Draft environmental management plan

Decommissioning and abandonment management plan

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Santos
GLNG Project

Santos GLNG Upstream

Decommissioning and Abandonment Management Plan

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Abbreviations and Units

Acronym	Description
ANZECC	Australia and New Zealand Environment and Conservation Council
APIA	Australian Pipeline Industry Association
APPEA	Australian Petroleum Production and Exploration Association
AS	Australian Standard
CCA	Conduction and Compensation Agreement
CSG	Coal Seam Gas
DAMP	Decommissioning and Abandonment Management Plan
EA	Environmental Authority
EHS	Environmental Hazard Standard
EHSMS	Environment, Health and Safety Management System
EP Act	*Environmental Protection Act 1994*
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999*
GLNG	Gladstone Liquefied Natural Gas
GRE	Glass Reinforced Epoxy
HDPE	High-Density Polyethylene
ISO	International Organisation for Standardisation
NZS	Standards New Zealand
P&G Act	*Petroleum and Gas (Production and Safety) Act 2004*
RMP	Rehabilitation Management Plan

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1.0 Introduction

This Decommissioning and Abandonment Management Plan (DAMP) outlines Santos GLNG's management approach for the suspension, decommissioning, demolition and/or abandonment of assets within the Santos GLNG Upstream Project Area.

Decommissioning and/or abandonment of assets, together with rehabilitation actions for Project related disturbances, are required by holders of petroleum and gas tenure and prior to Santos GLNG being able to successfully surrender an Environmental Authority (EA) associated with the relevant petroleum assets.

1.1 Purpose and Scope of the DAMP

1.1.1 Purpose

Santos GLNG has both a legal and social responsibility to decommission (including demolition) and / or abandon assets associated within the Santos GLNG Project. This DAMP has been prepared to satisfy these obligations and complements the overarching Santos Environment, Health and Safety Management System (EHSMS) (refer section 3.2).

The objectives of the DAMP are to:

- Support the Santos *Environmental Management Standard 11.11* – Decommissioning and Abandonment (EHSMS11.11);
- Provide a framework for Santos GLNG to:
    - Undertake the decommissioning and/or abandonment of assets in a manner that complies with Queensland's legislative requirements and GLNG Project approvals;
    - Undertake decommissioning and/or abandonment activities in a manner that meets stakeholder expectations;
    - Leave a landform which is safe, stable and non-polluting and compatible with the intended post-closure land use and enable effective transfer to third parties, such as landholders; and
    - Provide for the retention and beneficial reuse of infrastructure constructed by Santos GLNG to third parties (e.g. landholders or local authorities), where there is an appropriate agreement in place and regulatory authorities are satisfied.

1.1.2 Scope

This DAMP provides an overview of the Santos GLNG approach to manage decommissioning and/or abandonment activities. Specifically, this DAMP:

- Identifies the types of activities to be decommissioned and/or abandoned across the GLNG Upstream Project Area;
- Describes the general approach to decommissioning and/or abandonment of these activities;
- Describes general measures to minimise or manage potential adverse impacts associated with decommissioning and/or abandonment of the activities.

The DAMP does not discuss rehabilitation actions for decommissioned assets. Rehabilitation objectives are addressed in the *Santos GLNG Upstream, Rehabilitation Management Plan* (RMP).

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This DAMP is to be implemented by all Santos GLNG Project personnel responsible for the demolition, decommissioning and/or abandonment of Project infrastructure during the exploration, construction, production, decommissioning and rehabilitation phases of the Project.

This DAMP applies to activities carried out within the Santos GLNG Upstream Project Area. The Santos GLNG Upstream Project Area consists of Santos GLNG petroleum tenements comprising the Arcadia, Fairview, Roma and Scotia gas fields and as illustrated in Figure 1

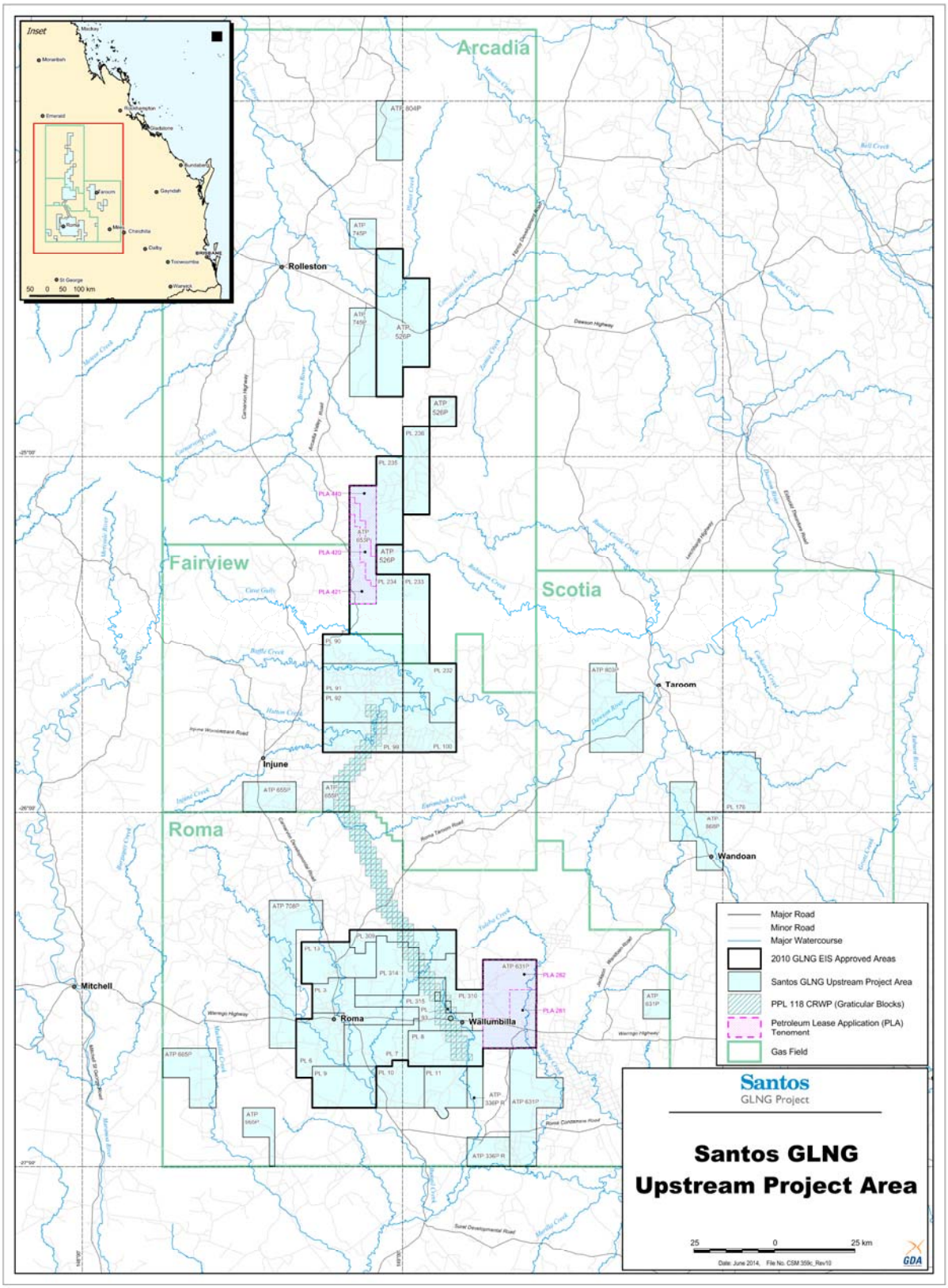

Figure 1: The Santos GLNG Upstream Project Area

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2.0 Roles and Responsibilities

In relation to the safety and environmental risks of decommissioning and/or abandonment of plant and equipment, a Management of Change (MoC) proposal shall be developed (*Santos EHSMS12 Management of Change*) and submitted to the relevant Asset Manager for review and approval prior to the commencement of physical work. The relevant management of change proposal must address the matters listed in *Santos EHSMS11.11 Decommissioning and Abandonment*.

Santos GLNG Project personnel are responsible for the environmental performance of their activities, for complying with relevant approval / permit requirements and for ensuring that all environmental objectives associated with the work are achieved. Santos GLNG Project personnel must also be mindful of the General Environmental Duty (GED) as outlined in the *Environmental Protection Act 1994* (Qld) (EP Act). Section 319(1) of the EP Act states that "*a person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practical measures to prevent or minimise the harm.*"

Roles, responsibilities and accountability under the DAMP will be assigned in accordance with the *Santos EHSMS05 – Responsibility and Accountability*.

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3.0 Legal and Other Requirements

3.1 Legislation and Strategies

An overview of the key legislation considered in the development of the DAMP is provided in Table 1.

Table 1: Summary of Key Applicable Legislation and Codes

Act or Strategy	Summary of Act or Strategy
***Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act)**	The EPBC Act protects matters of national environmental significance (MNES). Approval of the GLNG Project EIS in 2010 was subject to the development of a Decommissioning Plan (Conditions 82 and 83 of the EPBC approval).
***Environmental Protection Act 1994* (EP Act)**	The EP Act authorises development of GLNG Upstream Project Areas while placing obligations on GLNG to take all reasonable and practicable measures to prevent or minimise environmental harm. GLNG holds a series of EAs that include provisions for decommissioning activities and provision of financial assurance. Chapter 7, Part 8 of the Act contains provisions for contaminated land.
***Petroleum and Gas (Production and Safety) Act 2004* and *Petroleum Act 1923* (P&G Acts)**	The P&G Acts include obligations and responsibilities for petroleum lease and pipeline licence holders to decommission petroleum wells and pipelines. The Acts also includes conduct and compensation agreement (CCA) requirements for entering private land (Section 3.2).
National Environment Protection (Assessment of Site Contamination) Measure 1999	Establishes a nationally consistent approach to the assessment of site contamination to ensure sound environmental management practices.
Guideline for Contaminated Land Professionals (DEHP 2012)	The purpose of the guideline is to establish best practice for managing land contamination through the planning and development control process.
Code of Practice for Constructing and Abandoning Coal Seam Gas Wells in Queensland (DEEDI 2011)	This code was developed to ensure that all coal seam gas wells are constructed and abandoned to a minimum acceptable standard resulting in long term well integrity, containment of gas and the protection of groundwater resources.
Code of Environmental Practice Onshore Pipelines (APIA 2013)	This code has been published as the minimum acceptable standard to mitigate or eliminate the environmental impact of pipeline activities.
Code of Environmental Practice (APPEA 2008)	This code gives guidance on objectives to be achieved when managing environmental impacts associated with petroleum exploration and production.
Land Access Code (DEEDI 2010)	The Land Access Code supports the P&G Act and imposes mandatory conditions concerning the conduct of resource activities on private land.

3.1.1 Conduct and Compensation Agreements

As stated in Table 2, the P&G Act and Petroleum Act includes requirements for a Conduct and Compensation Agreement (CCA) to be entered into between Santos GLNG and the landholder when activities to be carried out on the landholder's property may have an impact on the landholder's business or land use. CCAs can be used to provide for compensation during the use of the land and/or the remainder of a dam or other asset once operations have ceased. Post-petroleum beneficial use of dams or other assets may require agreement by the administering authority in accordance with the respective EA.

CCAs will be specific to each landholder and their property. The asset-specific plan will be required to take into account any specific CCA requirements in place.

3.2 Santos Environment, Health and Safety Management System

The Santos EHSMS, provides a framework for environmental and safety practices across Santos operations worldwide. The framework has been developed to be consistent with *AS 4801:2000 Occupational Health and Safety Management Systems* and *AS/NZS ISO 14001:2004 Environmental Management Systems*. The DAMP complements the requirements of the EHSMS, in particular, the Santos Environmental Hazard Standard *EHS11.11 Decommissioning and Abandonment.* This standard defines the requirements to manage risks associated with the decommissioning and abandonment of assets.

This DAMP addresses features and requirements relating to the Santos GLNG Project. GLNG specific documentation is based on managing identified safety, environmental and reputational risks and accounts for the GLNG Project's legal and other obligations, commitments made by the Santos GLNG Project and GLNG's Social Licence to Operate. In this context, the DAMP provides additional guidance for the management of environmental issues and supports the development of asset / activity / department-based decommissioning plans and work instructions, in order to secure compliance with legal requirements as well as deliver on company environmental standards.

The Santos approach to environmental management is illustrated in Figure 2.

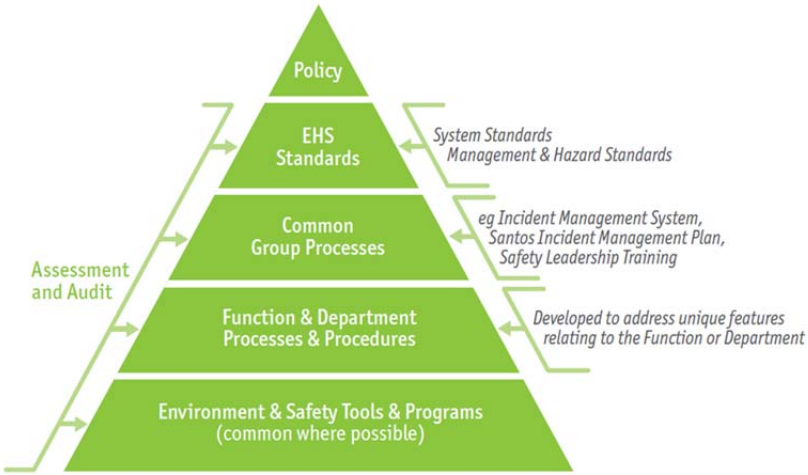

Figure 2: Santos Approach to Environmental Management

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4.0 Management of Decommissioning, Demolition and Abandonment Activities

4.1 Scope of Decommissioning, Demolition and Abandonment Works

In accordance with EHSMS11.11, prior to commencement of decommissioning or abandonment activities for any one asset, a scope of work for decommissioning or abandonment shall be developed and agreed with relevant stakeholders.

The purpose of preparing a scope of works is to ensure that decommissioning, abandonment and demolition activities occur in a manner that avoids, minimises and manages health and safety and environmental risks. Potential health and safety and environmental risks or impacts will be specific to each asset to be decommissioned, abandoned or demolished. The required management measures will therefore be specific to that asset.

The following Guidelines shall be considered in the development of the scope:

- EHSMS11.11 Appendix A Guidelines for Decommissioning or Abandonment of Sites
- EHSMS11.11 Appendix B Guidelines for Oil and Gas Well Suspension and Abandonment

The following principles shall be considered in the development of the scope:

- Health and safety of future alternative uses of the area;
- Current environmental standards of the area;
- Cost effectiveness of remediation measures;
- Existing and future use of the area;
- Extent of decontamination and remediation of underground services;
- Current and potential regulatory standards and legislation;
- Monitoring system to assess effectiveness of decommissioning or abandonment; and
- Contracts which are relevant to operating the site.

Decommissioning, abandonment and demolition activities will also be undertaken in accordance with the Santos GLNG Upstream Management Plans listed below, so as to ensure any associated impacts to the environment are minimised as far as practicable:

- Waste Management Plan
- Erosion and Sediment Control Management Plan
- Santos GLNG Upstream Fauna Management Plan
- Land Release Management Plan;
- Noise Management Plan; and
- Chemical and Fuel Management Plan

The following sections provide an overview of typical decommissioning and abandonment activities that will apply to common infrastructure types across the Santos GLNG Upstream Project Area. As described above, specific methods for decommissioning of infrastructure will be determined at the time of the works and in accordance with the up-to-date regulatory requirements, guidelines and standards.

4.2 Preliminary Decommissioning

Prior to the final decommissioning and/or abandonment of an asset, preliminary decommissioning of assets may be required. Preliminary decommissioning typically occurs when an asset is no longer required for production or unlikely to return to production, however final decommissioning is not yet practicable. The activities are undertaken as required to manage health, safety and environmental risks. Preliminary decommissioning is most commonly associated with production well infrastructure but can also apply to other assets such as water management dams.

Preliminary decommissioning involves the full isolation of a production well and/or surface equipment and generally involves one or more of the activities:

- Wellhead infrastructure positively isolated from surface equipment;
- Surface infrastructure and piping electrically and mechanically isolated;
- Surface infrastructure depressurised, purged and drained;
- Flow-lines disconnected from the wellhead and depressurised;
- Well integrity verified such that the well is suitable to be left in a suspended state;
- Annulus pressure monitoring and potential bleed off of pressure;
- Removal of well lease surface equipment for recycling or disposal;
- Removal of fuels and lubricants for recycling or disposal;
- Collection and removal of chemicals, wastes, sludge and fluids for recycling or disposal;
- Routine inspections, patrols and / or monitoring;

4.3 Final Decommissioning, Demolition and Abandonment

Once the production capacity of the gas resource has been realised, final decommissioning activities can commence, including abandonment and/or demolition activities. All decommissioning activities will be documented as required and be subject to routine inspections, patrols and/or monitoring to ensure health, safety and environmental issues are minimised and managed as appropriate.

4.3.1 Wells

Decommissioning and abandonment of wells may comprise:

- Isolation of gas reservoirs and aquifers by suitable barriers (where required)
- Placement of a surface cement plug
- Disconnection and de-pressurisation of flow lines and relevant gathering-lines
- Removal of well surface equipment, such as generators, separators, tanks, metering skid and water transfer equipment
- Removal of well casing and tubing to below ground level
- Removal, storage or disposal of all casing risers, flow loops, or other pipe work attached to the wellhead (but not parts of downstream production flow-lines or facilities)
- Cutting off of screw piles associated with the well site foundations below ground level and abandoned
- Backfilling of remaining excavations (if present) such as from drilling, work-over or production operations
- Marking of well locations

- Transferring to third parties remaining well-bores (e.g. water bores) and responsibility for their ongoing maintenance in accordance with appropriate regulatory authorities, CCA or signed contract, and ensuring the recipient of any infrastructure is properly instructed in the safe operating methods and appropriate maintenance of equipment.

4.3.2 Hub Facilities, Laydown Areas and Camps

Hub Facilities (comprising compressor stations and/or water treatment systems), camps (temporary or permanent) and laydown areas may be comprised of a combination of pad-mounted, modular structures and onsite fabricated structures. Examples of these buildings may include offices, accommodation units, storage, kitchens, warehousing, switch rooms, maintenance facilities, tanks, sewage treatment plants and power generation (if not connected to reticulated power).

Modular type structures are generally able to be disassembled and removed intact, where re-use or sale is practicable. Where removal is not practicable, then they may be demolished and recycled or disposed of. Fabricated type structures typically require demolition activities and comprise partial or complete removal of surface infrastructure, with piping and other structural elements such as screw piling, cut off and/or capped below grade.

A number of other large structures may be present, at compression stations such as hub and nodal compressors, alternators and gas turbines. For these large structures disassembly for relocation and reuse may not be a practicable alternative and they may be demolished for scrap recycling or disposal.

Decommissioning and abandonment activities may comprise:

- Removal of fuels, lubricants, chemicals and wastes, for recycling or disposal;
- Demolition of the building structures (roof, siding and structural materials) for recycling or disposal recycled or disposed;
- Demolition of concrete pads and foundations of the building and infrastructure (where practicable) or abandonment in-situ;
- Concrete crushed and steel rebar segregated for recycling or disposal;
- Abandonment in-situ of underground utilities or piping;
- Removal of gravel pathways, pavements or hardstand areas; and
- Concrete crushed and steel rebar segregated for recycling or disposal.

4.3.3 Pipelines

It is likely that abandonment of pipelines will occur in-situ. Where practicable, pipelines may be transferred to a third-party for on-going beneficial use. Decommissioning and abandonment activities may comprise:

- Disconnection from and disposal of all aboveground structures such as pigging stations
- Disconnection of the cathodic protection systems
- Cutting and filling critical sections (such as rail crossings) with a stable material (e.g. concrete) to prevent potential future subsidence due to corrosion or breakage
- Cutting and capping at defined locations to prevent the pipe from acting as a conduit for water and / or contaminants

4.3.4 Electrical and Communication Lines

Underground electrical and communication lines that are no longer required will be decommissioned in accordance with legislative requirements applicable at that time. Decommissioning and abandonment activities may comprise:

- De-energising and isolating lines;
- Arc flash precautions (as required);
- Removal and recycling or disposal of electrical and communication lines (where practicable) or abandonment in-situ;
- Removal and recycling or disposal of all surface equipment such as transformers, switchyards, substations and communication towers;
- Demolition of concrete pads and foundations such as for switchyards, substations, transformers and communication towers (where practicable) or abandonment in-situ;
- Concrete crushed and steel rebar segregated for recycling or disposal; and
- Demolition and recycling or disposal of transmission poles which may involve cutting off poles below grade.

4.3.5 Roads and Access Tracks

Where practicable, roads and access tracks may be transferred to a third-party for on-going beneficial use. In the event that a road or access track is to be decommissioning and removed, activities may comprise the removal and recycling or disposal of pavements such as asphalt and gravel (if present) and grading of the surface to form a stable landform.

4.3.6 Borrow Pits and Quarries

Where practicable, borrow pits and quarries may be transferred to a third-party for on-going beneficial use. In the event that a borrow pit or quarry is to be decommissioned, activities may comprise:

- Removal and recycling or disposal of surface infrastructure such as pumps, screening and washing facilities;
- Filling voids with acceptable material to form a safe landform;
- Ensuring drainage is adequate to minimise pollution run-off; and
- Stabilising area areas of disturbance and batter slopes.

4.3.7 Dams

Where practicable, dams may be transferred to a third-party for on-going beneficial use. In the event that the dam is to be decommissioning and removed, activities may comprise:

- Removal of water contained within the dams;
- Removal of accumulated sludge on the dam liners;
- Removal (partial or complete) of the dam liners;
- Removal and recycling or disposal of surface infrastructure such as pumps;
- In-situ abandonment of piping;
- Sampling of soils under the liner and adjacent to the dam;
- Removal and disposal of impacted soils (if required); and
- Removal of dam wall, grading and stabilisation of soils.

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5.0 Evaluation and Review

5.1 Evaluation

The implementation and effectiveness of this management plan will be regularly assessed to ensure:

- Santos GLNG is demonstrating compliance with legal and landholder obligations;
- The overall management strategy remains relevant and up to date; and
- The issue is being adequately managed.

Effectiveness will be assessed by a number of methods as shown in Table 2.

Table 2: Methods to Assess Effectiveness

Assessment Tool	Description
Checklists – Santos Compliance Management System	• Checklists, developed to reflect legal and procedural requirements / outcomes may be used by individual Santos Departments to assess and manage compliance. The results of the checklists will be evaluated for trending non-compliances that may be resolved as a result of a procedural change or by implementing another measure or process.
Audits	• Conduct internal and third party audits to formally assess the level of compliance with both regulatory requirements and with Santos GLNG procedures. • Audit outcomes are used to develop corrective actions which may include changes to procedures.
Review of Incidents	• A review of internal incidents, near misses or hazards will be undertaken to identify recurrences of similar incident types. This may highlight a requirement for a change in an existing procedure, require the development of a new procedure or by implementation of another measure or process to address the recurring issue.
Review of Data	• Analyse all relevant data collected for negative and/or undesirable trends that may be prevented by procedural changes or by implementing another measure or process.

5.2 Review

The DAMP is a living document and shall be reviewed at least every three years or sooner if any of the following occur:

- The plan is not adequately managing the issue;
- Legislative requirements change;
- The area of activity changes; and/or
- Significant changes to decommissioning activities occur.

Reviews and changes to the DAMP will be communicated to relevant Santos GLNG Project personnel.

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