



G1 | Nature Conservation



Report

GLNG Dredge Material Placement Facility Pipeline Nature Conservation

NOVEMBER 2009

Prepared for
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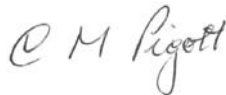


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Introduction

1.1 Background

The Queensland Government have undertaken the Port of Gladstone Western Basin Master Plan to provide a framework for the development of the Western Basin and a basis for the consistent assessment of the cumulative impacts of industrial development and ensure the Western Basin is developed in an efficient manner. In addition, the Gladstone Ports Corporation (GPC) are currently preparing an Environmental Impact Statement (EIS) for the Western Basin Dredging and Disposal project to assess the environmental impacts of dredging activity that may be required to provide safe and efficient ship access for the potential port development considered in the Master Plan. The EIS and Master Plan include the capital dredging proposed for the GLNG Project.

If for some reason the Western Basin Dredging and Disposal project is delayed or does not progress, a plan specific to the GLNG Project has been prepared to manage the project's dredge material. This plan involves the development of a DMPF south of Laird Point on Curtis Island.

Santos recognises that the use of Laird Point for the construction and operation of a DMPF would require approval by the Queensland Coordinator-General for a material change of use of the site to permit dredge material disposal.

This report investigates the potential use of an inlet south of Laird Point on Curtis Island for storage of dredge material. Dredging will be required for ship access to the Product Loading Facility (PLF) and the Materials Offloading Facility (MOF). The dredged water and sediment will be transported hydraulically to the DMPF via a temporary pipeline.

Two options for the routing of the pipeline are being considered, one of which is land based (onshore), the other a submerged offshore pipeline (Figure 1). The offshore pipeline option will potentially be a combination of temporary floating and submerged pipelines depending upon the nature of works in the area. Thus, consideration will be given to cater for existing requirements within Port Curtis including dredging and navigational channels.

The onshore pipeline option is expected to be approximately 3.5 km long with a maximum ROW width of 15 m. At least one booster pumping station will be required for the pipeline located on land on the edge of China Bay. A desktop analysis and field investigation was undertaken for the onshore pipeline option in order to ascertain the environmental values and potential impacts from the proposed alignment. This report discusses the results for the onshore pipeline option investigation only.

1.2 Study Aims and Objectives

The aims of the investigation were to verify the vegetation communities along the alignment of the DMPF Pipeline option on Curtis Island and identify areas of vegetation or species of conservation significance. In meeting these aims, the objectives of the assessment were to:

- Review existing terrestrial ecological data for the local area;
- Verify the Regional Ecosystems occurring in the study area;
- Identify the occurrence or expected occurrence of conservation significant flora species;
- Describe weed species and their distribution in the study area; and
- Determine the impacts of the DMPF pipeline on the fauna and flora and develop appropriate management strategies.

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1.3 Review of Existing Information

To assist in the identification of the ecological values that may be present along the proposed DMPF pipeline a review of existing data was undertaken, including the following references:

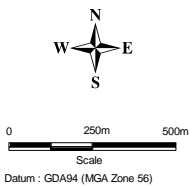
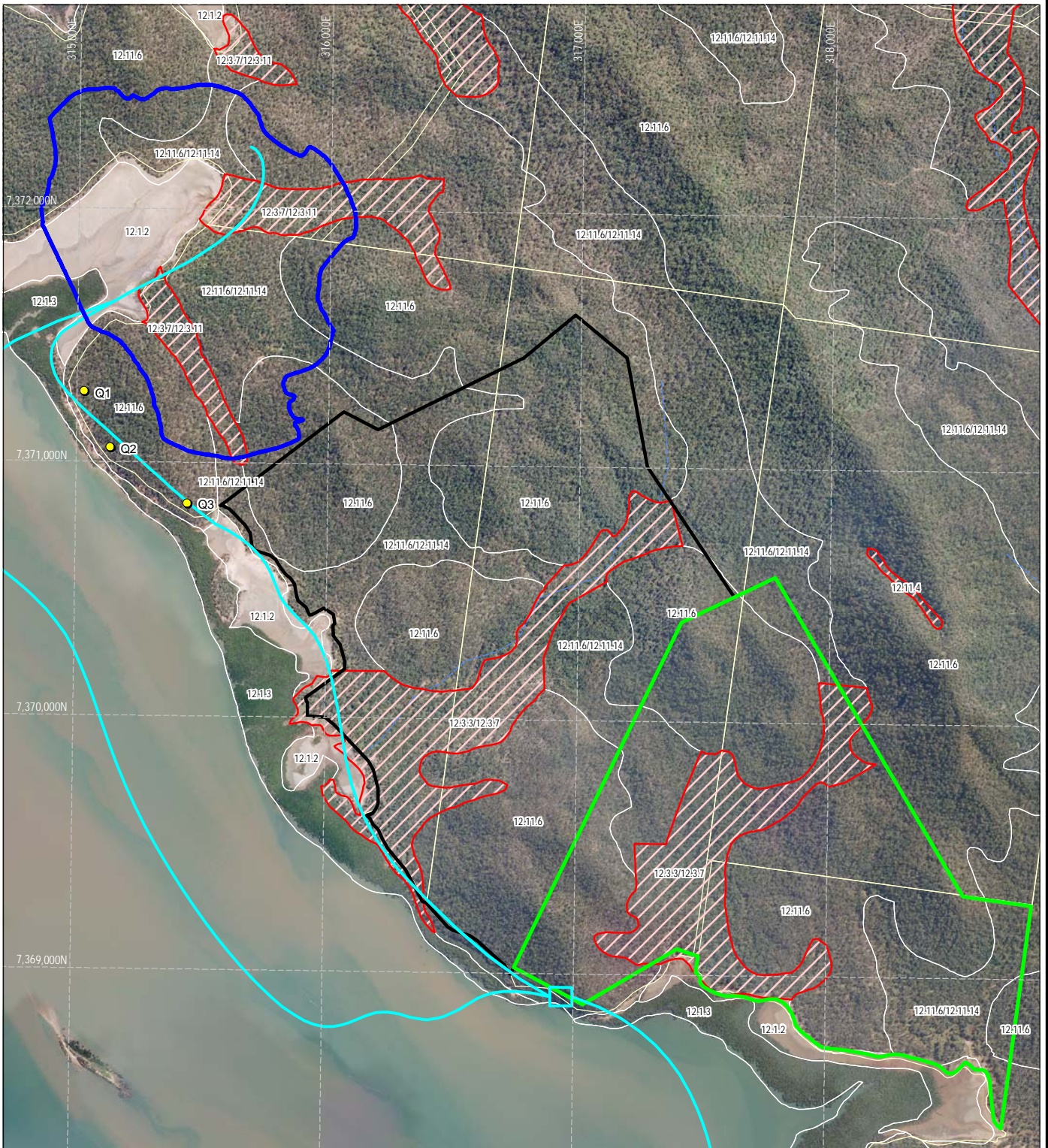
- Queensland DERM 1:100, 000 Regional Ecosystems and Essential Habitat mapping V5.2 2007;
- GLNG EIS: Marine Ecology Report (Appendix R1);
- GLNG EIS: Nature Conservation Gas Transmission Pipeline (GTP) Report (Appendix N2);
- GLNG EIS: Nature Conservation LNG Facility Report (Appendix N3); and
- QCLNG LNG Facility Terrestrial Ecology Report (Vol-5-Ch-07).

1.4 Field Survey Approach

The potential alignment of the temporary DMPF pipeline was traversed on foot on 14 September 2009. The walkover was conducted to assess the site and confirm ecological values assessed previously during desktop and field studies for the LNG facility and GTP on Curtis Island. Specifically, the following attributes were assessed:

- Regional Ecosystems (REs);
- Fauna, flora or vegetation communities of significance;
- Overall habitat values; and
- The presence of declared weeds.

Three quaternary-level vegetation assessments were undertaken along the proposed pipeline route between the QCLNG LNG facility site boundary and the proposed DMPF to verify REs present (Figure 1). As no access permissions were in place within the QCLNG LNG facility site, current 1:100, 000 RE mapping (v 5.2) was used for this portion of the DMPF pipeline (DERM, 2007). RE mapping previously undertaken by URS for the DMPF (EIS Appendix DD4) was utilised where the pipeline traversed that area. The typical field survey methodology for quaternary sample plots is detailed in Appendix N2 of the GLNG EIS. A detailed fauna survey was not undertaken as part of the supplementary studies.



- Survey Locations
- DMPF Pipeline
- RE - Endangered
- Essential Habitat
- GLNG Facility Indicative Site Boundary
- GLNG Dredge Material Placement Facility
- OCLNG LNG Facility Site Boundary

Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

| | | | |
|---|--|---|------------------|
| <p>Client</p> | <p>Project</p> <p style="text-align: center;">GLADSTONE LNG PROJECT ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT</p> | <p>Title</p> <p style="text-align: center;">THE DMPF PIPELINE STUDY AREA WITH RES AND SURVEY SITES</p> | |
| <p>Drawn: VH Approved: JB Date: 04-11-2009</p> | | <p>Figure: 1</p> | <p>Rev:C</p> |
| <p>Job No: 4262 6440 /6220 File No: 42626440-g-2138.wor</p> | | | <p>A4</p> |

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Study Results

2.1 Site Characteristics

Curtis Island is located off the coast of central Queensland near Gladstone and forms part of the eastern rim of Port Curtis. It is approximately 40 km long and 20 km across at its widest point. It is located within the Gladstone Regional Council area.

Typical landforms on the island include moderate to steep wooded slopes, wooded alluvial plains, ephemeral watercourses, estuarine systems and fresh and saltwater wetlands. The south-western portion of Curtis Island is dominated by *Eucalyptus* and *Corymbia* woodlands on moderate to low slopes and along watercourses. Mangrove and saltmarsh communities are present within intertidal areas. The area displays impacts consistent with a long history of use that includes grazing, clearing, cropping, and selective timber felling. The presence of weeds and a history of fire have also impacted upon the ecological values of the site. Whilst the majority of the woodland is regrowth, mature trees are present, especially along the ephemeral creeks.

2.2 Regional Ecosystems

Table 2-1 details the REs present along the DMPF pipeline. The location of REs is presented on Figure 1.

Table 2-1 REs through which the DMPF Pipeline traverses

| RE | Description | VM Status | BD Status | EPBC Status |
|----------|---|----------------|-----------------------|-------------|
| 12.1.2 | Saltpan vegetation including grassland and herbland on marine clay plains | Not of Concern | No concern at present | Not listed |
| 12.1.3 | Mangrove shrubland to low closed forest on marine clay plains and estuaries | Not of Concern | No concern at present | Not listed |
| 12.3.3 | <i>Eucalyptus tereticornis</i> woodland to open forest on alluvial plains | Endangered | Endangered | Not listed |
| 12.3.7 | <i>Eucalyptus tereticornis</i> , <i>Melaleuca viminalis</i> , <i>Casuarina cunninghamiana</i> fringing forest | Not of Concern | No concern at present | Not listed |
| 12.11.6 | <i>Corymbia citriodora</i> , <i>Eucalyptus crebra</i> open forest on metamorphics ± interbedded volcanics | Not of Concern | No concern at present | Not listed |
| 12.11.14 | <i>Eucalyptus crebra</i> , <i>E. tereticornis</i> woodland on metamorphics ± interbedded volcanics | Of Concern | Of Concern | Not listed |

2.3 Weeds

The site assessment determined the presence of *Opuntia stricta* (prickly pear), a Class 2 declared weed under the *Land Protection (Pest and Stock Route Management) Act 2002*. Previous URS studies have determined the presence of *Cryptostegia grandiflora** (rubber vine) (Class 2) and *Lantana camara** (Lantana) (Class 3) from the vicinity (EIS Appendices N3 and DD). The QCLNG EIS confirms that these species are present within the QCLNG LNG facility site.

2.4 Significant Vegetation Communities

RE 12.3.3 (*Eucalyptus tereticornis* woodland to open forest on alluvial plains) is listed as 'Endangered' (VM and BD status) under the *VM Act*. The locations of this RE are presented in Figure 1-1.

2 Study Results

2.5 Significant Flora Species

No significant flora species were found to be potentially present in the study site from desktop analysis. No significant flora species were observed during the fieldwork or considered likely to occur within habitat along the proposed alignment.

2.6 Significant Fauna Species

No significant fauna species were found to be potentially present in the study site from desktop analysis. No significant fauna species were observed during the fieldwork. There is a possibility that koalas might utilise suitable habitat along the proposed alignment (see Section 2.7, below).

2.7 Essential Habitat

The DMPF pipeline traverses areas mapped by DERM as Essential Habitat for the koala (*Phascolarctos cinereus*). Field studies to date within areas in which the DMPF pipeline passes have not detected koalas. A targeted koala field survey was undertaken in September 2009 in habitat to the north-east of the proposed DMPF pipeline. The targeted field survey detected traces and signs that are attributable to koala (*Phascolarctos cinereus*) on a single tree within the area designated as DERM 'Essential Habitat'. Markings identified as characteristic koala scratchings were identified on a large *Eucalyptus tereticornis* (forest red gum) tree located in the 'Essential Habitat' to the east of Laird Point adjacent to Graham Creek (Plate 2-1). These markings indicate that at least an individual koala has utilised the area in relatively recent times.

The absence of any other signs for this species on any other habitat trees in the area surveyed, in conjunction with the absence of any other previous records for the species in the area indicates that this is unlikely to be a core habitat area for a significant koala population, and densities of any population of this species in the area would be expected to be low.

The presence of the markings found on a single tree is consistent with the habit of koalas to show preference for specific habitat trees, and may also be attributable to a single individual koala migrating through the area ranging between areas of more significant core habitat. This area cannot be discounted as potential habitat for the species.

2.8 Habitat Values

The DMPF pipeline traverses terrestrial woodland and saline wetland ecosystems. Dominant terrestrial vegetation communities present include *Corymbia citriodora* (lemon-scented gum) and *Eucalyptus crebra* (narrow-leaved ironbark) woodlands. Within the study area, these generally grow on low hills with skeletal and rocky soils. Saline wetlands consisting of claypans, mangrove communities and chenopod herblands proliferate within intertidal areas.

2.8.1 Woodlands

Whilst some woodland areas support a dense midlayer dominated by *Acacia* species, *Alphitonia excelsa* (red ash) and juvenile eucalypts, much of the woodlands are devoid of a shrub layer. Similarly, the ground layer is variably dense or sparse depending upon shade and soil depth. There is generally an abundance of ground habitat features such as timber, rocks and clumps of native

2 Study Results

grasses. Areas supporting a denser mid-storey are attractive to forest birds, whilst honeyeaters and canopy gleaners are active in the canopy.

Within the valleys and gullies, narrow fringing woodland of *Eucalyptus tereticornis* (forest red gum) is found on alluvium. Trees of this species are generally mature with a large number of habitat hollows. Recruitment is occurring at low levels. A low tree layer featuring wattles (*Acacia* spp.), sheoak (*Allocasuarina torulosa*) and juvenile *Eucalyptus* and *Corymbia* species is present. The alluvial areas generally possess a denser ground covering due to the moister microclimate and more fertile soils in these areas. Ground habitat features in these areas are abundant and include rank grasses, fallen timber and microhabitat within the creek lines.

Previous field studies undertaken for the EIS (Appendix N3) have confirmed that the high concentration of hollows within the alluvial communities support arboreal fauna such as the common brushtail possum (*Trichosurus vulpecula*) and squirrel glider (*Petaurus norfolcensis*), along with their primary predator, the powerful owl (*Ninox strenua*). The canopy, when in blossom, supports flocks of lorikeets, honeyeaters and insectivores. Where a denser mid-layer is present, insectivorous birds such as the rufous whistler (*Pachycephala rufiventris*), satin flycatcher (*Myiagra cyanoleuca*) and grey fantail (*Rhipidura fuliginosa*) are active.

Plate 2-1 Example of indicative scratchings identified on *Eucalyptus tereticornis* attributable to koala (*Phascolarctos cinereus*) during the field survey on 14/09/2009



2 Study Results

2.8.2 Marine Wetlands

South of Laird Point at the site of the DMPF, mangrove and saltmarsh communities inhabit the intertidal areas. The terrestrial woodland typically merges into grassland dominated by exotic pasture species and then to saltmarsh, claypan and mangrove communities. *Rhizophora stylosa* (spotted mangrove) is the dominant species, often in association with *Avicennia marina* (grey mangrove) and *Lumnitzera racemosa* (black mangrove). The littoral communities offer feeding resources for shore/wader birds such as the whimbrel (*Numenius phaeopus*) and beach stone-curlew (*Esacus neglectus*). Mangroves are also productive for members of the swallow, honeyeater and gerygone groups.

Potential Impact and Mitigation Strategies

3.1 Potential Impacts

3.1.1 Vegetation Disturbance

Clearing of the 15 m wide ROW for the DMPF pipeline will result in the disturbance of approximately 5.34 ha of remnant vegetation. The impact to each RE is based on a maximum ROW width, using an approximate placement for the DMPF pipeline. Once finalised, the ultimate disturbance to each RE may differ; however, the total area of disturbance may be less than proposed. The total area of each community potentially impacted and the percentage of each vegetation community within the sub-region (as defined by RE types within the Burnett-Curtis Hills and Ranges sub-region) are presented below in Table 3-1. These do not include the area of the pipeline within the DMPF as these are calculated in EIS Appendix DD4.

Table 3-1 Maximum Area of Vegetation to be Removed within the DMPF Pipeline ROW

| RE | Description | ~ Ha cleared ¹ | Area within Sub-region (ha) ² | % of Sub-regional Extent |
|----------|---|---------------------------|--|--------------------------|
| 12.1.2 | Saltpan vegetation including grassland and herbland on marine clay plains | 1.37 | 15181 | 0.009 |
| 12.1.3 | Mangrove shrubland to low closed forest on marine clay plains and estuaries | 0.33 | 16544 | 0.002 |
| 12.3.3 | <i>Eucalyptus tereticornis</i> woodland to open forest on alluvial plains | 0.67 | 26250 | 0.003 |
| 12.3.7 | <i>Eucalyptus tereticornis</i> , <i>Melaleuca viminalis</i> , <i>Casuarina cunninghamiana</i> fringing forest | 0.45 | 12663 | 0.004 |
| 12.11.6 | <i>Corymbia citriodora</i> , <i>Eucalyptus crebra</i> open forest on metamorphics ± interbedded volcanics | 2.47 | 178525 | 0.001 |
| 12.11.14 | <i>Eucalyptus crebra</i> , <i>E. tereticornis</i> woodland on metamorphics ± interbedded volcanics | 0.05 | 4620 | 0.001 |

¹ Data presented is based upon current 1:100, 000 DERM RE mapping (v 5.2) and field survey results.

² Derived from RE data for the Burnett-Curtis Hills and Ranges bioregion as per Accad *et al.* (2008).

The vegetation community of *Corymbia citriodora*, *Eucalyptus crebra* open forest on metamorphics ± interbedded volcanics (RE 12.11.6) is subject to the greatest potential disturbance (approximately 2.47 ha). This disturbance represents approximately 0.001 % of this community within the sub-region. This vegetation community has no current conservation significance under state or commonwealth legislation.

The vegetation community Saltpan vegetation including grassland and herbland on marine clay plains (RE 12.1.2) is subject to the second greatest disturbance of remnant vegetation overall (approximately 1.37 ha). This disturbance represents approximately 0.009 % of this community within sub-region which is also the greatest disturbance of the six REs to be impacted when viewed as a percentage of the sub-regional extent. This vegetation community has no current conservation significance under state or commonwealth legislation.

3 Potential Impact and Mitigation Strategies

3.1.2 Impacts to Fauna and Flora

The placement of the DMPF pipeline will result in some clearing of native vegetation. At present the location of the pipeline has not been finalised. There may be some variability in the actual location of the pipeline relative to that shown in Figure 1. It is not anticipated that the REs affected (Table 3-1) will differ significantly as a result of pipeline movement. In addition, given the consistency of habitat quality within each RE the impacts to biodiversity will not differ significantly. The pipeline utilised will be a temporary above-ground pipe that has a degree of flexibility that will allow for a large degree of impact avoidance. Those REs potentially impacted are displayed in Table 2-1.

The clearing for the DMPF pipeline will involve the loss of vegetation. This may result in the removal of habitat features such as trees, shrubs, ground cover, rocks and timber along the pipe alignment. Impacts to fauna as a result of these measures may include mortality and loss of habitat and breeding areas. Implementation of appropriate strategies as outlined below (Section 3.2.1) will considerably reduce the potential for fauna mortality.

Members of all fauna groups may potentially be impacted to some extent by the proposed works. Small ground mammals, reptiles and amphibians will potentially be directly disturbed by vehicular movement and removal of habitat. As many species within these groups shelter within or utilise ground habitat features, there is the potential for these groups to be affected by these works.

Fauna utilising arboreal hollows and feeding resources such as possums, gliders and many hollow nesting species of birds and insectivorous bats, may be affected by the removal of these habitat features. In addition to the possibility of some fauna mortality during clearing, the loss of nesting resources may affect local prey and predator fauna populations. Avian fauna will be less affected by the proposal due to their ability to easily move from the zone of impact.

The clearing for the pipeline will result in fragmentation of the communities in which it traverses. This may have an impact on the ability of fauna to move within the terrestrial ecosystems and between the terrestrial and marine ecosystems. Given that the ROW is likely to be relatively narrow and selectively placed with minimal removal of ground habitat features, it is unlikely that impacts to movement will be significant. Avifauna is the group most likely to use both ecosystem types. Their mobility will allow them to reduce any impacts of fragmentation stemming from pipe laying.

It should be noted that field studies for the GLNG and QCLNG Projects on Curtis Island have determined a low diversity and abundance of native fauna. Mortality impacts and predator prey disruption from habitat loss are expected to be relatively low in the context of the overall landscape ecology and it is not considered that there will be significant long-term impacts to overall faunal assemblages and species populations.

3.1.3 Impacts to Significant Fauna

Given the location of the proposed DMPF pipeline, it is unlikely that there will be impacts to significant fauna. However, the following species have been identified as potentially occurring within habitat impacted by the proposed pipeline.

Koala

Field studies undertaken for this investigation in a *Eucalyptus tereticornis* (forest red gum) community to the east of Laird Point detected potential signs of koala. There is a minimal chance of the koala

3 Potential Impact and Mitigation Strategies

being present in communities impacted by the proposed DMPF pipeline and therefore there is a very low chance koalas will be directly impacted. However, indirect impacts from fragmentation, the creation of barriers to movement and mortality from vehicle strikes whilst crossing roads may occur. Potential impacts upon this species can be reduced by following the impact mitigation strategies presented in Section 3.2.1 below.

Powerful Owl

The powerful owl (*Ninox strenua*) was detected during surveys for the GTP on Curtis Island (GLNG EIS Appendix N2). Although the powerful owl would hunt for prey in vegetation communities through which the DMPF pipeline traverses, it is not considered core habitat. The construction of the DMPF pipeline alone would not particularly impact upon this species. However, in the context of all the proposed development on the south-west coast of Curtis Island, there may be impacts on this species and its prey. This is expanded upon in the Cumulative Impacts section below (Section 3.1.6).

Water Mouse

Targeted searches for the water mouse (*Xeromys myoides*) were conducted within potential marine habitat on Curtis Island (BAAM, 2008). The results of the investigation showed that it is unlikely to be present and therefore the DMPF pipeline is highly unlikely to impact upon this species.

Beach Stone-curlew

The beach stone-curlew (*Esacus neglectus*) has been observed on Curtis Island in the vicinity of the proposed DMPF pipeline. The habitat potentially impacted by the pipeline is not considered to be core habitat for this species. Therefore, potential impacts to this species are considered negligible.

3.1.4 Impacts to Significant Vegetation Communities

RE 12.3.3 (*Eucalyptus tereticornis* woodland to open forest on alluvial plains) is listed as 'Endangered' (VM and BD status) under the VM Act. The proposed alignment of the DMPF shows that a maximum of approximately 0.67 ha of this community will be impacted by activities associated with the placement of the pipeline. This represents approximately 0.003 % of this community when viewed in a sub-regional context. Impacts to this community may also include fragmentation and spread of weeds which may result in degradation of this community. Mitigation of potential impacts to this community is discussed below in Section 3.2.1.

RE 12.11.14 (*Eucalyptus crebra*, *E. tereticornis* woodland on metamorphics ± interbedded volcanics) will also be impacted by the proposed DMPF pipeline. This RE is listed as 'Of Concern' (VM and BD status) under the VM Act. A maximum of approximately 0.05 ha of this community will be impacted by activities associated with the placement of the pipeline. This represents approximately 0.001 % of this RE within the sub-region.

3.1.5 Impacts to Marine Plants

The potential clearing of marine plants may affect the vegetation community of Saltpan vegetation including grassland, herbland and sedgeland on marine clay plains (RE 12.1.2). An application to clear these marine plants will be required under the *Fisheries Act 1994*. Impacts to marine plants are

3 Potential Impact and Mitigation Strategies

detailed within Section 8.4.4.4 of the EIS (Marine Flora and Fauna: Potential Impacts and Mitigation Measures).

3.1.6 Potential Weed Introductions/ Expansions

Desktop and field studies have confirmed the presence of the declared weeds *Opuntia stricta** (prickly pear), *Cryptostegia grandiflora** (rubber vine) and *Lantana camara** (lantana). Other declared weeds could be introduced to the DMPF pipeline alignment through poor weed hygiene practices. Weed mitigation strategies are outlined below in Section 3.2.1.

3.1.7 Cumulative impacts

The construction of the DMPF pipeline will result in a maximum disturbance of 5.34 ha to remnant vegetation communities. The majority of the route will traverse areas within or adjacent to proposed development sites on the south-west coast of Curtis Island including the GLNG LNG facility, the QCLNG facility and the DMPF. In this context, the temporary DMPF will not result in significant impacts to biodiversity. However, the cumulative impacts of all proposed development in this area of Curtis Island may have an impact on fauna and flora. Given that habitat within this location is disturbed and sub-optimal, and fauna surveys have determined that there is a relatively low diversity of terrestrial fauna, overall impacts to this group will be low. The majority of conservation significant fauna species present are birds. Their mobility allows them to move away from the zone of impact. The habitat to be impacted does not form core habitat, therefore loss of vegetation should not impact overall population numbers. There is scope for many species to continue to utilise habitats in the environs of the proposed works. Further details of cumulative impacts are provided in the Cumulative Impact Assessment (Attachment J).

3.2 Mitigation Strategies

3.2.1 Fauna and Flora

Where native vegetation is to be cleared, the following commitments are to be developed and implemented within the Environmental Management Plan (EMP) to minimise impacts and where possible ensure current ecological values of habitat are maintained during the construction phase of the project. Mitigation strategies will include:

- Restriction of the amount of vegetation to be cleared to minimise the footprint required clearly marking vegetation to be retained;
- Restriction on the size of vehicles and plant involved in pipe laying;
- Design of the route so that trees possessing habitat hollows and other habitat features are avoided wherever practicable;
- Design of the final alignment will include ecological considerations to ensure impacts to fauna and flora are minimised;
- To ensure fauna movement is possible, suitable crossing points will be provided including tunnels or scrapes beneath the pipe or ramps over the pipe where possible. Such features will be located approximately every 100 to 200 m;

3 Potential Impact and Mitigation Strategies

- As the DMPF pipeline is a temporary structure, restoration of disturbed habitat will occur after removal except where the site is to be utilised by a subsequent approved Project. This will include the planting of shrubs and trees and replacement of habitat features where necessary;
- Clearing near any waterways or riparian areas will include adequate sedimentation fencing to ensure sediment and erosion impacts to waterways are minimised; and
- Implementation of a protocol to ensure qualified fauna spotters are actively present during clearing of woodland vegetation and any other areas of faunal habitat. Canopy and mid-layer trees and shrubs are to be assessed for koalas prior to removal.

3.2.2 Significant Vegetation Communities

Where significant vegetation communities are to be cleared, the following commitments are to be developed and implemented within the Environmental Management Plan (EMP) to minimise impacts and where possible ensure current ecological values of habitat are maintained during the construction phase of the project. Mitigation strategies will include:

- Where possible, alterations to the pipeline alignment will be made to avoid RE 12.3.3 (*Eucalyptus tereticornis* woodland to open forest on alluvial plains);
- Ecological input into route design and on-ground location will occur to ensure habitat values are not significantly impacted; and
- Implementation of a program offsetting cleared vegetation communities in accordance with current Commonwealth and State legislative criteria for the offsetting of significant vegetation communities and habitat.

3.2.3 Weeds

The introduction of vehicles and heavy machinery may potentially increase the risk of introducing new and declared weeds, and spread existing weeds across the site and its surrounds. Appropriate weed management strategies will be implemented for controlling the spread of weeds, including continued weed monitoring as per EIS Section 12.16.9 (Weed Management) of the Gas Transmission Pipeline EMP. Management Strategies in the Weed Management Plan include, but are not limited to:

- Effective management strategies to control the spread of declared weed species in keeping with Santos Standards (including Santos EHS09 Weeds and Pest Animal Control), regional management practice or DNRW pest control fact sheets;
- Ongoing monitoring of the project site to identify any new incidence of weed infestation; and
- Provision of information for project staff on the identification of declared weeds and their dispersal methods.

In addition to the above the following mitigation measures will also be undertaken such as:

- Equipment and materials will be thoroughly inspected for pest animals and weeds according to Santos EHS09 Weed and Pest Animal Control, prior to being shipped to Curtis Island for clearing and pipe laying operations; and
- Appropriate washdown and inspection procedure will be in place to reduce weed seeds, vegetative material and exotic fauna being transported to and from Curtis Island.

3 Potential Impact and Mitigation Strategies

3.2.4 Environmental Offsetting

Appendix N2 of the GLNG EIS outlines legislative and corporate requirements for biodiversity offsetting. Santos has developed an Environmental Offsets Strategy in conjunction with Ecofund Queensland (a Queensland government advisory service) that is intended to address the objectives of both State and Commonwealth governments offset requirements. An analysis has been undertaken to identify the offset requirements for proposed impacts for the GLNG Project. Analysis requirements being undertaken for offsets include:

- Extent and size of offsets required to be secured;
- Ecological values required to be offset;
- Options available for pooling or consolidation offset requirements;
- Options for securing offsets;
- Offset assessment and analysis includes the co-ordination of multiple offset requirements and is being carried out under the following policies;
- Vegetation management offsets under the *Vegetation Management Act, 1999* (Qld);
- Fish habitat offsets under the *Fisheries Act, 1992*;
- Protected plants offsets under the *Nature Conservation Act, 1992*;
- Biodiversity offsets under the *Draft Policy for Biodiversity Offsets 2008* (Qld); and
- Environmental offsets under the *Environmental Protection & Biodiversity Conservation Act, 1999* (Cwlth).

Further steps to be undertaken within a suitable timeframe as part of the process include:

- Identification of suitable offset options;
- Assessment of properties;
- Landholder liaison and negotiation to secure required offsets;
- Offset validation and preparation of specific Environmental Offset Management Plan(s); and
- Liaison to finalise contractual arrangements and covenants.

In addition to the objectives outlined above and those previously stated within the EIS (Sections 6.4, 7.4, 8.4 and Appendices N1, N2 and N3), the Environmental Offset Management Plan will be implemented over an appropriate time frame to accomplish the following specific aims:

- Identification of suitable potential offset areas with ecological values analogous to impacted ecological communities;
- Assessment of the ecological value and equivalence of offsets to ensure suitable offset extent, species assemblage, floristic structure and ecological integrity utilising an appropriate biometric field methodology;
- Development of appropriate management prescriptions to ensure long term viability of offsets (such as pest control, livestock management, access exclusion, ameliorative plantings and fire regime management);
- Placement of appropriate covenants for future conservation and management of offsets; and
- Development of appropriate monitoring and maintenance activities and performance review processes to ensure long-term viability of the offsets.

The process of developing a suitable Environmental Offset Management Plan is an iterative process with State and Commonwealth regulatory bodies and the outcome will be coordinated with the other GLNG components.

References

BAAM (2008). *Gladstone LNG Plant and Pipeline – Curtis Island Water Mouse, Powerful Owl and Wading Bird Investigations*. Report prepared for URS Australia, December 2008. Biodiversity Assessment and Management Pty Ltd Brisbane.

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URS (2008a) *GLNG EIS: Marine Ecology Report (Appendix R-1)*. Report prepared for Santos Ltd.

URS (2008b) *GLNG EIS: Nature Conservation Gas Transmission Pipeline Report (Appendix N-2)*. Report prepared for Santos Ltd.

URS (2008c) *GLNG EIS: Nature Conservation LNG Facility Report (Appendix N-3)*. Report prepared for Santos Ltd.

Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated 15th July 2009.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared between 21 September 2009 and 18 November 2009 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

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