, operation, projects, and	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
			tasks & jobs. The Standard provides hyperlinks to relevant procedures including to Control of Change.	
150. System to monitor safe work practices and loss prevention methods	Y	Improvement Plan	Refer Incident Investigation. Improvement plan includes uncontained LOCs, significant process safety exceptions and uncontained spills.	
151. Protective equipment provided	Y	Site tours. HSHS 17 <i>Personal Protective Equipment</i>	HSHS 17 <i>Personal Protective Equipment</i> provides requirements for PPEs. Includes an Auditor's guide. Requirements are repeated in Induction training (all levels). Evidence of implementation during site tours.	
152. First aid facilities/training	Y	EHSMS 13.1 <i>First Aid and Medical Facilities</i>	EHSMS 13.1 <i>First Aid and Medical Facilities</i> includes requirements and contents.	
153. Workplace Hazardous Substances compliance and training	Y	HSHS08 <i>Chemical Management and Dangerous Goods</i> , July 2011	Risk Assessment are mandatory for all DGs and Hazardous Substances.	

## 12 MANAGEMENT AND ADMINISTRATION OF THE SAFETY MANAGEMENT SYSTEM

### 12.1 PLANNING AND VISIONS

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
154. Planning	Y	EHSMS Rollout Plan; EHS Fundamentals.	Gap analysis identifies the need for raised awareness of environmental and safety related hazards. The outcome of the Gap analysis are included in the EHSMS Rollout Plan for improvements (Sept '12 - Sept '13). Monitoring of progress against the plan done during pre-start meeting (daily, involving all personnel). EHS Fundamentals is a Corporate driven initiative, including topics s.a. Hazard Identification and Plant and Equipment. This initiative is canvassed at the Safety meetings on Mondays (across NSW).	

### 12.2 CONTRACTOR MANAGEMENT

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
155. Managing On-Site Contractors	Y	ESHMS10 Contractor & Supplier ESH Management, August 2012	ESHMS10 Contractor & Supplier ESH Management sets out the requirements for managing On-Site Contractors. Minimum requirements include Induction training Levels 1 & 2 (and L3 for contractors attending WPPS and BCS). Also heat stress for site work.	



## 12.3 SECURITY

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
Security of Premises				
156. Full time security staff provided	Y	Discussion	BCS and WPPS do not have security staff touring the premises. A Site risk assessment was conducted for both BCS and WPPS. The assessment identified the minimum security measures required for the sites, including fence, locking etc., refer #159.	
157. Employees or contractors	Y	Discussion	N/A	
158. Level of authority	Y	Discussion	N/A	
159. Control of access to facility	Y	Site tour	WPPS: 6-foot chain mesh fence. Locked access gates. Also locked gate 800m up the road from the Station. BCS: 6-foot chain mesh fence with barbwire. Locked access gates. Narrabri Centre: Standard locking of doors. Wells: Fence and locked gates. A project is underway to install Closed Circuit Television (CCTV) at the Narrabri offices, WPPS and BCS to be connected to the Operations Centre. Expenditure approval received.	
160. Are security personnel trained in emergency procedures	Y	Discussion	N/A	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
161. What restrictions on access during emergency	Y	Site tour	Fence and locked gates at WPPS and BCS.	
162. Any special restrictions on visitors	Y	Site tour	L3 site induction when accessing the BCS and WPPS. Sign-in sheet used at both sites. Gates are securely locked.	
163. Do security officers tour the premises	Y	Discussion	No	

## 13 ENVIRONMENTAL PROTECTION

### 13.1 WASTE MANAGEMENT

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
164. Solid waste control and disposal (sludges, empty drums, carbon etc.)	Y	<i>Waste Management Plan</i> , Santos 12 Sept 2012	- Waste is split up into general solid waste (paper, cardboard) and regulated waste (oily rags, filter, batteries, waste oil). Agreement in place between Eastern Star Gas (ESG) and Transpacific. Agreement being put in place between Santos and Veolia and with Transpacific. - An Environmental Compliance Audit was conducted in 2012 (URS) covering the Narrabri Project.	
165. Liquid waste control and disposal (containment, storage, processing and spill management)	Y	<i>Water Management Plan</i> , Santos 12 Sept 2012	Water Management Plan for water and brine produced.	

### 13.2 ATMOSPHERIC EMISSIONS

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
166. Control of atmospheric emissions (smoke, gases, fumes and dust)	Y	Santos NPI - Reporting Form 1/1/11 to 31/12/11 for the Narrabri project. Extract NGER Narrabri CSG Project 2011/12.	Santos <i>National Environmental Pollutant Inventory</i> (NPI) for emissions reporting conducted for the Narrabri Project and for WPPS, covering the 1/1/11 to 31/12/11 period.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
167. Soil or groundwater contamination (testing required, e.g. monitoring wells for underground tanks)	Y	SOP FWDR-03, <i>Single Aquifer Monitoring Well Installation</i> , CH2MHill 16/2/2012, Figure 2 – Leewood Piezometer Locations, Figure 2 – Bibblewindi Piezometer Locations, Figure 2 – Wilga Park Local Piezometer Locations, Figure 3 – Wilga Park Regional Piezometer Locations, Figure 2 – Leewood Piezometer Locations.	Ground water baseline data is being obtained through the installation of a series of underground monitoring wells (piezometer). The results of monitoring will form the basis for the development of a Soil and Groundwater Management Plan will.	
168. Containment and disposal of spillages and contaminated firewater	Y	Site tour	No firewater on site.	
169. Fugitive emissions program (if required by the EPA licence)	Y	Refer #166	Refer #166	

### 13.3 CONTROL OF INCOMPATIBLE MATERIALS

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
170. Likelihood of mixing incompatible liquids in drainage system	Y	Discussion	Without the Reverse Osmosis (RO) plant for water treatment there are no incompatible materials on site. The DG store at BCS displays a chart showing segregation requirements for DGs.	

### 13.4 LICENCE

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
171. EPA and DG licence conformance	Y	-"	- No DG Licence required. - No EPA Licence required (Licence required at 30MW). - No Gas Production Licence required. - Flowline not required to be licenced.	
172. Effluent treatment and disposal (e.g. Trade Waste to Sydney Water)	Y	-"	Prior to shutdown of RO plant, effluents consisted of process water coming out of the RO plant and discharged into Bohena Creek. Agreement with EPA. No discharge since Santos took over from ESG.	
173. Where are records kept (view records)	Y	-"	N/A	
174. Are incidents recorded (e.g. flare releases)	Y	-"	Small flare discharges would not constitute a recordable incident. Emissions from WPPS are recorded as per the NPI scheme (refer #166). Large flaring incidents, initiated from a process upset, would be investigated and recorded in accordance with Santos' Incident Management procedure.	

Question	Item OK? (Y / N)	Document/ Person	Status / Description	Recommended Action
175. Other safety studies carried out on the facility. Status of outstanding recommendations from these studies to be reviewed. Obtain full references for the Hazard Audit report.	Y	--	Fire Safety Study and HAZOP. No Preliminary Hazard Analysis was prepared (not a requirement). HAZOP action management transparent.	

## 14 REFERENCES

- 1 Department of Urban Affairs and Planning, *Hazardous Industry Planning Advisory Paper No. 5: Hazard Audit Guidelines*; NSW Government, Sydney, 2011 Edition

## Appendix 1

# Details of the Topics Covered in the Hazard Audit

## Report of the 2012 Hazard Audit of the Santos Operations Associated with the Narrabri PEL 238 Project



## **Appendix 1 – Details of the Topics Covered in the Hazard Audit.**

### **1 Scope**

The hazard audit is a requirement of the consent document associated with new plant or significant modifications. Formal guidelines are available (Advisory Paper No. 5). The main review areas of software and technical controls that have been targeted by the Department in past reports still form the basis of the proposed audit.

The key areas to be covered by the Audit are listed below. The audit comprises:

- Review of documents and procedures
- Inspection of facility
- Observation of operations

Discussions with employees at all levels, i.e. operators, maintenance employees, supervisors, managers, security officers, safety officer.

### **2 Plant and Process Systems**

- Physical condition of equipment and storage
- Labelling and identification of equipment/valves/instruments/pipes
- Assumptions in hazard analysis study incorporated in plant hardware
- Are all items of equipment and control functioning satisfactorily
- P&ID's and process flow diagrams
- Process systems monitoring e.g. operator logs, alarms, trips
- General housekeeping of premises
- Materials inventory system and records
- Loading/unloading operations and transport records

### **3 Review of Operating Procedures**

- Who writes them
- How often are they reviewed
- Who is authorised to make changes
- Are they up-to-date
- Method sheets with quick summaries
- How does the Supervisor know how well the procedure is working out
- How do Managers keep informed about satisfactory operation of the procedures
- Back-up systems (e.g. trip systems) on procedural failures

### **4 Process Operator Training**

- Training modules (why and what of operation)
- Training methods and records
- What restrictions on operator who has not completed training
- Evaluation of training
- Personal precautions in handling flammable or toxic materials
- Appreciation of hazards, identification and control

### **5 Maintenance Procedures**

- Do formal procedures exist (preventative?)
- Are the aims of procedures clearly outlined
- How do supervisors keep informed about how well the procedures are working
- How and where are records kept

- Frequency of maintenance
- Relief valve installation and testing schedule
- Pressure vessel testing schedule
- Work permit system
- Vessel entry
- Hot work clearance system
- How are correct materials of construction verified
- Emergency repair equipment/spares available
- Line venting/depressuring/purging procedures
- List of critical valves checked regularly
- Calibration and set point testing facilities for instruments
- Computer servicing and maintenance

## **6 Safety Training of Employees**

- Personal safety training and records
- Induction training of new employees
- Appreciation of inherent hazards in plant and during maintenance
- Work permit procedures
- Equipment to be used (e.g. non sparking tools)
- Protective clothing
- Control of electrical equipment in classified hazardous areas
- Procedures for outside contractors working on premises

## **7 Plant Modification Control**

- How is this documented
- Who approves modification
- Who screens and reviews the proposal
- How is updating of drawings and operating/maintenance procedures co-ordinated
- Are HAZOP techniques employed
- What documentation exists

## **8 Testing of Protection Systems**

- Are all protection systems listed
- Testing of trips/alarms/emergency valves procedures documented
- Where are records kept
- Relief valves, bursting discs
- Frequency of testing
- Is there a test schedule
- Authority to bypass trips during testing
- Work permit for testing
- Check whether trip re-activated after testing
- Procedure if protection system taken out of service temporarily
- Ventilation air flows
- Earthing of equipment
- Other preventative maintenance checks

## **9 Electrical Equipment Handling**

- Maintenance procedures
- Isolation procedures
- Defining areas in plant where portable electrical equipment prohibited
- Hazardous area classification drawings

## **10 Unusual Incident Reporting**

- Reporting system
- Investigation procedure. Who chairs the investigation team
- Follow up action
- Record maintenance
- Is an Unusual Incident defined by management
- Publicity for report and action

## **11 Injury/Accident Reporting**

- **Reporting system**
- Investigation procedure
- Follow up action
- Safety targets set by management
- Re-training program

## **12 Fire Protection and Training**

- Fixed protection systems

- Types of extinguishers
- Number and location
- Labelling
- Accessibility
- Dematching system
- Who maintains and repairs fire protection equipment
- Inspection and testing frequency
- Adequacy of firewater
- Is all critical equipment protected
- Fire training/drill for employees
- Fire protection manual
- Plan or register of fire protection equipment

### **13 Emergency Procedures**

- Is there an emergency plan
- Who gets copies
- Does everyone know who is in charge
- Emergency drills conducted regularly
- Emergency lighting adequate
- Are the following situations covered:
  - Fire
  - Explosion
  - Loss of utilities (power, water, instrument air, nitrogen)

- Bomb threat
- Flood
- Toxic leaks and spills
- Computer systems/transponder failure
- Outside services police/ambulance/fire brigade - pre-arrangements with the above
- Are duties clearly defined for:
  - Fire fighting
  - Security
  - Safety
  - Medical contact
  - Evacuation and roll call
  - Communications
  - Media contact
- System to update emergency procedures
- Whose telephone numbers listed and where
- Procedure to update telephone numbers
- Management Safety System
- Internal audits
- Safety policy
- Process operator training
- Safety organisation and meetings (including minutes)

- Hazard identification, risk assessment and control
- System to monitor safe work practices and loss prevention methods
- Who is responsible for safety organisation
- Protective equipment provided
- First aid facilities/training
- Workplace Hazardous Substances compliance and training

## **15 Security of Premises**

- Full time security staff provided
- Employees or contractors
- Level of authority
- Control of access to facility
- Are security men trained in emergency procedures
- What restrictions on access during emergency
- Any special restrictions on visitors
- Do security officers tour the premises

## **16 Environmental Protection**

- Solid and liquid waste disposal
- Control of atmospheric emissions
- Soil or groundwater contamination
- Containment and disposal of spillages
- EPA licences
- Effluent disposal (Sydney Water)



- Where are records kept

## **17 Additional Requirements**

The Department's Advisory Paper No. 5 requires the following:

- Maps and sketches of the facility and of surrounding land uses
- Listing of hazardous materials being handled, stored or processed at the site, with an indication of variations in quantities held
- Locations of significant quantities of hazardous materials to be marked up on a site map
- Specific Material Safety Data Sheets may be included as attachments
- A map showing the layout of fire fighting services should be included as an attachment to the report (or reference the Fire Safety Study)
- Process description
- Other safety studies carried out on the facility. Recommendations made in these studies to be reviewed.