Terrestrial ecology 18

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18.1 Introduction

This section describes the terrestrial ecology, environmentally sensitive areas (ESAs) and Matters of National Environmental Significance (MNES) of the GFD Project area and surrounds.

The GFD Project area is situated in the Brigalow Belt bioregion which has experienced a long history of human disturbance mainly as a result of agricultural practices. At a regional level, most remaining areas of vegetation are now fragmented, occurring on the rockier hilly areas of ranges, as roadside vegetation, or as relatively small isolated remnants.

The potential impacts arising from the GFD Project activities on terrestrial ecology, ESAs and MNES are described, and mitigation measures are identified. Full details of the terrestrial ecology, ESAs and MNES assessments are provided in Appendix R: Terrestrial ecology and Appendix U1: Report on Matters of national environmental significance (ecology). MNES relating to water resources are provided in Appendix U2: Report on Matters of national environmental significance (water resources).

This section has been prepared in accordance with section 4.10 of the *Terms of reference for an environmental impact statement* issued March 2013. The index to locate where each ToR requirement is met within this EIS is included in Appendix B: Terms of reference cross-reference.

18.2 Regulatory context

This EIS has been prepared in accordance with the State and Commonwealth regulatory context described within Appendix C: Regulatory framework. The legislation, policies and guidelines that apply to the terrestrial ecology, ESAs and MNES values and potential impacts of the GFD Project are outlined in Table 18-1.

Table 18-1 Regulatory context of the GFD Project – terrestrial ecology, environmentally sensitive areas and MNES

Legislation, policy or guideline	Relevance to the GFD Project
Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) This Act is the central piece of environmental legislation at the Commonwealth level. It provides for the protection of environmental values, including MNES.	The GFD Project has been determined the to be a 'controlled action' by the Commonwealth Environment Minister requiring assessment and approval under the EPBC Act, due to the likely potential impacts on MNES. The relevant controlling provisions nominated under the EPBC Act for the GFD Project are: • Wetlands of international importance (sections 16 and 17B) • Listed threatened species and communities (sections 18 and 18A) • Listed migratory species (sections 20 and 20A) • Water resources in relation to coal seam gas developments.
Environmental Offsets Policy (2012) (Cth) This policy outlines the Australian Government's approach to the use of environmental offsets for impacts to MNES.	The GFD Project identifies suitable measures to address the residual impacts to MNES under the EPBC Act environmental offsets policy.

Legislation, policy or guideline	Relevance to the GFD Project
Environmental Protection Act 1994 (Qld) (EP Act) The EP Act is the principal legislation for the protection and management of environmental values within Queensland. The Act aims to protect the natural environment and associated ecological systems and processes, while allowing for sustainable development.	The EP Act is applicable to the GFD Project in regards to Environmental Authorities (EAs). Development of a natural gas lease requires an EA before the issue of a license. The EP Act details the process of environmental assessment for the granting of EAs. The EP Act requires petroleum activities to develop a plan of operations prior to commencing development activities. This plan, which is developed after detailed design completions, provides information on how the EA conditions are going to be complied with.
Land Protection (Pest and Stock Route Management) Act 2002 (Qld) (LP Act) The LP Act lists declared plants and animals that are targeted for control because they have, or could have, serious economic, environmental or social impacts. The Act mandates the control of declared species, including their supply, sale, keeping and transport.	Three categories of declared species are defined in the LP Act: • 'Class 1 Pest' (fauna or flora species that has the potential to become a very serious pest in Queensland in the future) • 'Class 2 Pest' (fauna or flora species that has already spread over substantial areas of Queensland, but its impact is considered sufficiently serious to warrant control) • 'Class 3 Pest' (fauna or flora species that is commonly established in parts of Queensland, but its control by landholders is not warranted unless the plant is impacting or has the potential to impact on a nearby ESAs). Class 2 and Class 3 pest species are known to exist within the GFD Project area.
Nature Conservation Act 1992 (Qld) (NC Act) The NC Act provides for the conservation and protection of native flora and fauna species in Queensland and a framework for establishing, managing and the use of protected areas.	The following permits and management plans may be required for the GFD Project: • Wildlife Movement Permits (sections 88 and 97 of the NC Act) - for wildlife protected under the NC Act, and those found in certain areas covered by conservation plans created and implemented under the NC Act • Clearing Permit (Protected Plants) (section 89 of the NC Act) • Rehabilitation Permit (spotter catcher endorsement) (section 207 of the *Nature Conservation (Wildlife Management) Regulation 2006*) • Damage Mitigation Permit (removal and relocation) (section 181 of the *Nature Conservation (Wildlife Management) Regulation 2006*) • Species Management Plan must be submitted to the Department of Environment and Heritage Protection (EHP) for approval for tampering with some animal breeding places (section 332 of the *Nature Conservation (Wildlife Management) Regulation 2006*).
Petroleum and Gas (Production and Safety) Act 2004 (Qld) (P&G Act) The P&G Act regulates petroleum activities with the aim of developing a safe, efficient and viable petroleum and fuel gas industry in Queensland. Petroleum tenure is granted under the Act.	The GFD Project contains tenure granted under this Act. Santos GLNG will comply with the requirements of the Act in undertaking GFD Project activities.
Petroleum Act 1923 (Qld) (Petroleum Act) Petroleum tenure was granted under the Petroleum Act prior to the development of the P&G Act. Petroleum leases may still be granted under this Act for holders of existing tenure (authority to prospect) granted under this Act. However, prospecting tenure cannot be applied for under the Petroleum Act.	The GFD Project contains tenure granted under this Act. Santos GLNG will comply with the requirements of the Act in undertaking GFD Project activities.

Legislation, policy or guideline	Relevance to the GFD Project
Sustainable Planning Act 2009 (Qld) (SP Act) The Act seeks to achieve ecologically sustainable development by managing the process and effects of planning and development in a coordinated and integrated manner. The SP Act provides the overarching framework for Queensland's planning and development assessment system.	For works that fall outside of the P&G Act, assessment under the SP Act and the associated Sustainable Planning Regulation 2009 will be required. An example of these activities includes any activities that are proposed off tenure, areas proposed for irrigation to manage water produced from production wells, permanent camps or other permanent infrastructure.
Vegetation Management Act 1999 (Qld) (VM Act) The VM Act regulates the conservation and management of vegetation communities and clearing of vegetation. It provides a framework for identification, description, and mapping of remnant regional ecosystems (REs) certified by the Department of Environment and Heritage Protection (EHP) as endangered, of concern or least concern.	Chapter 5 activities under the EP Act, including natural gas activities, are exempt from the vegetation management framework, the requirements of the VM Act and associated policies. However, activities associated with the GFD Project that are subject to approval under SP Act will also be subject to the VM Act and any relevant codes and offset policies developed under the VM Act. Works that occur as part of the GFD Project will have to comply with any conditions contained in the EA (under the EP Act) regarding vegetation management. Despite these exemptions, the impacts to biodiversity values resulting from Chapter 5 activities still need to be considered in the impact assessment process and biodiversity offsets strategy. Therefore, the intent of the VM Act and associated policies have been considered when assessing impacts and mitigation opportunities for the GFD Project as these are the most widely accepted tools for assessment and mitigation of vegetation impacts in Queensland.
Queensland Government Environmental Offsets Policy (Qld) (QGEOP) The QGEOP aims to provide a supporting framework for environmental offsets in Queensland, including guidelines for using environmental offsets and guidance on when offsets should be used.	The biodiversity offsets package that will likely be required for the GFD Project will follow the principles and the guidelines of the QGEOP and will likely trigger one or more of the specific issue offset policies depending upon whether the EP Act or SP Act applies to the project activity. The Coordinator-General will have jurisdiction of any conditions regarding offsets.
Environmental Offsets Act 2014 (Qld) The main purpose of this Act is to counterbalance the significant residual impacts of particular activities on prescribed environmental matters through the use of environmental offsets.	The Act includes consequential amendments to existing legislation to align the environmental offset provisions in each Act. This includes VM Act, NC Act, EP Act, Fisheries Act, and SP Act. The Act establishes a single environmental offsets policy. This ensures that previous State government environmental offset policies in effect prior to the introduction of the Act will no longer apply to applications lodged after the commencement of the Act. At the time of writing, the substantive provisions of the Act were not in operation.
State Planning Policy (SPP) The single SPP introduced in December 2013 defines Queensland Government policies about matters of State interest in land use planning and development.	The SPP *state interest—biodiversity* seeks to protect matters of environmental significance, particularly those areas containing matters of state environmental significance (MSES). The GFD Project area covers a number of MSES including wildlife habitat, regional ecosystems, and protected areas.
Nature Conservation (Koala) Conservation Plan 2006 and Management Program 2006 to 2016 (Qld) (The Koala Plan) The Koala Plan promotes the continued existence of koala populations in the wild through preventing the decline of koala habitats and identifying land use and development that is compatible with the survival of koala populations.	Under the Koala Plan, the State is divided into three districts to allow management regimes to be implemented. The GFD Project area falls within District C. The Koala Plan places restrictions on the methods of clearing in Koala habitat in Districts A and B, but not C. The Koala Plan also provides a policy for offsets for net benefits to Koalas and Koala habitat for situations that impact high quality Koala habitat, the Offsets for Net Gain of Koala Habitat in South East Queensland Policy (Department of Environment and Heritage Protection, 2010). This policy only applies to the South East Queensland Bioregion and therefore does not apply to the GFD Project.

Legislation, policy or guideline	Relevance to the GFD Project
Biodiversity Planning Assessments (Qld) (BPAs) Biodiversity planning assessments have been prepared for each of Queensland's bioregions. They incorporate information about threatened ecosystems and/or species, large tracts of habitat in good condition, ecosystem diversity, landscape context and connection, as well as buffers to wetlands or other types of important areas for ecological processes.	The GFD Project area is located within the Brigalow Belt BPA area, which is separated into the north landscape and the south landscape (Queensland Government, 2008b).
Back on Track species prioritisation framework (Qld) This framework considers the probability and consequence of extinction for individual species over the whole of Queensland. Under the framework, species are ranked as critical, high, medium or low priority for the State and for the natural resource management regions, regardless of their threatened classification under the NC Act or EPBC Act.	Priority Back on Track species have been identified for each of the 14 natural resource management (NRM) regions across Queensland. The GFD Project area is located in two NRM regions: the Fitzroy NRM and Border Rivers Maranoa-Balonne NRM. A total of 1,125 priority Back on Track species (flora and terrestrial vertebrate fauna) have been identified for the Fitzroy NRM region (Queensland Government 2009). A total of 867 priority Back on Track species have been identified for the Border Rivers Maranoa-Balonne NRM region (Queensland Government, 2009).

This EIS seeks to obtain primary approvals for the project including the Queensland Government Coordinator-Generals Report and Commonwealth Government EPBC Act approval.

Application for or amendments to existing environmental authorities will occur subsequent to this EIS process. Other subsequent approvals required after the EIS process has been completed, corresponding triggers and legislative frameworks applicable to the GFD Project are identified in Section 2: Project approvals.

Approval of this EIS will trigger a number of subsequent approvals required for the GFD Project to proceed. Approvals will be required on tenure and off-tenure. Section 2: Project approvals summarises the key approvals necessary for the planning, construction, operations and decommissioning of the GFD Project. The triggers for each approval, the relevant administering authority and application details are provided. Consultation on the subsequent approvals will be ongoing with the administering authorities.

18.3 Assessment methodology

This assessment describes the terrestrial ecology, ESAs and MNES values and assesses the GFD Project's potential impacts on these values.

To establish the existing environmental values of the terrestrial ecology, ESAs and MNES within the GFD Project Terrestrial Ecology Study area (defined as the GFD Project tenures plus a 25 km buffer), information was compiled from desktop studies, aerial photographic surveys, predictive habitat modelling, targeted field surveys, the GLNG Project EIS (2009 EIS) and previous ecology surveys of areas within the Terrestrial Ecology Study area. Field data collected during these surveys is compatible with both CORVEG and HERBECS guidelines. All significant species encountered have been submitted with the Queensland Herbarium for incorporation into the HERBRECS database. The overall survey effort of the Terrestrial Ecology Study area equates to over 1,700 days and has incorporated seasonal variations. Details of the field survey methodology are provided in Appendix R: Terrestrial ecology and Appendix U1: Report on Matters of national environmental significance (ecology).

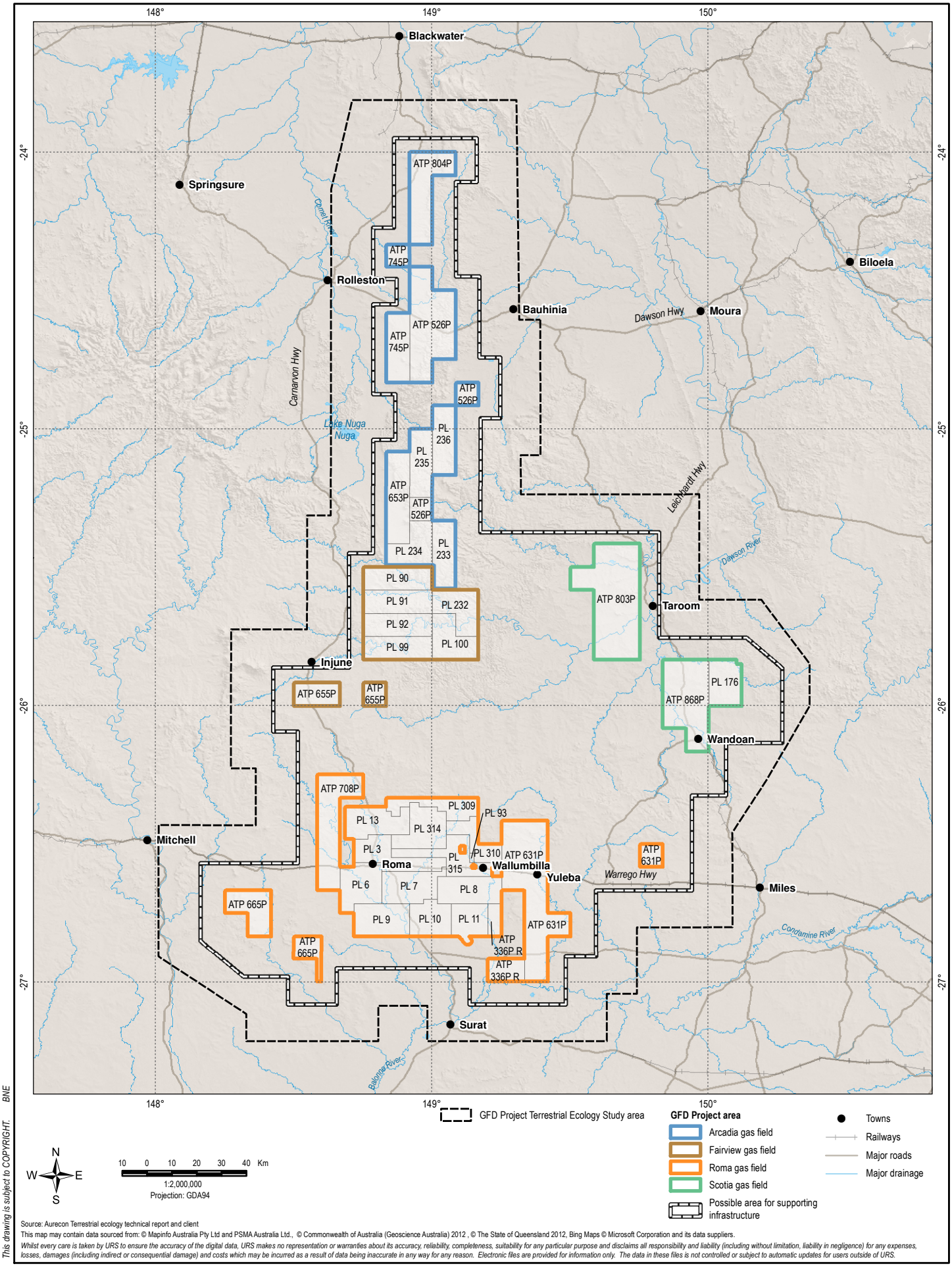
Santos GLNG already has a detailed understanding of the impact and management of its project activities on terrestrial ecology, ESAs and MNES, from its established history of operations. This EIS has used a maximum disturbance scenario in assessing the impacts of the GFD Project based on a conceptual field development plan and field layout concept, as discussed in sections 5.4 and 5.5 of Section 5: Assessment framework.

The potential impact disturbance areas for each terrestrial ecology, ESAs and MNES receptor were predicted using the Land Disturbance Probabilistic Calculation Model. This model used simplified probabilistic assumptions of disturbance which were applied to the ecological constraints mapping datasets in order to provide probable maximum magnitudes of disturbance in a spatial context. Further details of the Land Disturbance Probabilistic Calculation Model are provided in Appendix R: Terrestrial ecology and Appendix U1: Report on Matters of national environmental significance (ecology).

Impacts were assessed using the significance assessment methodology, which considers the sensitivity of the underlying environment and the magnitude of a potential impact to assess its level of significance. This methodology is used when it is known that some impact will occur and the significance of that impact is determined by considering its magnitude and the sensitivity to change of the environmental value that will be affected. The management framework and associated mitigation measures that may be used to reduce the risk associated with potential impacts on the terrestrial ecology, ESAs and MNES have also been identified.

The full description of the significance assessment methodology is described in section 5.6.3 of Section 5: Assessment framework and in Appendix R: Terrestrial ecology and Appendix U1: Report on Matters of national environmental significance (ecology). A summary of the impact assessment is shown in section 18.7.

The Terrestrial Ecology Study area used to assess baseline ecology values and project impacts is shown in Figure 18-1.



Source: Aurecon Terrestrial ecology technical report and client

Santos GLNG Project

GFD PROJECT EIS

GFD PROJECT AREA AND TERRESTRIAL ECOLOGY STUDY AREA

URS

TERRESTRIAL ECOLOGY

Figure: **18-1**

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18.4 Environmental values

The Terrestrial Ecology Study area incorporates the diversities of the region and contains large areas of land that have been previously disturbed for agriculture and also areas of native vegetation in good condition. Of the 1,067,600 ha GFD Project tenures area, approximately 315,614 ha (approximately 29.5%) is mapped as containing remnant vegetation under the provisions of the VM Act. At a regional level, most remaining areas of vegetation are now fragmented; occurring on the rockier hilly areas of ranges, as roadside vegetation or as relatively small isolated remnants.

A summary of the findings of the terrestrial ecology, ESAs and MNES assessments and delineation of key environmental values (EVs) for the Terrestrial Ecology Study area are presented below.

18.4.1 Terrestrial ecology

18.4.1.1 Flora desktop assessment

Conservation significant flora species

Seventy-nine conservation significant flora species listed under the provisions of the EPBC Act and/or NC Act were identified from the desktop assessment as potentially occurring within the Terrestrial Ecology Study area.

Refinement of the potential occurrence of each species based on the likelihood of occurrence assessment identified 74 conservation significant flora species that are known to occur within the Terrestrial Ecology Study area due to the presence of suitable habit and historic records. A further four conservation significant flora species are considered to have a moderate likelihood of occurrence within the Terrestrial Ecology Study area based on their known range and the presence of suitable habitat (Table 18-2). The one remaining conservation significant flora species is considered to have a low likelihood of occurrence within the Terrestrial Ecology Study area.

Maps of predictive habitat for flora species listed under the provisions of the EPBC Act and/or NC Act within the GFD Project Terrestrial Ecology Study area are provided in Appendix R: Terrestrial ecology.

Table 18-2 Conservation significant flora species known or potentially present within Terrestrial Ecology Study area

Family	Scientific name	Common name	NC Act status	EPBC Act status	Likelihood of occurrence^
Acanthaceae	*Xerothamnella herbacea*	Xerothamnella	E	E	Known
Apocynaceae	*Cerbera dumicola*	-	NT	-	Known
Arecaceae	*Livistona fulva*	Blackdown Tablelands palm	NT	-	Known
Arecaceae	*Livistona nitida*	Carnarvon fan palm	NT	-	Known
Asclepidaceae	*Tylophora linearis*	Thin-leaved tylophora	E	E	Moderate
Asteraceae	*Cymbonotus maidenii*	Darling daisy	E	-	Known
Asteraceae	*Picris barbarorum*	Plains picris	V	-	Known
Asteraceae	*Rutidosis crispata*	-	V	-	Known
Asteraceae	*Rutidosis glandulosa*	-	NT	-	Known
Asteraceae	*Rutidosis lanata*	-	E	-	Known
Byttneriaceae	*Commersonia pearnii*	-	E	-	Known
Caesalpiniaceae	*Senna acclinis*	Rainforest cassia	NT	-	Known

Family	Scientific name	Common name	NC Act status	EPBC Act status	Likelihood of occurrence^
Campanulaceae	*Wahlenbergia islensis*	Cliff bluebell	NT	-	Known
Celastraceae	*Apatophyllum teretifolium*	Sandstone prickle bush	NT	-	Known
Cupressaceae	*Callitris baileyi*	Bailey's cypress	NT	-	Known
Cyperaceae	*Cyperus clarus*	-	V	-	Known
Cyperaceae	*Eleocharis blakeana*	-	NT	-	Known
Ericaceae	*Leucopogon grandiflorus*	Large-flowered beard-heath	NT	-	Known
Eriocaulaceae	*Eriocaulon carsonii*	Salt pipewort	E	E	Known
Euphorbiaceae	*Bertya opponens*	-	C	V	Known
Euphorbiaceae	*Bertya pedicellata*	-	NT	-	Known
Fabaceae	*Daviesia discolor*	Bitter pea	V	V	Known
Fabaceae	*Daviesia quoquoversus*	-	V	-	Known
Fabaceae	*Desmodium macrocarpum*	Large-podded trefoil	NT	-	Known
Fabaceae	*Swainsona murrayana*	Slender darling-pea	V	V	Moderate
Fabaceae	*Zornia pallida*	-	NT	-	Known
Haloragaceae	*Myriophyllum artesium*	Milfoil	E	-	Known
Lamiaceae	*Plectranthus blakei*	-	NT	-	Known
Lamiaceae	*Westringia parvifolia*	-	V	V	Moderate
Loganiaceae	*Logania diffusa*	-	V	V	Low
Loranthaceae	*Lysiana filifolia*	-	NT	-	Known
Mimosaceae	*Acacia argentina*	-	V	-	Known
Mimosaceae	*Acacia barakulensis*	Waajie wattle	V	-	Known
Mimosaceae	*Acacia calantha*	Cracow wattle	NT	-	Known
Mimosaceae	*Acacia curranii*	Curly-bark wattle	V	V	Known
Mimosaceae	*Acacia grandifolia*	-	C	V	Known
Mimosaceae	*Acacia islana*	Isla Gorge wattle	V	-	Known
Mimosaceae	*Acacia spania*	Western rosewood	NT	-	Known
Mimosaceae	*Acacia storyi*	-	NT	-	Known
Mimosaceae	*Acacia tenuinervis*	-	NT	-	Known
Mimosaceae	*Acacia wardellii*	Thomby Range wattle	V	-	Known
Myrtaceae	*Calytrix gurulmundensis*	-	V	V	Known
Myrtaceae	*Calytrix islensis*	-	V	-	Known
Myrtaceae	*Eucalyptus beaniana*	Bean's ironbark	V	V	Known
Myrtaceae	*Eucalyptus curtisii*	Plunket mallee	NT	-	Known
Myrtaceae	*Eucalyptus pachycalyx* subsp. *waajensis*	Pumpkin gum	E	-	Known
Myrtaceae	*Eucalyptus sideroxylon* subsp. *improcera*	-	V	-	Known
Myrtaceae	*Homoranthus decasetus*	-	NT	-	Known
Myrtaceae	*Homoranthus decumbens*	A shrub	V	E	Known

Family	Scientific name	Common name	NC Act status	EPBC Act status	Likelihood of occurrence^
Myrtaceae	*Melaleuca groveana*	Grove's paper-bark	NT	-	Known
Myrtaceae	*Melaleuca irbyana*	Swamp tea-tree	E	-	Known
Myrtaceae	*Melaleuca pearsonii*	-	NT	-	Known
Myrtaceae	*Micromyrtus carinata*	Gurulmundi heath-myrtle	E	-	Known
Myrtaceae	*Micromyrtus patula*	-	E	-	Known
Myrtaceae	*Ochrosperma obovatum*	-	V	-	Known
Myrtaceae	*Sannantha brachypoda*	-	NT	-	Known
Oleaceae	*Notelaea pungens*	-	NT	-	Known
Orchidaceae	*Chiloglottis longiclavata*	Northern wasp orchid	NT	-	Known
Orchidaceae	*Phaius australis*	Swamp orchid	E	E	Known
Orchidaceae	*Pterostylis cobarensis*	Cobar greenhood orchid	C	V	Moderate
Picrodendraceae	*Pseudanthus pauciflorus*	-	NT	-	Known
Poaceae	*Amphibromus whitei*	-	EX	EX	Known
Poaceae	*Aristida annua*	-	V	V	Known
Poaceae	*Arthraxon hispidus*	Hairy-joint grass	V	V	Known
Poaceae	*Dichanthium queenslandicum*	King bluegrass	V	E	Known
Poaceae	*Dichanthium setosum*	Blue grass	NT	V	Known
Poaceae	*Digitaria porrecta*	Finger panic grass	NT	-	Known
Poaceae	*Homopholis belsonii*	Belson's panic	E	V	Known
Poaceae	*Sporobolus partimpatens*	-	NT	-	Known
Proteaceae	*Hakea lorea subsp. lorea* (formerly *Hakea fraseri)*	Fraser's hakea	C	V	Known
Rhamnaceae	*Cryptandra ciliata*	Silky Cryptandra	NT	-	Known
Santalaceae	*Thesium australe*	Toad flax	V	V	Known
Solanaceae	*Solanum dissectum*	-	E	-	Known
Solanaceae	*Solanum elachophyllum*	-	E	-	Known
Solanaceae	*Solanum papaverifolium*	-	E	-	Known
Solanaceae	*Solanum stenopterum*	-	V	-	Known
Surianaceae	*Cadellia pentastylis*	Ooline	V	V	Known
Thelypteridaceae	*Thelypteris confluens*	Swamp fern	V	-	Known
Zamiaceae	*Macrozamia platyrhachis*	Cycad	E	E	Known

- = Species not listed or no common name, EX = Extinct, E = Endangered, V = Vulnerable, NT = Near threatened, C = Least concern. ^ = Further details regarding likelihood of occurrence within the GFD Project area and habitat descriptions are provided in Appendix R: Terrestrial ecology.

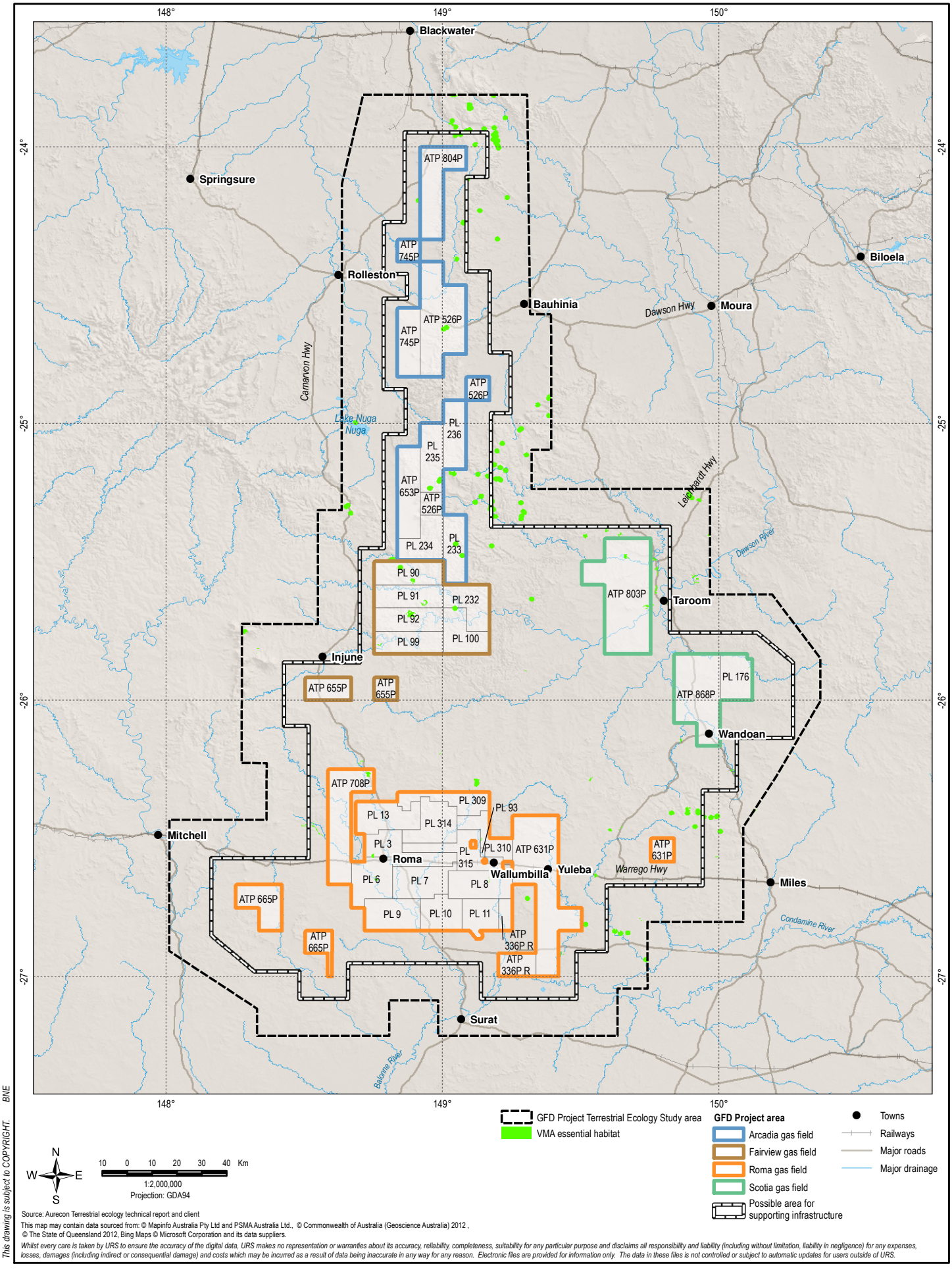
Essential habitat

Essential habitat for 10 conservation significant flora species has been mapped within the GFD Project Terrestrial Ecology Study area (Table 18-3 and Figure 18-2).

Table 18-3 Conservation significant flora species for which essential habitat has been mapped within the Terrestrial Ecology Study area

Gas field	GFD Project tenure	Scientific name	Common name	NC Act status	EPBC Act status
Arcadia	PL 233	*Eucalyptus beaniana*	Bean's ironbark	V	V
	PL 234	*Xerothamnella herbacea*	Xerothamnella	E	E
	PL 235	*Calytrix islensis*	-	V	-
Fairview	PL 90	*Acacia islana*	Isla Gorge wattle	V	-
	PL 90	*Xerothamnella herbacea*	Xerothamnella	E	E
	PL 91	*Melaleuca irbyana*	Swamp tea-tree	E	-
	PL 92	*Melaleuca irbyana*	Swamp tea-tree	E	-
	PL 99	*Eriocaulon carsonii* subsp. *orientale*	Salt pipewort	E	E
	PL 100	*Acacia islana*	Isla Gorge wattle	V	-
Roma	PL 315	*Homopholis belsonii*	Belson's panic	E	V
	PL 315	*Picris barbarorum*	Plains picris	V	-
	ATP 708P	*Solanum papaverifolium*	-	E	-
Scotia	ATP 803P	*Cadellia pentastylis*	Ooline	V	V

- = Species not listed or no common name, E = Endangered, V = Vulnerable.



Source: Aurecon Terrestrial ecology technical report and client

Santos GLNG Project

GFD PROJECT EIS

ESSENTIAL HABITAT MAPPING WITHIN THE TERRESTRIAL ECOLOGY STUDY AREA

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TERRESTRIAL ECOLOGY

Figure: 18-2

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Priority 'Back on Track' flora species

The Back on Track species prioritisation framework ('Back on Track') is an initiative of EHP and is based on the method of Marsh et al. (2007) that ranks species as 'Critical', 'High', 'Medium' or 'Low' priority for the State and for the NRM region. There is also a 'data deficient' category according to three sets of criteria: probability of extinction, consequences of extinction and potential for successful recovery.

The Terrestrial Ecology Study area covers two NRM regions: the Fitzroy NRM region and the Border Rivers Maranoa-Balonne NRM region. There are 336 'Back on Track' flora species identified for the Fitzroy NRM region and 261 'Back on Track' flora species identified for the Border Rivers Maranoa-Balonne NRM region (Queensland Government, 2009). The 'Back on Track' flora species and the corresponding State Back on Track Ranks are presented in Appendix R: Terrestrial ecology.

Brigalow Belt South priority flora species

Under the *Biodiversity Assessment and Mapping Methodology* (Department of Environment and Heritage Protection, 2002a), expert panels are convened to review and refine the results of initial determination of significance of the *Biodiversity Planning Assessment framework* (Department of Environment and Heritage Protection and Environmental Planning Southwest Queensland, 2002b; 2002c) at a bioregional scale. These panels provide recommendations in relation to habitat for conservation significant species and Essential Habitat for priority taxa.

Nine priority taxa flora species for the Brigalow Belt South bioregion (not listed in the EPBC Act and/or NC Act) are known to be present in the GFD Project tenures. These species include *Acacia melvillei* (Melville's wattle), *Acacia omalophylla* (Yarran wattle), *Corchorus reynoldsiae*, *Corymbia bloxsomei* (Yellow bloodwood), *Eucalyptus baileyana* (Bailey's stringybark), *Eucalyptus bakeri* (Baker's mallee), *Eucalyptus melanoleuca* (Nanango's ironbark), *Eucalyptus rhombica* and *Eucalyptus suffulgens*. These species are mapped within PL 90 and PL 91 in the Fairview gas field, as well as PL 234 and ATP 526P in the Arcadia gas field.

All other priority taxa flora species for the Brigalow Belt South bioregion are listed as conservation significant under the provisions of the EPBC Act and/or NC Act and have been discussed in the previous sections.

18.4.1.2 Flora field assessment

Biodiversity

The EIS and previous Santos GLNG field assessments identified the presence of 372 native flora species and 59 non-native flora species within the Terrestrial Ecology Study area.

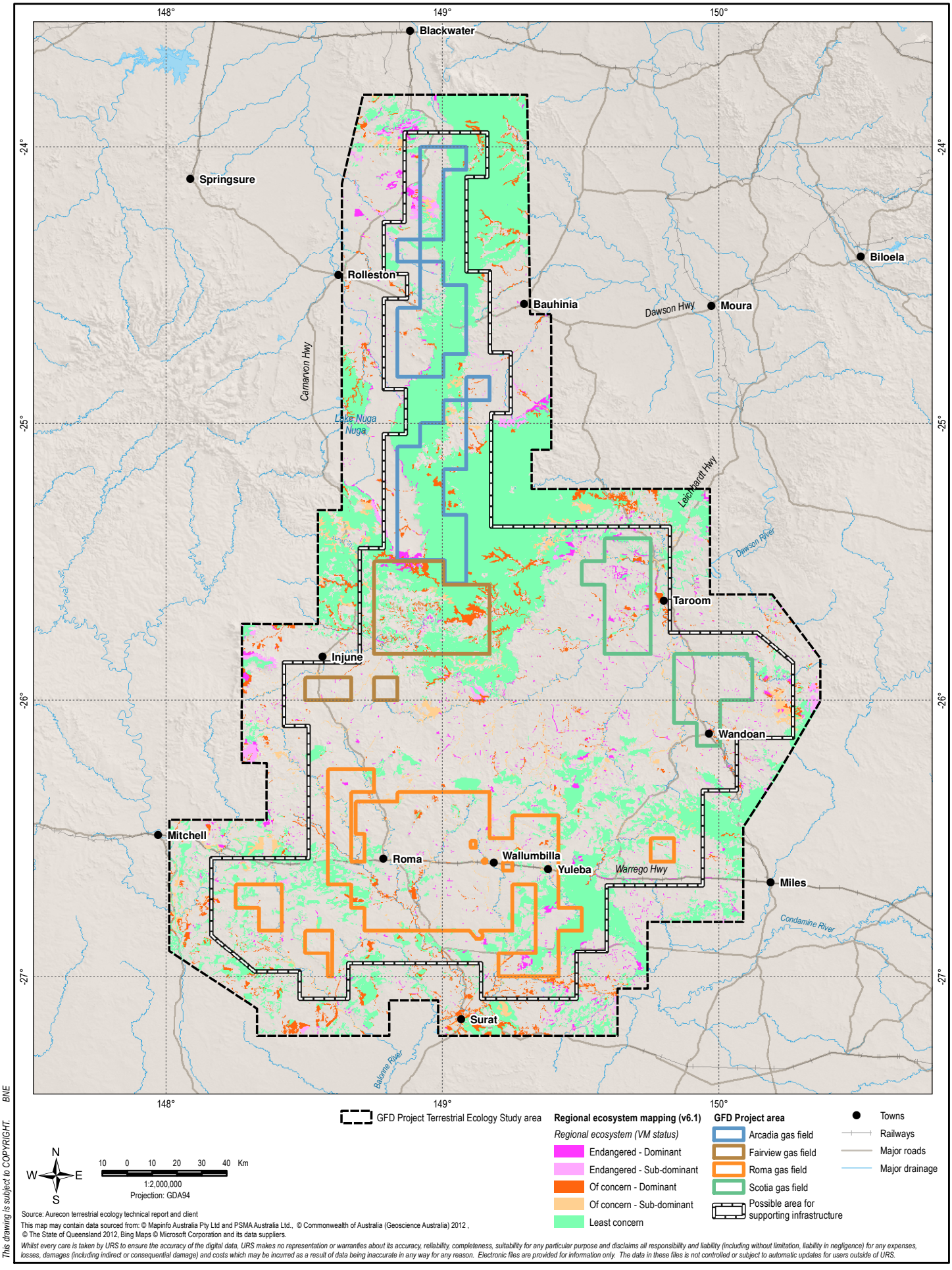
Appendix R: Terrestrial ecology provides a full list of flora species observed during the GFD Project EIS field assessments. Refer to Appendix R Table 4-12 for a list of REs in the GFD Project area, including subregional REs

Regional Ecosystems

The majority of the GFD Project tenures contain non-remnant vegetation. However, there are still some extensive areas of remnant REs mapped within the GFD Project area (approximately 315,610 ha) (Figure 18-3).

The most prevalent REs across the GFD Project tenures are RE 11.3.2 (*Eucalyptus populnea* woodland on alluvial plains), RE 11.3.25 (*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines), RE 11.9.5 (*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks) and RE 11.9.10 (*Eucalyptus populnea*, *Acacia harpophylla* open forest on fine-grained sedimentary rocks). RE polygons within the GFD Project tenures range from those smaller fragments less than 1 ha in size (e.g. RE 11.5.2 - *Eucalyptus crebra, Corymbia* species, with *E. moluccana* on lower slopes of Cainozoic sand plains/remnant surfaces), to large tracts of intact vegetation approximately 11,925 ha in size (e.g. RE 11.10.1 (*Corymbia citriodora* woodland on coarse-grained sedimentary rocks) in PL 235 in the Arcadia gas fields). Some of these REs are analogous to Threatened Ecological Communities (TECs) listed under the EPBC Act, discussed further in section 18.4.3.2. Five RE polygons greater than 5,000 ha in size exist within the GFD Project tenures within ATP 526P, ATP 653P, PL 100, PL 234, PL 235 within the Arcadia and Fairview gas fields. The smaller RE polygons are generally subject to edge effects and weed invasion from agricultural practices such as cattle grazing. The larger polygons have been observed to be relatively undisturbed and are resilient to degradation due to their size and large area of core habitat.

A complete list of each RE type, bioregional and sub-region extent, the VM Act status and biodiversity status that are mapped within each GFD Project tenure is provided in Appendix R: Terrestrial ecology.



Source: Aurecon terrestrial ecology technical report and client

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EHP CERTIFIED REGIONAL ECOSYSTEMS MAPPING WITHIN THE TERRESTRIAL ECOLOGY STUDY AREA

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TERRESTRIAL ECOLOGY

Figure: 18-3

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Endangered and Of concern Regional Ecosystems

There are 42 'Endangered' and 53 'Of concern' RE communities present in the GFD Project tenures (biodiversity status). The most prevalent 'Endangered' RE community was RE 11.9.5 that is mapped across all GFD Project tenures on the EHP certified RE mapping as either dominant or sub-dominant RE polygons. RE 11.9.5 is described as *Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks (Queensland Herbarium, 2013). Patch sizes of RE 11.9.5 dominant and sub-dominant RE polygons range from less than 1 ha, to large patches of approximately 1,120 ha. The smaller patches are generally heavily degraded and suffer from extensive weed invasion while some larger patches remain relatively undisturbed with weed invasion restricted to edges.

The most prevalent 'Of concern' RE communities within the GFD Project tenures were RE 11.3.2 and RE 11.3.25 that are mapped across most GFD Project tenures on the EHP certified RE mapping. RE 11.3.2 is described as *Eucalyptus populnea* woodland on alluvial plains (Queensland Herbarium, 2013). Patch sizes of RE 11.3.2 dominant and sub-dominant RE polygons range from less than 1 ha to larger patches of approximately 2,091 ha.

RE 11.3.25 is described as *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines (Queensland Herbarium, 2013). Patch sizes of RE 11.3.25 dominant and sub-dominant RE polygons range from less than 1 ha to larger patches of approximately 3,515 ha for RE 11.3.25. All patches of RE 11.3.2 and RE 11.3.25 are subject to degradation and heavy weed invasion due to their situation on floodplains and, in the case of RE 11.3.25, their long linear shape fringing drainage lines.

Threshold Regional Ecosystems

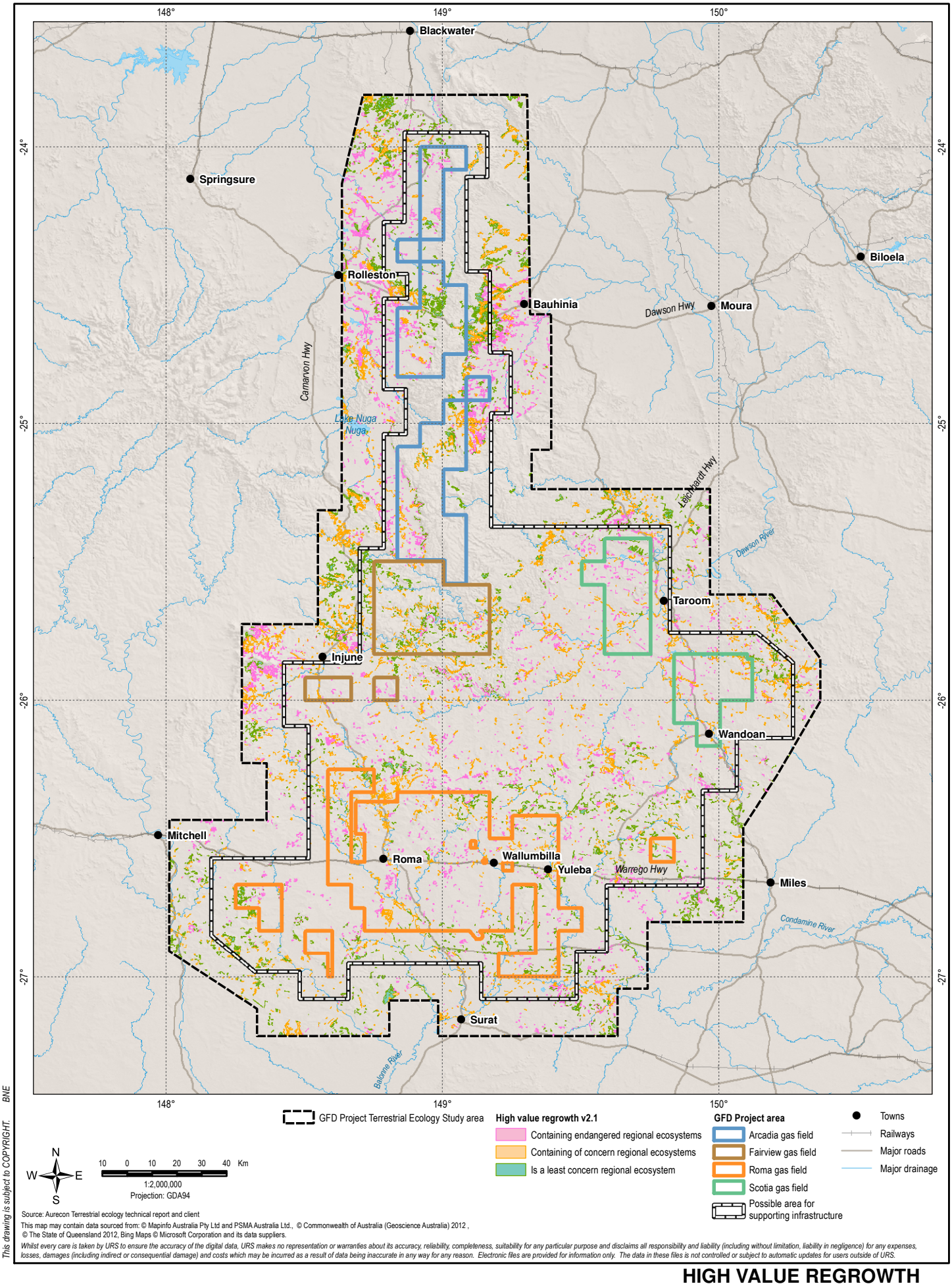
Five RE types present in the GFD Project tenures are at the threshold of their current conservation status (i.e. are at risk of becoming 'Endangered' or 'Of concern' under the VM Act in the near future). These REs are detailed in section 4.2.5.2 of Appendix R: Terrestrial ecology.

Critically limited Regional Ecosystems

Critically limited REs have a remnant extent below 5% of their pre-clearing extent and an area less than 500 ha in total extent, or that have a remnant extent less than 200 ha, or that are at risk of the remnant extent falling below 200 ha. One critically limited RE, 11.9.6 (*Acacia melvillei* +/- *Acacia harpophylla* open forest on fine-grained sedimentary rocks), is mapped within ATP 868P. No other GFD Project tenures contain critically limited REs as mapped on the EHP certified RE mapping (Queensland Government, 2013).

High Value Regrowth

Mapped patches of 'Endangered', 'Of concern' and 'Least concern' High Value Regrowth (HVR) are present throughout the GFD Project tenures (Figure 18-4). The largest patches of regrowth vegetation are present in ATP 526P, ATP 804P, ATP 665P, PL 236, PL 9 and ATP 803P. The remaining project tenures also contain areas of mapped HVR but to a lesser extent. The patches of regrowth vegetation within the GFD Project tenures are generally in poor condition suffering from extensive weed invasion and disturbance from cattle grazing practices.



Source: Aurecon Terrestrial ecology technical report and client

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HIGH VALUE REGROWTH VEGETATION MAPPING WITHIN THE TERRESTRIAL ECOLOGY STUDY AREA

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TERRESTRIAL ECOLOGY

Figure: 18-4

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Conservation significant flora species

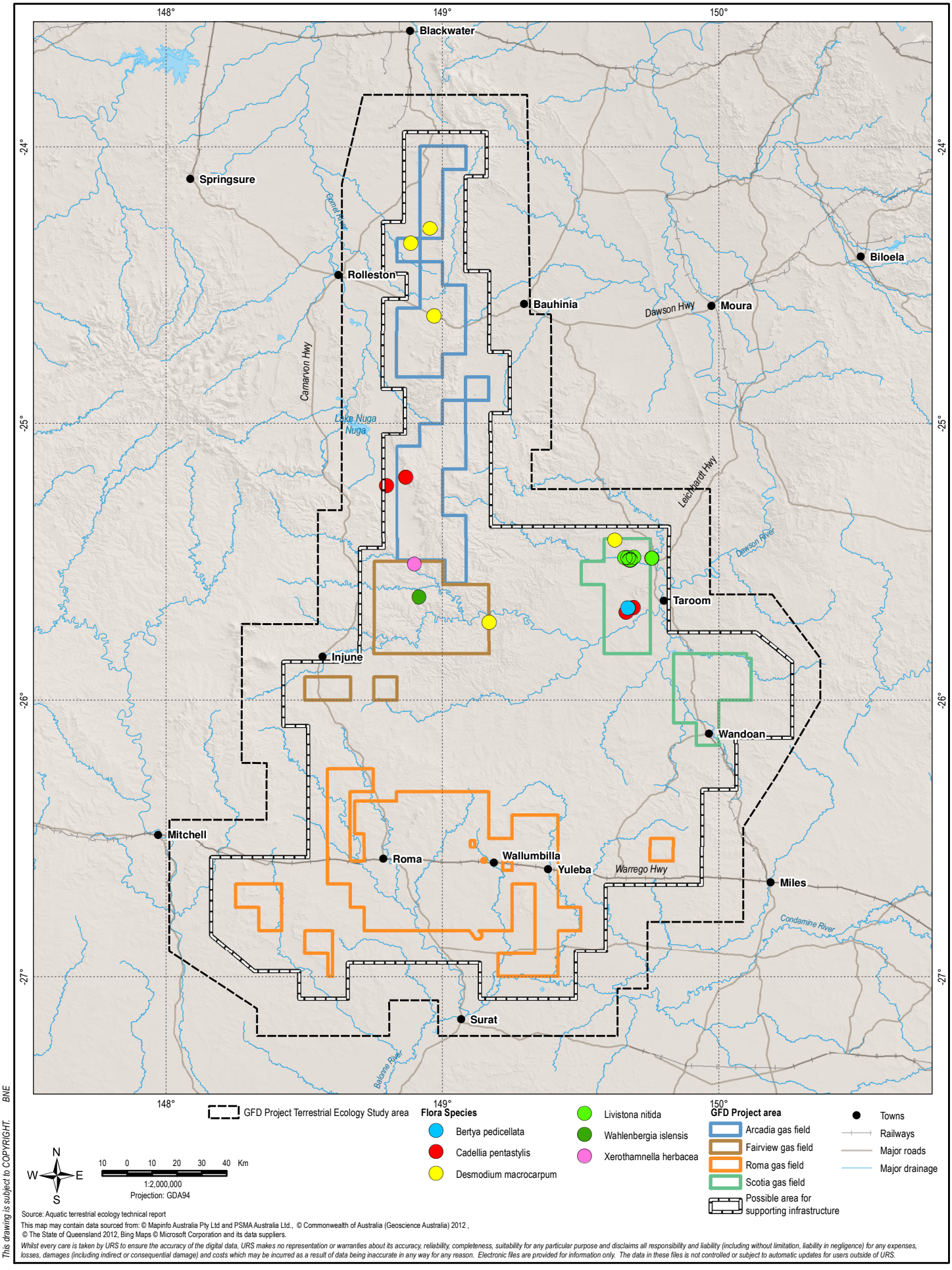
Nine conservation significant flora species listed under the provisions of the EPBC Act and/or NC Act were recorded in the Terrestrial Ecology Study area during the EIS and previous Santos GLNG field assessments.

Table 18-4 outlines the conservation significant flora species identified and Figure 18-5 illustrates the location of these species.

Table 18-4 Conservation significant flora species recorded within the Terrestrial Ecology Study area

Family	Scientific name	Common name	NC Act status	EPBC Act status
Acanthaceae	*Xerothamnella herbacea* [1,2]	Xerothamnella	E	E
Arecaceae	*Livistona nitida* [1]	Carnarvon Fan Palm	NT	-
Campanulaceae	*Wahlenbergia islensis* [1,2]	Australian bluebell	NT	-
Epacridaceae	*Leucopogon grandiflorus* [2]	Whorl-leaved Heath	NT	-
Euphorbiaceae	*Bertya pedicellata* [1]	-	NT	-
Fabaceae	*Desmodium macrocarpum* [1,2]	Large-leaved desmodium	NT	-
Mimosaceae	*Acacia islana* [2]	Isla Gorge wattle	V	-
Myrtaceae	*Melaleuca irbyana* [2]	Swamp tea-tree	E	-
Surianaceae	*Cadellia pentastylis* [1,2]	Ooline	V	V

- = Species not listed or no common name, [1] = species observed during EIS field assessments; [2] = species observed during previous Santos GLNG field assessments, E = Endangered, V = Vulnerable, NT = Near threatened.



Source: Aquatic terrestrial ecology technical report

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CONSERVATION SIGNIFICANT FLORA SPECIES RECORDED WITHIN THE TERRESTRIAL ECOLOGY STUDY AREA

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TERRESTRIAL ECOLOGY

Figure: 18-5

File No: 42627064-g-1084b.mxd Drawn: MH Approved: RS Date: 21-08-2014 Rev. B A4

Weed species

Eight non-native flora species declared as pests under the LP Act were identified within the Terrestrial Ecology Study area during the EIS and previous Santos GLNG field assessments (Table 18-5).

Table 18-5 LP Act declared flora species recorded within the Terrestrial Ecology Study area

Family	Scientific name	Common name	LP Act status	Location and abundance
Asteraceae	*Parthenium hysterophorus* [1]	Parthenium	Class 2	This species has been recorded in the Arcadia gas fields in relatively low abundance
Cactaceae	*Harrisia martini* [2]	Harrisia cactus	Class 2	This species has been recorded in the Arcadia, Roma and Fairview gas fields in relatively low abundance
Cactaceae	*Opuntia aurantiaca* [1,2]	Tiger pear	Class 2	This species has been recorded in the Roma and Arcadia gas fields in relatively low abundance
Cactaceae	*Opuntia stricta* [1,2]	Prickly pear	Class 2	This species has been recorded in the Roma, Fairview and Arcadia gas fields in moderate abundance
Cactaceae	*Opuntia tomentosa* [1,2]	Velvety tree pear	Class 2	This species has been recorded in the Roma, Arcadia, Scotia and Fairview gas fields in relatively high abundance
Mimosaceae	*Vachellia nilotica* [2] (formerly *Acacia nilotica*)	Prickly acacia	Class 2	Present within Fairview gas fields with very low abundance
Solanaceae	*Lycium ferocissimum* [1,2]	African boxthorn	Class 2	This species has been recorded in the Scotia, Roma and Fairview gas fields in moderate abundance
Tamaricaceae	*Tamarix aphylla* [2]	Athel pine	Class 3	Present within Fairview gas fields with very low abundance

Class 2 = Landowners must take reasonable steps to keep land free of Class 2 pests and is a serious offence to introduce, keep or supply these plans without a permit issued by Biosecurity Queensland.; Class 3 = Landholders are not required to control Class 3 plants unless their land is adjacent to an environmentally significant area and they are issued with a pest control notice. It is a serious offence to supply a Class 3 pest without a permit issued by Biosecurity Queensland; * = Sourced from DAFF (2011); 1 = identified during EIS field assessments; 2 = identified during previous Santos GLNG field assessments.

18.4.1.3 Fauna desktop assessment

Conservation significant fauna species

Forty-eight conservation significant fauna species listed under the provisions of the EPBC Act and/or NC Act were identified from the desktop assessment as potentially occurring within the Terrestrial Ecology Study area. This includes 1 arthropod, 1 fish, 2 amphibians, 22 birds, 14 reptiles and 8 mammals.

Refinement of the potential occurrence of each species based on the likelihood of occurrence assessment identified 33 conservation significant fauna species that are known to occur within the Terrestrial Ecology Study area (refer Table 18-6). In addition, 13 other fauna species are considered to have a moderate likelihood of occurrence within the Terrestrial Ecology Study area based on their known range and the presence of suitable habitat within the Terrestrial Ecology Study area. The remaining two conservation significant fauna species are considered to have a low likelihood of occurrence within the Terrestrial Ecology Study area based on no historic records, unavailability of suitable habitat, or are locally extinct.

Maps of predictive habitat for fauna species listed under the provisions of the EPBC Act and/or NC Act within the Terrestrial Ecology Study area are provided in Appendix R: Terrestrial ecology.

Table 18-6 Conservation significant fauna species known or potentially present within the Terrestrial Ecology Study area

Class	Common name	Scientific name	NC Act status	EPBC Act status	Likelihood of occurrence^
Amphibians	Cooloola tree frog	*Litoria cooloolensis*	NT	-	Low
Amphibians	Rough frog	*Cyclorana verrucosa*	NT	-	Known
Arthropods	Pale imperial hairstreak butterfly	*Jalmenus eubulus*	V	-	Known
Aves	Australasian bittern	*Botaurus poiciloptilus*	C	E	Moderate
Aves	Australian painted snipe	*Rostratula australis*	V	E, M	Known
Aves	Black-breasted button-quail	*Turnix melanogaster*	V	V	Moderate
Aves	Black-chinned honeyeater	*Melithreptus gularis*	NT	-	Known
Aves	Black-necked stork	*Ephippiorhynchus asiaticus*	NT	-	Known
Aves	Black-throated finch	*Poephila cincta cincta*	E	E	Moderate
Aves	Cotton pygmy-goose	*Nettapus coromandelianus*	NT	-	Known
Aves	Freckled duck	*Stictonetta naevosa*	NT	-	Known
Aves	Glossy black-cockatoo	*Calyptorhynchus lathami*	V	-	Known
Aves	Grey goshawk	*Accipiter novaehollandiae*	NT	-	Known
Aves	Major mitchell's cockatoo	*Lophochroa leadbeateri*	V	-	Known
Aves	Painted honeyeater	*Grantiella picta*	V	-	Known
Aves	Paradise parrot	*Psephotus pulcherrimus*	EX	PE	Low
Aves	Plains-wanderer	*Pedionomus torquatus*	V	V	Moderate
Aves	Powerful owl	*Ninox strenua*	V	-	Known
Aves	Red goshawk	*Erythrotriorchis radiatus*	E	V	Moderate
Aves	Square-tailed kite	*Lophoictinia isura*	NT	-	Known
Aves	Squatter pigeon	*Geophaps scripta scripta*	V	V	Known
Aves	Star finch	*Neochmia ruficauda ruficauda*	E	E	Moderate
Aves	Superb parrot	*Polytelis swainsonii*	C	V	Moderate
Aves	Swift parrot	*Lathamus discolor*	E	E	Moderate
Aves	Turquoise Parrot	*Neophema pulchella*	NT	-	Known
Fish	Murray cod	*Maccullochella peelii*	C	V	Moderate
Mammals	Bridled nail-tail wallaby	*Onychogalea fraenata*	E	E	Known
Mammals	Brush-tailed rock-wallaby	*Petrogale penicillata*	V	V	Known
Mammals	Grey-headed flying-fox	*Pteropus poliocephalus*	C	V	Known
Mammals	Koala	*Phascolarctos cinereus*	S	V	Known
Mammals	Large pied bat	*Chalinolobus dwyeri*	V	V	Known
Mammals	Little pied bat	*Chalinolobus picatus*	NT	-	Known
Mammals	Northern quoll	*Dasyurus hallucatus*	C	E	Moderate
Mammals	South-eastern long-eared bat	*Nyctophilus corbeni*	C	V	Known
Reptiles	Brigalow scaly-foot	*Paradelma orientalis*	V	-	Known
Reptiles	Collared delma	*Delma torquata*	V	V	Known
Reptiles	Collett's Snake	*Pseudechis colletti*	NT	-	Moderate

Class	Common name	Scientific name	NC Act status	EPBC Act status	Likelihood of occurrence^
Reptiles	Common death adder	*Acanthophis antarcticus*	NT	-	Known
Reptiles	Darling Downs earless dragon	*Tympanocryptis tetraporophora*	E	-	Known
Reptiles	Dunmall's snake	*Furina dunmalli*	V	V	Known
Reptiles	Eyrean Earless Dragon	*Tympanocryptis tetraporophora*	E	-	Moderate
Reptiles	Fitzroy river turtle	*Rheodytes leukops*	V	V	Known
Reptiles	Five-clawed worm-skink	*Anomalopus mackayi*	E	V	Moderate
Reptiles	Golden-tailed gecko	*Strophurus taenicauda*	NT	-	Known
Reptiles	Grey snake	*Hemiaspis damelii*	E	-	Known
Reptiles	Ornamental snake	*Denisonia maculata*	V	V	Known
Reptiles	Woma	*Aspidites ramsayi*	NT	-	Known
Reptiles	Yakka skink	*Egernia rugosa*	V	V	Known

- = Species not listed or no common name, S = Special least concern, PE = Presumed extinct, EX = Extinct, E = Endangered, V = Vulnerable, NT = Near threatened, C = Least concern. ^ = Further details regarding the likelihood of occurrence within the GFD Project area and habitat descriptions are presented in Appendix R: Terrestrial ecology.

Essential Habitat

Essential Habitat for eight conservation significant fauna species has been mapped in the Terrestrial Ecology Study area (Queensland Government, 2013) (Table 18-7 and Figure 18-2). Essential Habitat for fauna species is mapped in the Arcadia, Roma and Scotia gas fields within the following GFD Project tenures: PL 233, PL 234, PL 235, PL 3, PL 6, PL 8, PL 310 and ATP 803P.

Table 18-7 Conservation significant fauna species for which Essential Habitat has been mapped within the GFD Project tenures

Gas field	GFD Project tenure	Scientific name	Common name	NC Act status	EPBC Act status
Arcadia	PL 233	*Chalinolobus dwyeri*	Large-eared pied bat	V	V
		Delma torquata	Collared delma	V	V
		Geophaps scripta scripta	Squatter pigeon	V	V
		Paradelma orientalis	Brigalow scaly-foot	V	-
	PL 234	*Chalinolobus dwyeri*	Large-eared pied bat	V	V
		Delma torquata	Collared delma	V	V
		Geophaps scripta scripta	Squatter pigeon	V	V
		Paradelma orientalis	Brigalow scaly-foot	V	-
	PL 235	*Chalinolobus dwyeri*	Large-eared pied bat	V	V
		Delma torquata	Collared delma	V	V
		Geophaps scripta scripta	Squatter pigeon	V	V
		Paradelma orientalis	Brigalow scaly-foot	V	-
Roma	PL 3	*Egernia rugosa*	Yakka skink	V	V
	PL 6	*Grantiella picta*	Painted honeyeater	V	-
	PL 8	*Paradelma orientalis*	Brigalow scaly-foot	V	-
	PL 310	*Paradelma orientalis*	Brigalow scaly-foot	V	-

Gas field	GFD Project tenure	Scientific name	Common name	NC Act status	EPBC Act status
Scotia	ATP 803P	*Jalmenus eubulus*	Imperial hairstreak (northern subspecies)	V	-
		Nyctophilus corbeni	Greater long-eared bat	V	V
		Paradelma orientalis	Brigalow scaly-foot	V	-

- = Species not listed or no common name, V = Vulnerable.

Priority 'Back on Track' fauna species

The Terrestrial Ecology Study area covers two NRM regions: the Fitzroy NRM region and the Border Rivers Maranoa-Balonne NRM region. There are 789 'Back on Track' terrestrial vertebrate fauna species identified for the Fitzroy NRM region and 606 'Back on Track' terrestrial vertebrate fauna species identified for the Border Rivers Maranoa-Balonne NRM region (Queensland Government, 2009). The 'Back on Track' terrestrial vertebrate fauna species and the corresponding State Back on Track ranks are presented in Appendix R: Terrestrial ecology.

Sites of palaeontological and geomorphological significance

Fossils are the remains of plants, animals or tracks and traces which are preserved in sedimentary rock. No known sites of paleontological significance or geomorphological significance occur in the GFD Project area.

18.4.1.4 Fauna field assessment

Biodiversity

The field assessments identified the presence of 251 native fauna species and 16 non-native fauna species within the Terrestrial Ecology Study area. Appendix R: Terrestrial ecology provides a full list of fauna species observed during the GFD Project field assessments.

Conservation significant fauna species

Thirteen conservation significant fauna species listed under the provisions of the EPBC Act and/or NC Act were recorded in the Terrestrial Ecology Study area during the EIS survey and previous Santos GLNG field assessments.

Table 18-8 outlines the conservation significant fauna species identified and Figure 18-6 illustrates the location of these species.

Table 18-8 Conservation significant fauna species recorded within the Terrestrial Ecology Study area

Class	Common name	Scientific name	NC Act status	EPBC Act status
Aves	Cotton pygmy-goose	*Nettapus coromandelianus* [1]	NT	-
Aves	Glossy black-cockatoo	*Calyptorhynchus lathami* [2]	V	-
Aves	Glossy ibis	*Plegadis falcinellus* [1]	S	-
Aves	Rainbow bee-eater	*Merops ornatus* [1]	S	-
Aves	Red goshawk	*Erythrotriorchis radiatus* [2]	E	V
Aves	Squatter pigeon (southern sub-species)	*Geophaps scripta scripta* [1,2]	V	V
Mammals	Brush-tailed rock-wallaby	*Petrogale penicillata* [1] (probable record)	V	V
Mammals	Koala	*Phascolarctos cinereus* [1,2]	S	V
Mammals	Little pied bat	*Chalinolobus picatus* [1]	NT	-
Mammals	Platypus	*Ornithorhynchus anatinus* [2]	S	-
Mammals	Short-beaked echidna	*Tachyglossus aculeatus* [1,2]	S	-
Mammals	South-eastern long-eared Bat	*Nyctophilus* sp. (possibly *N. corbeni*[3]) [1]	C	V
Reptiles	Golden-tailed gecko	*Strophurus taenicauda* [1,2]	NT	-

- = Species not listed or no common name, S = Special least concern, E = Endangered, V = Vulnerable, NT = Near threatened, C = Least concern. [1] = species observed during EIS field assessments; [2] = species observed during previous Santos GLNG field assessments, [3] = Anabat recordings have confirmed the presence of at least one Long-eared Bat species (*Nyctophilus* sp.) within the Terrestrial Ecology Study area. Anabat call recordings for the conservation significant South-eastern long-eared bat (*N.* corbeni) are considered indistinguishable from non-listed *Nyctophilus* species. This species is known to occur within the locality of the Terrestrial Ecology Study area, and suitable habitat has been recorded within EIS site survey locations. It is therefore considered likely that this species occurs within the Terrestrial Ecology Study area.

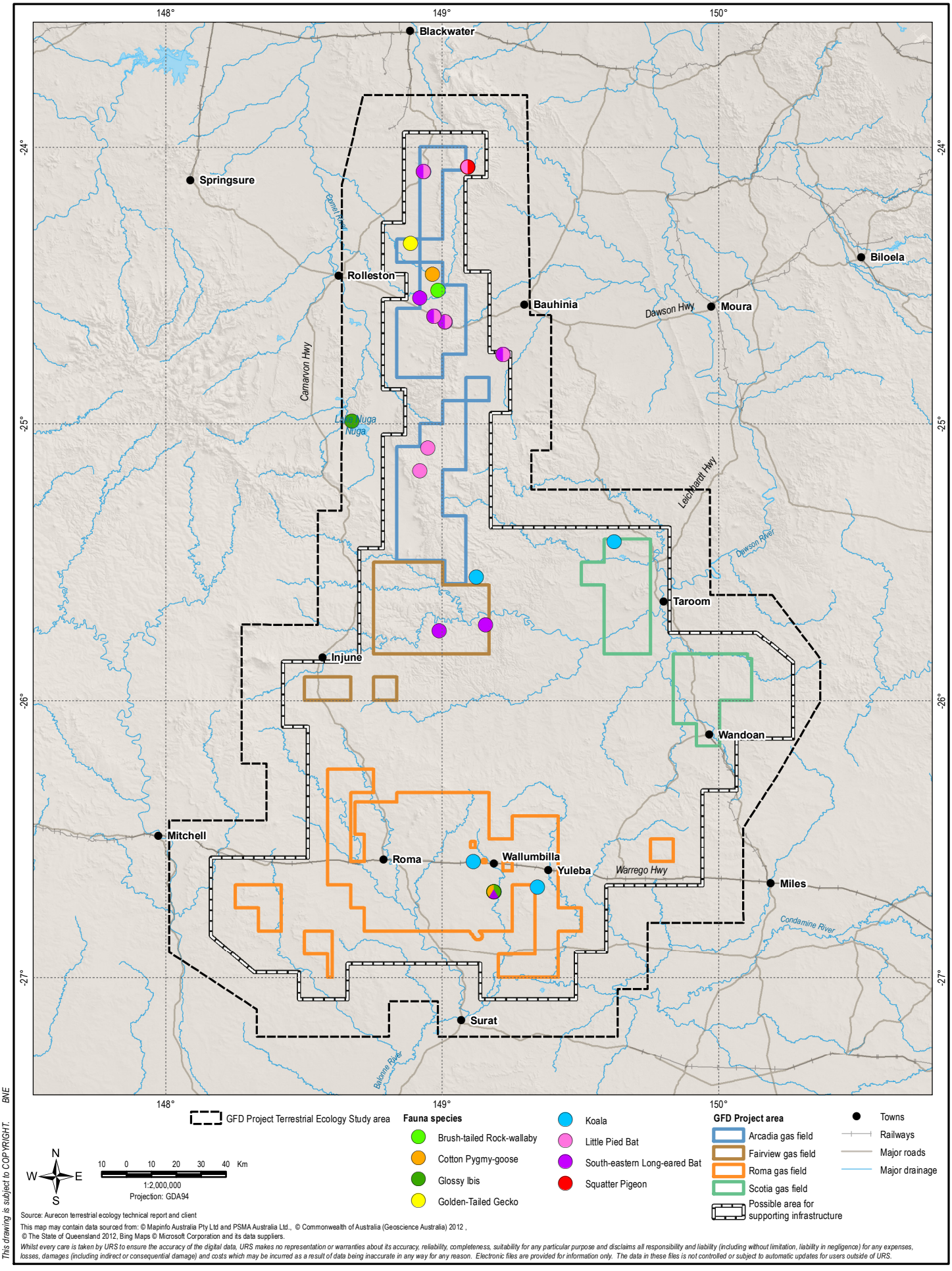
Pest species

Seven non-native fauna species declared as pests under the LP Act were identified within the Terrestrial Ecology Study area during the EIS survey and previous Santos GLNG field assessments (Table 18-9).

Table 18-9 LP Act declared fauna species recorded within the Terrestrial Ecology Study area

Class	Common name	Scientific name	LP Act status*
Mammal	Cat	Felis catus 1,2	Class 2
Mammal	Dingo	Canis lupus dingo 2	Class 2
Mammal	Dog	Canis lupus familiaris 1,2	Class 2
Mammal	European rabbit	Oryctolagus cuniculus 1,2	Class 2
Mammal	Feral pig	Sus scrofa 1,2	Class 2
Mammal	Goat	Capra hircus 1	Class 2
Mammal	Red fox	Vulpes vulpes 1	Class 2

Class 2 = Introduction, feeding, keeping, releasing and supplying is prohibited without a permit issued by Biosecurity Queensland. Landholders are required to control declared pests on their properties; * = Sourced from DAFF (2012); 1 = Species observed during EIS field assessments; 2 = Species observed during previous Santos GLNG field assessments.



Source: Aurecon terrestrial ecology technical report and client

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CONSERVATION SIGNIFICANT FAUNA SPECIES RECORDED WITHIN THE TERRESTRIAL ECOLOGY STUDY AREA

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TERRESTRIAL ECOLOGY

Figure: 18-6

File No: 42627064-g-1083c.mxd Drawn: MH Approved: RS Date: 07-08-2014 Rev. C A4

18.4.1.5 Biodiversity Planning Assessment

Biodiversity Planning Assessments (BPA) for each of Queensland's bioregions have been prepared based on the methodology outlined in the Biodiversity Assessment and Mapping Methodology (BAMM) (Queensland Government, 2002). The BPAs draw upon the EHP certified RE mapping, database information, and expert panel reports and incorporate information about threatened ecosystems and/or species, large tracts of habitat in good condition, ecosystem diversity, landscape context and connection, as well as buffers to wetlands or other types of important areas for ecological processes. The BPA assigns areas to one of three biodiversity significance levels:

- State significance — areas assessed as being significant for biodiversity at the bioregional or State scales
- Regional significance — areas assessed as being significant for biodiversity at the sub-bioregional scale
- Local significance and or other values — local values that are of significance at the local government scale.

All remnant vegetation will qualify into one of the above three categories. Section 4.2.2 of Appendix R: Terrestrial ecology depicts the BPA mapping for the Terrestrial Ecology Study area.

18.4.1.6 State significant biodiversity values

Queensland biodiversity and vegetation offsets special features are derived from the BPA that is utilised in the Queensland Government Ecological Equivalence Methodology. This methodology outlines 14 special feature criteria that are to be considered when determining the ecological equivalence of a proposed development site and offset site. These special features include BPA Criteria H (i.e. priority species), Criteria I (i.e. special biodiversity value areas) and Criteria J (i.e. corridors).

Section 4.2.3 of Appendix R: Terrestrial ecology depicts the areas or features within the Terrestrial Ecology Study area that are identified in the Queensland Government Environmental Offset Policy (Queensland Government, 2008a).

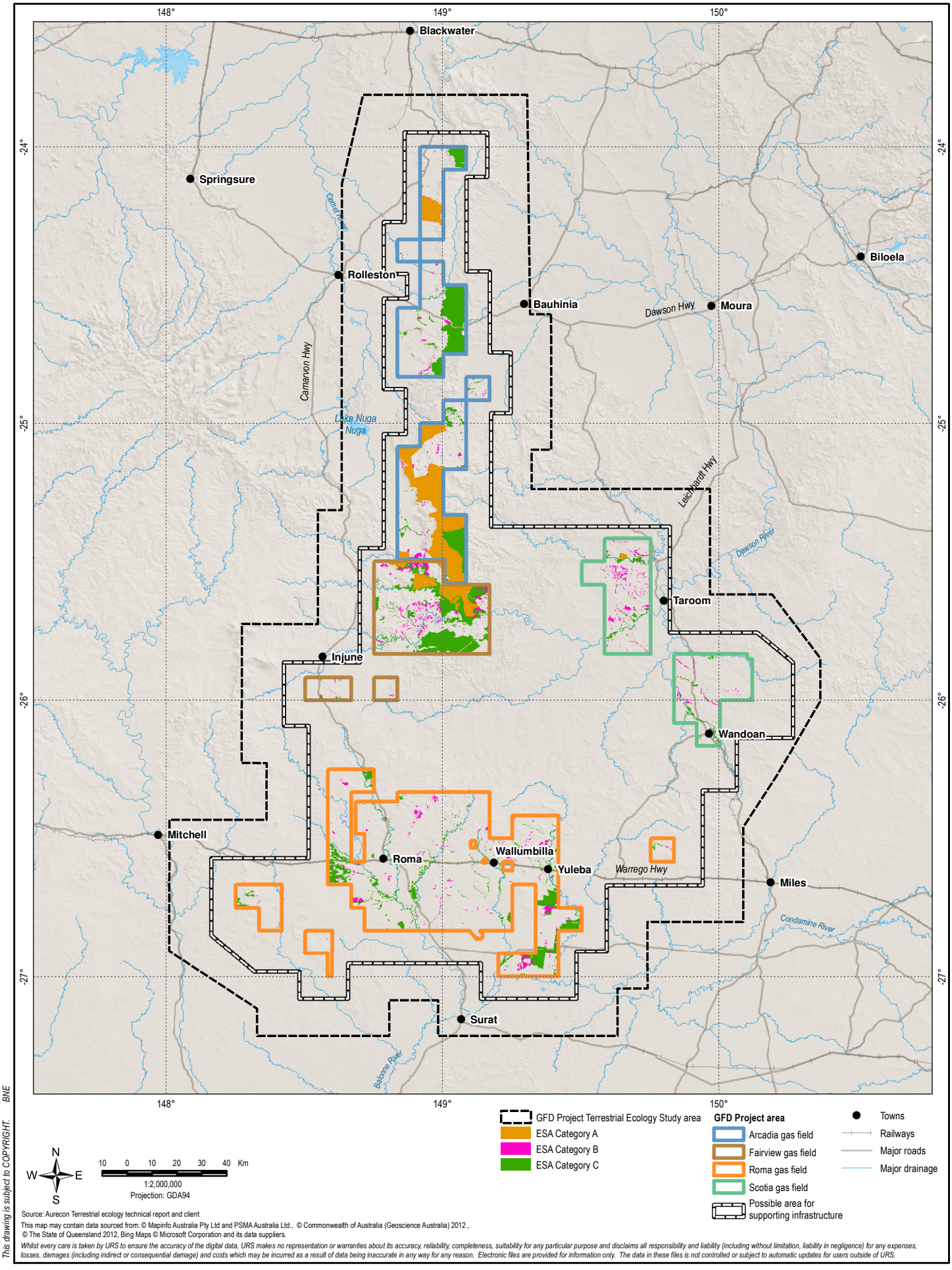
18.4.2 Environmentally sensitive areas

The GFD Project tenures contains Category A, B and C ESAs as defined under the EP Act (Figure 18-7).

Four Category A ESAs are present within the GFD Project tenures including:

- Expedition National Park – the largest national park within the GFD Project tenures located in the Arcadia and Fairview gas fields. Approximately 63,558 ha of Expedition National Park are located within the GFD Project tenures
- Humboldt National Park – a large area of remnant vegetation (formerly state forest) located in the Arcadia gas fields in ATP 804P. Approximately 7,445 ha of Humboldt National Park are located within the GFD Project tenures
- Lake Murphy Conservation Park – situated in the Scotia gas fields in ATP 803P. Lake Murphy Conservation Park protects a large perched ephemeral freshwater wetland (i.e. RE 11.3.27) situated beneath the Murphy Range. Approximately 520 ha of Lake Murphy Conservation Park are located within the GFD Project tenures
- Carraba Conservation Park – situated in the Scotia gas fields in ATP 803P. Approximately 49 ha of Carraba Conservation Park are located within the GFD Project tenures.

All GFD Project tenures contain some ESAs particularly 'Endangered' REs (i.e. Category B ESA). State forests are also prevalent (i.e. Category C ESA). Representation of REs in protected area estate are not shown on Figure 18-7as they are a constraint and will be addressed through the GFD Project Environmental Protocol for Constraints Planning and Field Development (the Constraints Protocol).



Source: Aurecon Terrestrial ecology technical report and client

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ENVIRONMENTALLY SENSITIVE AREAS WITHIN THE GFD PROJECT TENURES

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Figure: **18-7**

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18.4.3 Matters of national environmental significance

The following sections outline the MNES relevant to the Terrestrial Ecology Study area, including wetlands of international importance, conservation significant species, 'Migratory' species and Threatened Ecological Communities (TECs).

18.4.3.1 Wetlands of international importance

The GFD Project tenures are located within the Fitzroy (north) and Condamine-Balonne (south) catchments. There are no Ramsar wetlands of international significance within the GFD Project tenures or in close proximity. The nearest Ramsar wetland of international significance to the GFD Project tenures is the Narran Lake Nature Reserve (Australian Government, 2013a). This wetland is located 75 km north-west of Walgett in New South Wales, approximately 320 km downstream of the GFD Project boundary in the Condamine-Balonne catchment.

18.4.3.2 Threatened Ecological Communities

The following six TECs listed under the provisions of the EPBC Act were identified as potentially occurring in the GFD Project tenures based on the EPBC Act Protected Matters Search Report (Australian Government, 2013b):

- Brigalow (*Acacia harpophylla* dominant and co-dominant)
- Coolibah-Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
- Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
- The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin
- Weeping Myall Woodlands.

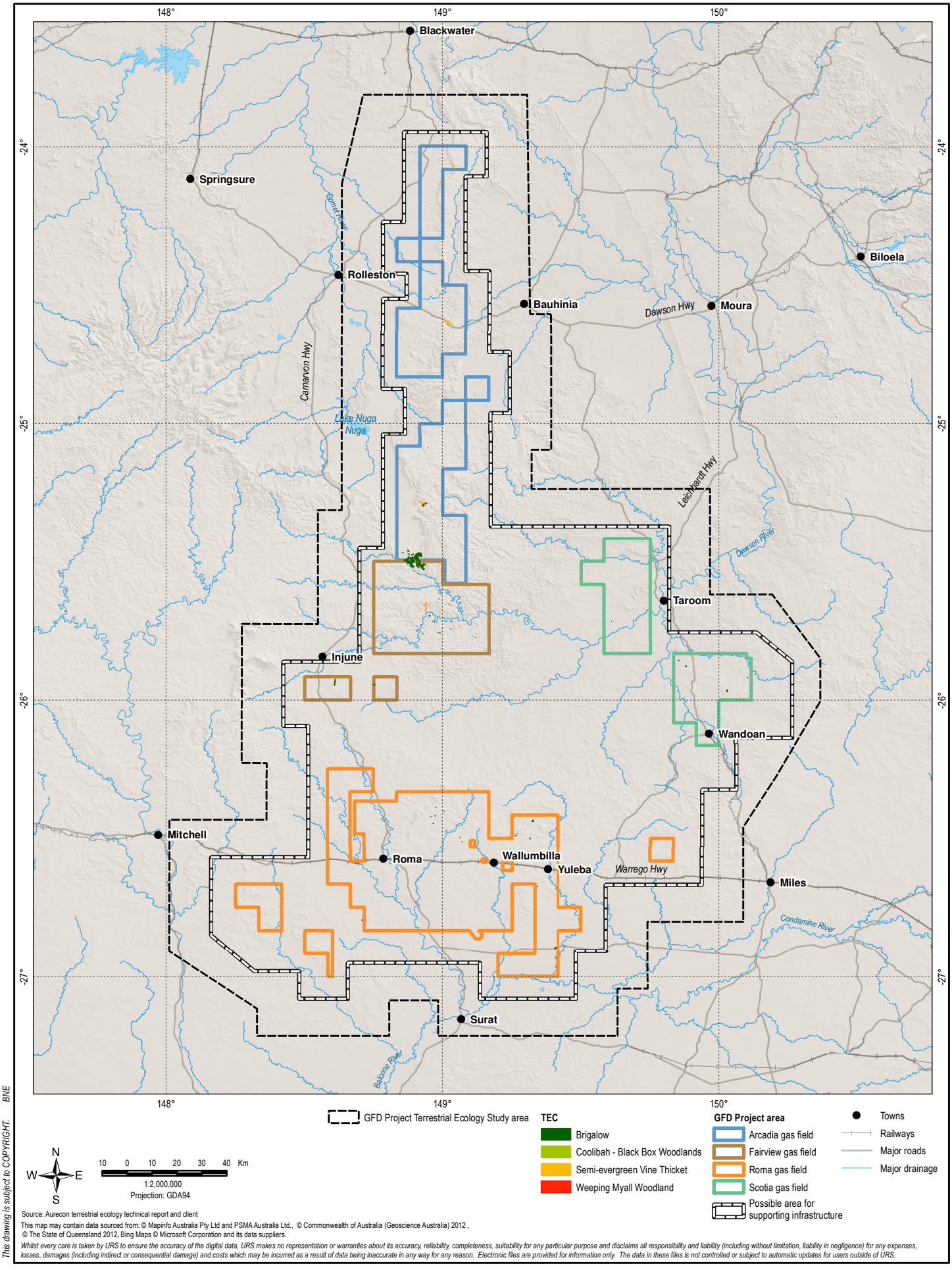
Table 18-10 and Figure 18-8 provide an overview of the occurrence of each TEC within the GFD Project tenures.

Table 18-10 EPBC Act Threatened Ecological Communities in the GFD Project tenures

TEC	Corresponding RE type	EPBC Act status	Likelihood of presence in GFD area	Area (ha) ^	Potential regrowth area
Brigalow (*Acacia harpophylla* dominant and co-dominant)	RE 11.3.1, 11.4.8, 11.4.9, 11.9.1, 11.9.5 and some unmapped regrowth vegetation	'Endangered'	Present in all GFD Project tenures except for PL 233 and PL 235. Variable in condition from small low quality patches with considerable weed invasion to very large good quality patches with little evidence of disturbance. 'Endangered' HVR vegetation has potential to be included within this TEC.	17,622	11,980
Coolibah-Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	RE 11.3.3 (may also include parts of the wetland RE 11.3.27)	'Endangered'	Occurs in patches of relatively good quality located in ATP 336P R and PL 6	1,748	434
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	RE 11.3.21, 11.9.3 and 11.8.11	'Endangered'	This TEC has not been identified within the GFD Project tenures during EIS surveys. However, it has potential to occur within the Roma gas fields in PL 6.	16,924	393
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	RE 11.9.4, 11.8.3	'Endangered'	Present in ATP 526P, ATP 653P, ATP 804P, PL 234, PL 232, PL 100, PL 91 and PL 92. Variable in condition from small low quality patches with considerable weed invasion to very large good quality patches with little evidence of disturbance	8,097	1,954
Weeping Myall Woodlands	May be contained within RE 11.3.2 *	'Endangered'	Only scattered individuals or small clumps of *Acacia pendula* were found in the GFD Project tenures. However, this TEC may still occur as a component of RE 11.3.2 in all project tenures	26,859	7,383

TEC	Corresponding RE type	EPBC Act status	Likelihood of presence in GFD area	Area (ha) ^	Potential regrowth area
The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin	11.3.25, 11.3.27, 11.3.2, 11.3.3, 11.3.1. Note, spring associated REs 11.3.22 and 11.10.14 are not mapped within the tenures	'Endangered'	This TEC occurs on Santos GLNG tenure within the southern portion of the Fairview gas fields at the following springs: Yebna 2/311 spring complexes (19 spring vents in total, comprised of 18 watercourse springs and 1 mound spring. TEC present at mound spring vent # 534) Lucky Last spring complex (12 spring vents in total, TEC present at all 12 spring vents # 287, 340, 686, 687, 687.1, 687.2, 687.3, 687.4, 687.5, 687.6, 688, 689) Spring Rock Creek spring complex (1 watercourse spring vent #285, TEC not present) Additional patches of this TEC may potentially occur outside of the Fairview, Arcadia and Scotia gas fields.	The approximate area size of this TEC is not able to be calculated as water levels and flow fluctuates seasonally.	The approximate potential regrowth area of this TEC is not able to be calculated as water levels and flow fluctuates seasonally.

^ = Areas are approximate and based on field verified RE mapping where available and include heterogeneous REs.
* = 26,859 ha of RE 11.3.2 is mapped within the GFD Project tenures, including heterogeneous REs. However, the extent of the Weeping Myall Woodlands TEC is likely to be less, as not all areas of RE 11.3.2 are classified as the TEC.



Source: Aurecon terrestrial ecology technical report and client

Santos GLNG Project

GFD PROJECT EIS

THREATENED ECOLOGICAL COMMUNITIES WITHIN THE GFD PROJECT TENURES

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TERRESTRIAL ECOLOGY

Figure: 18-8

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18.4.3.3 EPBC Act threatened flora species

Desktop assessment

Twenty-five conservation significant flora species listed under the provisions of the EPBC Act were identified from the desktop assessment as potentially occurring within the Terrestrial Ecology Study area (Table 18-2). Of these, 17 are predicted to occur in the Terrestrial Ecology Study area based on the EPBC Act Protected Matters Search Report (Australian Government, 2013b).

Refinement of the potential occurrence of each species based on the likelihood of occurrence assessment identified 20 EPBC Act listed flora species that are known to occur within the Terrestrial Ecology Study area based on specimen-backed records in the Wildlife Online, HERBRECS and Atlas of Living Australia databases. Four EPBC Act listed flora species are considered to have a moderate likelihood of occurrence within the Terrestrial Ecology Study area based on their known range and the presence of suitable habitat (refer Table 18-2). The remaining one EPBC Act listed flora species, *Logania diffusa*, was recorded more than 30 years ago approximately 9 km north of the GFD Project tenures (Queensland Herbarium, 2014). Due to the age of the historic record and the distance from the GFD Project tenures, this species is considered to have a low likelihood of occurrence and therefore has been excluded from further assessment.

Maps of predictive habitat for flora species listed under the provisions of the EPBC Act within the Terrestrial Ecology Study area are provided in Appendix U1: Report on Matters of national environmental significance (ecology).

Field assessment

Two conservation significant flora species listed under the provisions of the EPBC Act were recorded in the Terrestrial Ecology Study area during the EIS surveys and previous Santos GLNG field assessments.

Table 18-4 outlines the EPBC Act listed flora species identified and Figure 18-5 illustrates the location of these species.

18.4.3.4 EPBC Act listed fauna species

Desktop assessment

Twenty-six conservation significant fauna species listed under the provisions of the EPBC Act were identified from the desktop assessment as potentially occurring within the Terrestrial Ecology Study area (Table 18-6). This includes 11 birds, 1 fish, 1 gastropod, 6 reptiles and 7 mammals. Of these, 23 are predicted to occur in the Terrestrial Ecology Study area based on the EPBC Act Protected Matters Search Report (Australian Government, 2013b).

Refinement of the potential occurrence of each species based on the likelihood of occurrence assessment identified 14 EPBC Act listed fauna species that are known to occur within the Terrestrial Ecology Study area based on specimen-backed records in the Wildlife Online, Queensland Museum, Birds Australia and Atlas of Living Australia databases (refer Table 18-6). Eleven EPBC Act listed fauna species are considered have a moderate likelihood of occurrence within the Terrestrial Ecology Study area based on their known range and the presence of suitable habitat within the Terrestrial Ecology Study area. The remaining one EPBC Act listed fauna species (Paradise parrot [*Psephotus pulcherrimus*]) is considered to have a low likelihood of occurrence within the Terrestrial Ecology Study area based on the absence of suitable habitat. In addition, the Paradise parrot is considered to be locally extinct and is listed as 'Presumed Extinct' under the provisions of the EPBC Act.

Maps of predictive habitat for fauna species listed under the provisions of the EPBC Act within the Terrestrial Ecology Study area are provided in Appendix U1: Report on Matters of national environmental significance (ecology).

Field assessment

Five conservation significant fauna species listed under the provisions of the EPBC Act were recorded in the Terrestrial Ecology Study area during the EIS surveys and previous Santos GLNG field assessments.

Table 18-8 outlines the EPBC Act listed fauna species identified and Figure 18-6 illustrates the location of these species.

18.4.3.5 EPBC Act listed migratory species

Desktop assessment

'Migratory' species listed under the EPBC Act are those protected under international agreements to which Australia is a signatory. These include the Japan Australia Migratory Bird Agreement (JAMBA), the China Australia Migratory Bird Agreement (CAMBA), the Republic of Korea Migratory Bird Agreement (ROKAMBA), and the Bonn Convention on the Conservation of Migratory Species of Wild Animals. 'Migratory' species listed under the provisions of the EPBC Act do not include species listed as 'Marine' under the EPBC Act, as discussed in Appendix U1: Report on Matters of national environmental significance (ecology).

Twenty-three 'Migratory' species listed under the provisions of the EPBC Act were identified from the desktop assessment as potentially occurring within the Terrestrial Ecology Study area (Table 18-11). All identified species are birds. Of these, 13 are predicted to occur in the Terrestrial Ecology Study area based on the EPBC Act Protected Matters Search Report (Australian Government, 2013b).

Refinement of potential occurrence based on the likelihood of occurrence assessment identified 19 EPBC Act listed 'Migratory' species that are known to occur within the Terrestrial Ecology Study area based on specimen-backed records in the Wildlife Online, Queensland Museum, Birds Australia and Atlas of Living Australia databases (refer Table 18-11). Three EPBC Act listed 'Migratory' species are considered have a moderate likelihood of occurrence within the Terrestrial Ecology Study area based on its known range and the presence of suitable habitat within the Terrestrial Ecology Study area. The remaining one EPBC Act listed 'Migratory' species is considered to have a low likelihood of occurrence within the Terrestrial Ecology Study area based on the absence of suitable habitat.

Maps of predictive habitat for 'Migratory' species listed under the provisions of the EPBC Act within the Terrestrial Ecology Study area are provided in Appendix U1: Report on Matters of national environmental significance (ecology).

Table 18-11 EPBC Act listed 'Migratory' species known or potentially present within Terrestrial Ecology Study area

Class	Common name	Scientific name	NC Act status	EPBC Act status	Likelihood of occurrence^
Aves	Australian painted snipe	*Rostratula australis*	V	E, M (C)	Known
Aves	Black-faced monarch	*Monarcha melanopsis*	S	M (B)	Known
Aves	Black-tailed godwit	*Limosa limosa*	S	M (B,J,C,R)	Moderate
Aves	Caspian tern	*Hydroprogne caspia*	S	M (C)	Known
Aves	Cattle egret	*Ardea ibis*	S	M (J,C)	Known
Aves	Common greenshank	*Tringa nebularia*	S	M (B,J,C,R)	Known
Aves	Curlew sandpiper	*Calidris ferruginea*	S	M (B,J,C,R)	Moderate
Aves	Eastern great egret	*Ardea modesta*	S	M (J,C)	Known
Aves	Fork-tailed swift	*Apus pacificus*	S	M (J,C,R)	Known
Aves	Glossy ibis	*Plegadis falcinellus*	S	M (C)	Known
Aves	Latham's snipe	*Gallinago hardwickii*	S	M (J,C,R)	Known
Aves	Marsh sandpiper	*Tringa stagnatilis*	S	M (J,C,R)	Known
Aves	Osprey	*Pandion haliaetus*	S	M (B) (Marine)	Moderate
Aves	Pacific golden plover	*Pluvialis fulva*	S	M (B,J,C,R)	Known
Aves	Rainbow bee-eater	*Merops ornatus*	S	M (J)	Known
Aves	Rufous fantail	*Rhipidura rufifrons*	S	M (B)	Known
Aves	Satin flycatcher	*Myiagra cyanoleuca*	S	M (B)	Known
Aves	Sharp-tailed sandpiper	*Calidris acuminata*	S	M (J,C,R)	Known
Aves	Spectacled monarch	*Monarcha trivirgatus*	S	M (B)	Known
Aves	White-bellied sea-eagle	*Haliaeetus leucogaster*	S	M (C)	Known
Aves	White-tailed tropicbird	*Phaethon lepturus*	S	M (J,C)	Low
Aves	White-throated needle-tail	*Hirundapus caudacutus*	S	M (J,C)	Known
Aves	Wood sandpiper	*Tringa glareola*	S	M (J,C,R)	Known

- = Species not listed, S = Special Least Concern, E = Endangered, M = Migratory, V = Vulnerable, (B) = A list of migratory species established under section 209 if the EPBC Act, these species are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II), Committee = Agreement between the Government of Australia and the Government of the People's Republic of China for the Protection of Migratory Birds and their Environment (CAMBA)
(J) = Agreement between the Government of Australia and the Government of Japan for the Protection of Migratory Birds in Danger of Extinction and their Environment (JAMBA)
Committee = Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds (ROKAMBA)
^ = Likelihood of occurrence within the Terrestrial Ecology Study area and habitat descriptions are provided in Appendix U1: Report on Matters of national environmental significance (ecology).

Field assessment

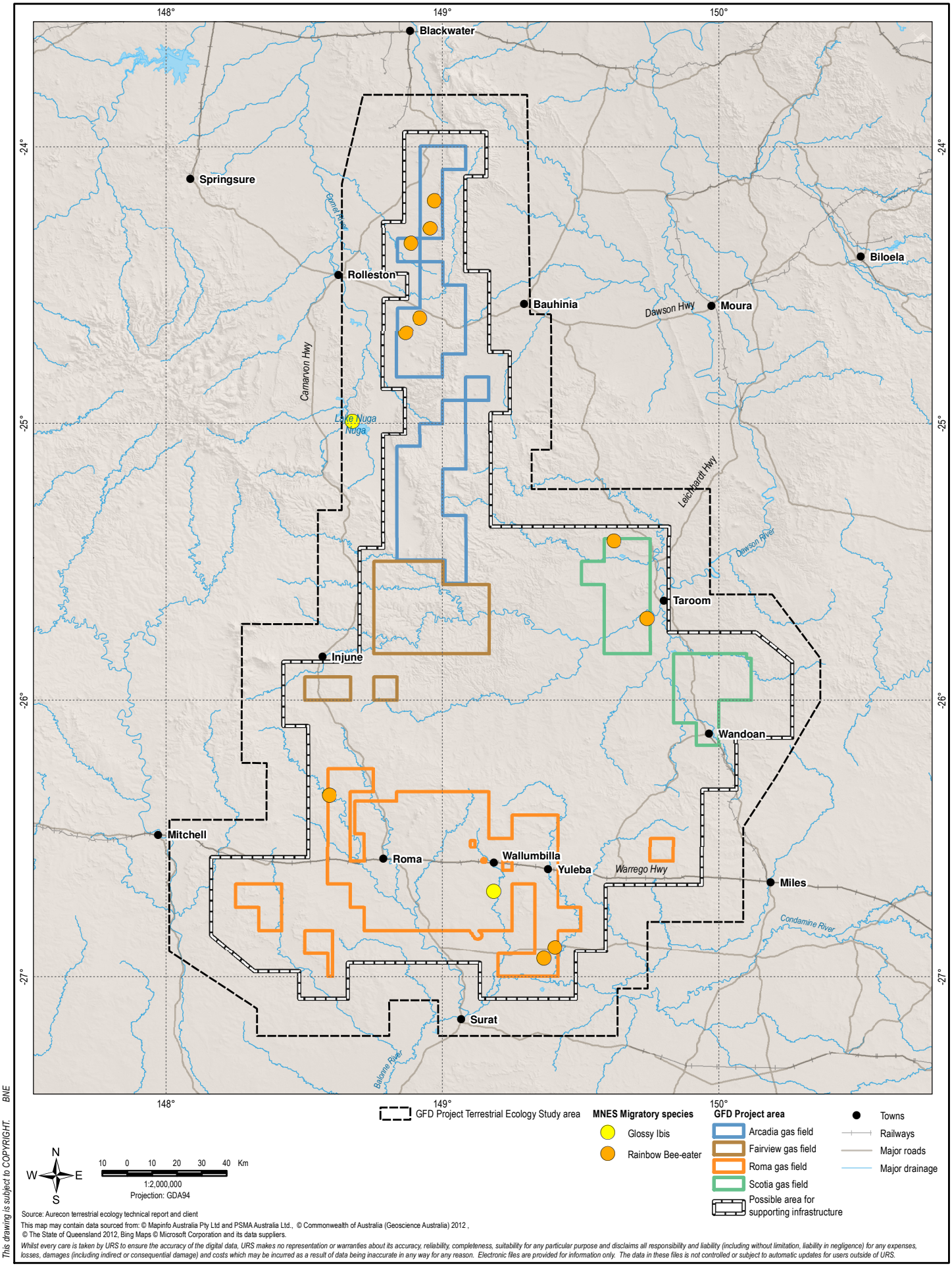
Six 'Migratory' species listed under the provisions of the EPBC Act were recorded in the Terrestrial Ecology Study area during the EIS surveys and previous Santos GLNG field assessments.

Table 18-12 outlines the EPBC Act listed 'Migratory' species identified and Figure 18-9 illustrates the location of these species.

Table 18-12 EPBC Act listed 'Migratory' species recorded during EIS field assessments and previous Santos GLNG field assessments within the Terrestrial Ecology Study area

Class	Common name	Scientific name	NC Act status	EPBC Act status
Aves	Cattle egret [2]	*Ardea ibis*	Special least concern	Migratory
Aves	Fork-tailed swift [2]	*Apus pacificus*	Special least concern	Migratory
Aves	Rainbow bee-eater [1,2]	*Merops ornatus*	Special least concern	Migratory
Aves	Satin flycatcher [2]	*Myiagra cyanoleuca*	Special least concern	Migratory
Aves	Spectacled monarch [2]	*Monarcha trivirgatus*	Special least concern	Migratory
Aves	Glossy ibis [1]	*Plegadis falcinellus*	Special least concern	Migratory

[1] = species observed during EIS field assessments; [2] = species observed during previous Santos GLNG field assessments.



Source: Aurecon terrestrial ecology technical report and client

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EPBC ACT LISTED 'MIGRATORY' SPECIES RECORDED WITHIN THE TERRESTRIAL ECOLOGY STUDY AREA

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TERRESTRIAL ECOLOGY

Figure: 18-9

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It is likely that the Terrestrial Ecology Study area contains suitable habitat for 'Migratory' species during locally favourable conditions or when episodic dry conditions prevail further inland.

In particular, agricultural land may provide habitat or refuge for migratory bird species including *Ardea ibis* (Cattle egret), *Merops ornatus* (Rainbow bee-eater), *Gallinago hardwickii* (Latham's snipe) and *Rostratula australis* (Australian painted snipe) during the wet season where they are situated on a floodplain. Seasonal or episodic availability of approximately 83,238 ha of potentially suitable habitat (riparian and floodplain eucalypt forest and wetland habitats) occurs within the Terrestrial Ecology Study area, which could be classed as 'important habitat' as defined under the EPBC Act Policy Statement 1.1 Significant Impact Guidelines (Australian Government, 2009) as the Terrestrial Ecology Study area is likely to contain:

- Habitat utilised by a 'Migratory' species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species
- Habitat within an area where the species is declining.

18.5 Potential impacts

Potential impacts to terrestrial ecology, ESAs and MNES that may occur as a result of the GFD Project include:

- Habitat loss from vegetation clearing/removal
- Fauna species injury or mortality from project activities
- Reduction in soil viability to support plant growth due to soil compaction
- Displacement of flora and fauna species by weed and pest species
- Reduction in the connectivity of biodiversity corridors
- Edge effects to habitat (e.g. weed invasion and reduction of biodiversity)
- Habitat fragmentation from vegetation clearing
- Barrier effects (e.g. loss of species' migration pathways)
- Disturbance to fauna and flora from noise, dust, and light
- Degradation of habitat from an increase in litter (waste).

The GFD Project's main infrastructure types and quantities are known and the locations of the infrastructure will be determined progressively as the project develops through each phase. To address this, the Land Disturbance Probabilistic Calculation Model was developed to provide an understanding of the potential impact based on a maximum development scenario for the GFD Project on the existing terrestrial ecology environment. Further information regarding the use of this model is outlined in Appendix R: Terrestrial ecology.

The assessment framework used to assess potential impacts and develop mitigation strategies is consistent with the existing approved approach used by the current GLNG Project. This methodology has been developed based on the knowledge, systems and procedures that have been previously assessed and approved by State and Commonwealth Governments. The approach applies the Constraints protocol through the identification of all environmental constraints into a hierarchy (based on regulatory and environmental constraints).

Details of each potential impact arising from the construction, operation and decommissioning of the GFD Project including short-term and long-term effects are discussed in section 5.4 of Appendix R: Terrestrial ecology. Potential cumulative impacts are discussed in section 6 of Appendix R: Terrestrial ecology.

18.6 Mitigation measures

Santos GLNG is committed to implementing the mitigation measures in Table 18-13 to manage potential terrestrial ecology, ESA and MNES related impacts. These mitigation measures are incorporated into Santos GLNG's management framework for the GFD Project, as described in Appendix Y: Draft environmental management plan.

Table 18-13 Mitigation measures – terrestrial ecology, environmentally sensitive areas and MNES

Management plan	Mitigation measures
Decommissioning and abandonment management plan (DAMP)	The DAMP describes the management framework in place for when petroleum activities cease. The objectives of the plan are to: • Undertake decommissioning of assets in a manner that complies with regulatory requirements and minimises the risk of environmental harm • Undertake decommissioning activities in a manner that meets stakeholder expectations • Leave a landform that is stable and compatible with intended post-closure land use • Provide for the beneficial reuse of Santos GLNG infrastructure constructed to third parties (e.g. landholders or local authorities) where an appropriate agreement has been signed by both parties and regulatory authorities are satisfied. The key mitigation measures of the DAMP include: • Once the production capacity of the gas resource has been realised, final decommissioning activities can commence, including demolition activities. This involves the removal of the primary asset and supporting infrastructure • The methods employed to decommission assets within the gas field will be based on the current guidelines and standards at the time of decommissioning, as decommissioning will occur throughout the life of the GFD Project • Decommissioning and demolition activities will be undertaken in a manner that minimises potential environmental impacts.
Draft environmental management plan (Draft EM plan)	The Draft EM plan identifies the environmental values potentially affected by the GFD Project and proposes measures to manage the risk of potential adverse impact to these environmental values. The Draft EM Plan comprises: • Environmental values potentially affected by the GFD Project • Environmental management objectives and associated management measures • Environmental monitoring and reporting • Coal seam water management • Proposed conditions.
Fauna management plan (FMP)	The FMP provides Santos GLNG's strategy to manage fauna during the construction and operations phases of the GFD Project. The plan: • Identifies fauna species present within the gas fields • Prioritises management of both livestock and wildlife • Provides mitigation measures to minimise impacts to fauna from Santos GLNG activities. The FMP includes measures such as: • Scheduling watercourse crossings, where practicable, during low flow periods. • Ensure mitigation measures for creek crossings are consistent with AS2885 'Pipelines', 'Gas, Liquid and Petroleum' and Australian Pipeline Industry Association Code of Environmental Practice' and the conditions of any specific approval (such as waterway barrier works) • Fauna passage devices such as pipes that allow the movement of fish and other aquatic fauna should be considered for major watercourse crossings Implement measures to reduce soil erosion and stream sedimentation.

Management plan	Mitigation measures
GFD Project environmental protocol for constraints planning and field development (the Constraints protocol)	The Constraints protocol applies to all gas field related activities. The scope of the Constraints protocol is to: • Enable Santos GLNG to comply with all relevant State and Federal statutory approvals and legislation • Support Santos GLNG's environmental policies and the General Environmental Duty (GED) as outlined in the EP Act • Promote the avoidance, minimisation, mitigation and management of direct and indirect adverse environmental impacts associated with land disturbances • Minimise cumulative impacts on environmental values. The Constraints protocol provides a framework to guide placement of infrastructure and adopts the following management principles: • Avoidance — avoiding direct and indirect impacts • Minimisation — minimise potential impacts • Mitigation — implement mitigation and management measures • Remediation and rehabilitation — actively remediate and rehabilitate impacted areas • Offset — offset residual adverse impacts in accordance with regulatory requirements. The Constraints protocol enables the systematic identification and assessment of environmental values and the application of development constraints to effectively avoid and/or manage environmental impacts. The Constraints protocol applies as follows: No-go area constraint applies to Category A ESAs Surface development exclusion areas apply to some Category B and C ESAs and a 200m Primary Protection buffer around Category A ESAs Moderate constraint areas apply to MNES Habitat, MNES TECs, MNES flora species, 100 m Secondary Protection Zone buffer around Category A ESAs, and some Category B and C ESAs plus a 200 Primary Protection buffer.
Offset strategy	Offsets are a mechanism to counterbalance any significant adverse residual impact, after the hierarchy of avoidance, minimisation, mitigation, remediation and rehabilitation measures have been implemented. The Offset strategy is part of the management framework and will be further developed and implemented to meet regulatory requirements. The purpose of the strategy is to: • Summarise the Australian and Queensland Governments' offset requirements and policies • Identify the environmental values that exist within the GFD Project area that after avoidance, minimisation, mitigation and remediation and rehabilitation measures may require offsetting • Demonstrate offsets completed as part of the Santos GLNG Project • Identify where existing Santos GLNG offset areas may be used for future additional offset required for the GFD Project • Provide a description of Santos GLNG's staged offsets approach to provide potential offset delivery options and proposed method of delivery.
Pest and weed management plan (PWMP)	The management of pest and weed species will be undertaken in accordance with the PWMP. The plan includes measures such as: • Identification of pest and weed species and areas of infestation • Avoidance of traversing and placing infrastructure in areas of known infestation • Prevention of the spread of pest and weed species by implementing appropriate work practices and promotion of risk awareness • Control of identified pest and weeds through containment, reduction or eradication as required by legislation. The key mitigation measures of the PWMP include: • Isolate infestations to prevent further spread and establish quarantine zones as practicable • Implement best practice control measures in accordance with Queensland Biosecurity guidelines, Santos GLNG procedures and landholder requests

Management plan	Mitigation measures
	• Limit movement into or out of areas of infestation • Enforce the requirements for vehicle and equipment washdown • Maintain access tracks to be free of declared or significant weed species to avoid accidental contamination of vehicles and machinery • Monitor controlled infestations for response to controls. Santos GLNG will review local government's pest and weed management plans and apply measures from these to the PWMP where it is appropriate.
Rehabilitation management plan	The Rehabilitation management plan outlines the rehabilitation objectives for Project-related disturbances within the GFD Project area. This includes the phasing of rehabilitation to first achieve stabilisation and subsequently final rehabilitation for disturbances to land (i.e. ground surface). The Rehabilitation management plan: • Describes Santos GLNG's approach to rehabilitation • Identifies key rehabilitation objectives and criteria to deem rehabilitation success • Outlines general rehabilitation actions to be undertaken by Santos GLNG when rehabilitation a disturbance • Provides an overview of monitoring and maintenance actions to be conducted on rehabilitated areas. The key mitigation measures of the Rehabilitation management plan are described below. <u>Transitional rehabilitation</u> Significantly disturbed areas that are no longer required for the on-going petroleum activities, will be transitionally rehabilitated within 12 months (unless an exceptional circumstance in the area to be rehabilitated (e.g. a flood event) prevents this timeframe being met) and be maintained so that: • Contaminated land resulting from petroleum activities is remediated and rehabilitated • The areas are non-polluting, a stable landform and re-profiled to contours consistent with the surrounding landform • Surface drainage lines are re-established • Top soil is reinstated • Either groundcover, that is not a declared pest species, is growing or an alternative soil stabilisation methodology that achieves effective stabilisation is implemented and maintained. <u>Final rehabilitation acceptance criteria</u> • All areas significantly disturbed by petroleum activities which are not being or intended to be utilised by the landholder or overlapping tenure holder will be rehabilitated to meet the agreed acceptance criteria. • Where the adjacent land use contains, or the pre-clearing land use contained, one or more REs, then at least one RE from the same broad vegetation group, as demonstrated by the predominant species in the ecologically dominant layer, will remain and will possess an equivalent or higher conservation value (biodiversity status) than the REs in either the adjacent land or pre-disturbed land • Where significant disturbance to land has occurred in an ESA, the agreed final rehabilitation criteria as measured against the pre-disturbance biodiversity values assessment will apply. <u>Remaining infrastructure</u> • Infrastructure that is no longer required for the carrying out of the petroleum activity/ies will not be subject to transitional or final rehabilitation acceptance criteria if the infrastructure has been approved in writing by the landholder/s to remain in-situ • Where remaining infrastructure is a dam (including a low hazard dam), in addition to the requirements of the above, the dam will be decommissioned to no longer accept inflow from the petroleum activity/ies and the contained water will be of a quality suitable for the intended ongoing use/s as agreed to in writing by the landholder/s.

Management plan	Mitigation measures
Significant species management plan (SSMP)	The plan provides an overview of the strategy, methods and controls implemented by Santos GLNG to manage adverse impacts to EPBC Act listed significant species and their habitats, and TECs. Specifically, the SSMP: • Identifies and profiles significant species and threatened ecological communities that are present, or may occur, within the gas fields • Identifies key threats to significant species and threatened ecological communities caused by activities within the gas fields • Outlines general mitigation measures to be implemented by Santos GLNG to minimise the potential adverse impact of key threats to significant species and TECs caused by Santos GLNG. The SSMP will include mitigation measures such as: • Regular visual inspections by a spotter catcher during clearing to remove turtles from threat of harm where clearing occurs within or adjacent to permanent water pools • Ensuring that watercourse and wetland crossings conform to approval conditions issued under the Fisheries Act (i.e. raising of a waterway). Alternatively, works are to be undertaken in accordance with Queensland Primary Industries and Fisheries (QPIF) Code for self-assessable development minor waterway barrier works, and the QPIF Code for self-assessable development temporary waterway barrier works on low order inland waterways • Ensuring that for minor waterway crossings where horizontal directional drilling (HDD) is not the agreed construction method, the watercourse bed and bank material and trench spoil will be stockpiled separately outside the buffer zone to reduce potential impacts to turtle nest areas (where applicable) • Weather permitting, rehabilitating impacted watercourses immediately after the pipeline has been lowered in and backfilled • Taking reasonable and practical measures to minimise the area to be cleared and avoiding the clearing of mature trees within 200 m of a wetland and/or watercourse • Clearing within the riparian zones to comply with clearing approval conditions (e.g. NC Act approval) • Clearing within the riparian zones to comply with the relevant clearing approval conditions • Minimising fragmentation of riparian vegetation along watercourses • Limiting the total clearing footprint within the riparian zones to that required for safe construction • Revegetation to be consistent with the plant density, floristic composition and distribution of the adjacent riparian and creek bed communities • Avoiding impacting on regenerating riparian zones and associated species habitat • Restricting vehicle and pedestrian access within and adjacent watercourses and wetlands to the defined access tracks • In the event that aquatic fauna are injured or killed during works or where there is unauthorised clearing of vegetation or native flora, the mitigation strategies being used will be reviewed in conjunction with an aquatic fauna specialist and any recommended changes implemented.

18.7 Significance assessment

As discussed in section 0, impacts were assessed using the significance assessment methodology. As the GFD Project area covers a large geographical area, the general nature of potential impacts to environmental values associated with GFD Project activities are identified and assessed within this section.

Table 18-14 summarises the assessment undertaken for the potential impacts of the GFD Project on terrestrial ecology, ESAs and MNES values. For each identified potential impact, the assessment considered:

- The potential pre-mitigated significance, which that only the Constraints protocol has been applied and the potential impacts are at their greatest
- The mitigation measures that will be used to manage the potential impacts on terrestrial ecology, ESAs and MNES values. These measures will reduce the magnitude of the potential impacts
- The residual significance of the potential impact after the implementation of mitigation measures. The residual significance takes into account the potential for impact that remains after the mitigation measures are applied.

Table 18-14 Project activities and potential impacts on terrestrial ecology, environmentally sensitive areas and MNES environmental values

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
Limited petroleum activities and Linear activities:	State significant ecological constraints: Endangered vegetation (RE and HVR)	High	Construction	Habitat loss from vegetation clearing/removal 0.07% potentially impacted within Bioregion 11 (between 1%-5% contained within the GFD project area potentially impacted)	Moderate	High	Draft EM Plan	Low	Moderate
			Operations	Habitat loss from vegetation clearing/removal No additional clearing	Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning		Negligible	Low	Draft EM Plan	Negligible	Low
		High	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Displacement of flora and fauna species from invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	PWMP	Negligible	Low
			Operations		Low	Moderate	PWMP	Negligible	Low
			Decommissioning		Low	Moderate	PWMP RMP DAMP	Negligible	Low

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
		High	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	SSMP PWMP	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Dust and light Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning		Low	Moderate	Draft EM Plan RMP DAMP	Negligible	Low
		High	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
Limited petroleum activities and Linear activities:	Of concern vegetation (RE and HVR)	High	Construction	Habitat loss from vegetation clearing/removal 0.08% potentially impacted within Bioregion 11 (between 1%-5% contained within the GFD project area potentially impacted)	Moderate	High	Draft EM Plan	Moderate	High

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Operations	Habitat loss from vegetation clearing/removal No additional clearing	Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Displacement of flora and fauna species from invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	PWMP	Negligible	Low
			Operations		Low	Moderate	PWMP	Negligible	Low
			Decommissioning		Low	Moderate	PWMP RMP DAMP	Negligible	Low
		High	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	SSMP PWMP	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Dust, and light Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning		Low	Moderate	Draft EM Plan RMP DAMP	Negligible	Low
		High	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
Limited petroleum activities and Linear activities:	Essential Habitat	High	Construction	Habitat loss from vegetation clearing/removal 0.04% potentially impacted within Bioregion 11 (between 1%-5% contained within the GFD project area potentially impacted)	Moderate	High	SSMP FMP	Low	Moderate
			Operations	Habitat loss from vegetation clearing/removal No additional clearing	Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Fauna species injury or mortality Localised Temporary and short term Could be effectively mitigated	Low	Moderate	SSMP	Low	Moderate
			Operations		Low	Moderate	SSMP	Low	Moderate
			Decommissioning		Low	Moderate	SSMP RMP DAMP	Low	Moderate

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
		High	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Displacement of flora and fauna species from invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	PWMP	Negligible	Low
			Operations		Low	Moderate	PWMP	Negligible	Low
			Decommissioning		Low	Moderate	PWMP RMP DAMP	Negligible	Low
		High	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	SSMP PWMP	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Noise (fauna only), dust, and light	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Decommissioning	Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan RMP DAMP	Negligible	Low
		High	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
Limited petroleum activities and Linear activities:	HES Wetlands	High	Construction	Habitat loss from vegetation clearing/removal 0.02% potentially impacted within Bioregion 11	Low	Moderate	SSMP FMP	Low	Moderate
			Operations	Habitat loss from vegetation clearing/removal No additional clearing	Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Fauna species injury or mortality Localised Temporary and short term Could be effectively mitigated	Low	Moderate	SSMP	Low	Moderate
			Operations		Low	Moderate	SSMP	Low	Moderate
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
		High	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Displacement of flora and fauna species from invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	PWMP	Negligible	Low
			Operations		Low	Moderate	PWMP	Negligible	Low
			Decommissioning		Low	Moderate	PWMP RMP DAMP	Negligible	Low
		High	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	SSMP PWMP	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Noise, dust, and light Localised	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Decommissioning	Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan RMP DAMP	Negligible	Low
		High	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Degradation of water quality due to increased sedimentation Localised Temporary and short term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning		Low	Moderate	Draft EM Plan	Low	Moderate
Limited petroleum activities and Linear activities:	HVR flora	High	Construction	Habitat loss from vegetation clearing/removal Contained within the region Short term Can be ameliorated	Moderate	High	Draft EM Plan	Low	Moderate
			Operations	Habitat loss from vegetation clearing/removal No additional clearing	Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
		High	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Displacement of flora and fauna species from invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	PWMP	Negligible	Low
			Operations		Low	Moderate	PWMP	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	SSMP PWMP	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Dust, and light Localised	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Decommissioning	Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan RMP DAMP	Negligible	Low
		High	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
Petroleum activities:		High	Construction	Habitat loss from vegetation clearing/removal Contained within the region Short term Can be ameliorated	Moderate	High	Draft EM Plan	Moderate	High
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
		High	Construction	Displacement of flora and fauna species from invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	PWMP	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Extends beyond disturbance but within region Short-term Can be ameliorated	Low	Moderate	SSMP PWMP	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Dust, and light Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	Dust, and light 0% potentially impacted within Bioregion 11	Negligible	Low	Draft EM Plan RMP DAMP	Negligible	Low

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
		High	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
Limited petroleum activities and Linear activities:	Nature Refuges	High	Construction	Habitat loss from vegetation clearing/removal 0% potentially impacted within Bioregion 11	Negligible	Low	Draft EM Plan	Negligible	Low
			Operations	Habitat loss from vegetation clearing/removal 0% potentially impacted within Bioregion 11	Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Fauna species injury or mortality 0% potentially impacted within Bioregion 11	Negligible	Low	SSMP	Negligible	Low
			Operations		Negligible	Low	SSMP	Negligible	Low
			Decommissioning		Negligible	Low	SSMP	Negligible	Low
		High	Construction	Reduction in biological viability of soil to support growth due to soil compaction 0% potentially impacted within Bioregion 11	Negligible	Low	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Displacement of flora and	Negligible	Low	PWMP	Negligible	Low

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Operations	fauna species from invasion of weeds and pest species 0% potentially impacted within Bioregion 11	Negligible	Low	PWMP	Negligible	Low
			Decommissioning	Displacement of flora and fauna species from invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Negligible	Low	PWMP RMP DAMP	Negligible	Low
		High	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects 0% potentially impacted within Bioregion 11	Negligible	Low	SSMP PWMP	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Noise, dust, and light 0% potentially impacted within Bioregion 11	Negligible	Low	Draft EM Plan	Negligible	Low
			Operations		Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning		Negligible	Low	Draft EM Plan	Negligible	Low
		High	Construction	Increase in litter (waste) 0% potentially impacted within Bioregion 11	Negligible	Low	Draft EM Plan	Negligible	Low
			Operations		Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
Limited petroleum activities and Linear activities:	Resource Reserves	Low	Construction	Habitat loss from vegetation clearing/removal 1.07% potentially impacted within Bioregion 11	Moderate	Low	Draft EM Plan	Moderate	Low
			Operations	Habitat loss from vegetation clearing/removal No additional clearing	Negligible	Negligible	Draft EM Plan	Negligible	Negligible
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		Low	Construction	Fauna species injury or mortality Localised Temporary and short term Could be effectively mitigated	Low	Negligible	SSMP	Low	Negligible
			Operations		Low	Negligible	SSMP	Low	Negligible
			Decommissioning		Low	Negligible	SSMP RMP DAMP	Low	Negligible
		Low	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Negligible	Draft EM Plan	Negligible	Negligible
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		Low	Construction	Displacement of flora and fauna species from	Low	Negligible	PWMP	Negligible	Negligible
			Operations		Low	Negligible	PWMP	Negligible	Negligible

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Decommissioning	invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Negligible	PWMP RMP DAMP	Negligible	Negligible
		Low	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Localised Temporary and short-term Could be effectively mitigated	Low	Negligible	SSMP PWMP	Negligible	Negligible
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		Low	Construction	Noise, dust, and light Localised Temporary and short-term Could be effectively mitigated	Low	Negligible	Draft EM Plan	Negligible	Negligible
			Operations		Low	Negligible	Draft EM Plan	Negligible	Negligible
			Decommissioning		Low	Negligible	Draft EM Plan RMP DAMP	Negligible	Negligible
		Low	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Negligible	Draft EM Plan	Negligible	Negligible
			Operations		Low	Negligible	Draft EM Plan	Negligible	Negligible
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
Limited petroleum activities and Linear activities:	State Forest and Timber Reserves	Moderate	Construction	Habitat loss from vegetation clearing/removal 0.85% potentially impacted within Bioregion 11	Low	Low	Draft EM Plan	Low	Low

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Operations	Habitat loss from vegetation clearing/removal No additional clearing	Negligible	Negligible	Draft EM Plan	Negligible	Negligible
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		Moderate	Construction	Fauna species injury or mortality Localised Temporary and short term Could be effectively mitigated	Low	Low	SSMP	Low	Low
			Operations		Low	Low	SSMP	Low	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		Moderate	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Low	Draft EM Plan	Negligible	Negligible
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		Moderate	Construction	Displacement of flora and fauna species from invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Low	PWMP	Negligible	Negligible
			Operations		Low	Low	PWMP	Negligible	Negligible
			Decommissioning		Low	Low	PWMP RMP DAMP	Negligible	Negligible

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
		Moderate	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Localised Temporary and short-term Could be effectively mitigated	Low	Low	SSMP PWMP	Negligible	Negligible
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		Moderate	Construction	Dust and light Localised Temporary and short-term Could be effectively mitigated	Low	Low	Draft EM Plan	Negligible	Negligible
			Operations		Low	Low	Draft EM Plan	Negligible	Negligible
			Decommissioning		Low	Low	Draft EM Plan RMP DAMP	Negligible	Negligible
		Moderate	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Low	Draft EM Plan	Negligible	Negligible
			Operations		Low	Low	Draft EM Plan	Negligible	Negligible
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
Limited petroleum activities and Linear activities:	EPBC Act TECs: TEC Brigalow	High	Construction	Habitat loss from vegetation clearing/removal 0.97% potentially impacted within GFD Project area	Low	Moderate	Draft EM Plan	Low	Moderate
			Operations	Habitat loss from vegetation clearing/removal No additional clearing	Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
		High	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Displacement of flora and fauna species from invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	PWMP	Negligible	Low
			Operations		Low	Moderate	PWMP	Negligible	Low
			Decommissioning		Low	Moderate	PWMP RMP DAMP	Negligible	Low
		High	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	SSMP PWMP	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Dust and light Localised	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Decommissioning	Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan RMP DAMP	Negligible	Low
		High	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
Limited petroleum activities and Linear activities:	TEC SEVT	High	Construction	Habitat loss from vegetation clearing/removal 2.07% potentially impacted within GFD Project area	Moderate	High	Draft EM Plan	Moderate	High
			Operations	Habitat loss from vegetation clearing/removal No additional clearing	Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Displacement of flora and fauna species from	Low	Moderate	PWMP	Negligible	Low
			Operations		Low	Moderate	PWMP	Negligible	Low

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Decommissioning	invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	PWMP RMP DAMP	Negligible	Low
		High	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	SSMP PWMP	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Dust and light Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning		Low	Moderate	Draft EM Plan RMP DAMP	Negligible	Low
		High	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
Limited petroleum activities and Linear activities:	TEC Coolabah TEC Weeping Myall	High	Construction	Habitat loss from vegetation clearing/removal 2.8 % of TEC Coolabah and 2.15% of TEC Weeping Myall potentially impacted within GFD Project area	Moderate	High	Draft EM Plan	Moderate	High
			Operations	Habitat loss from vegetation clearing/removal No additional clearing	Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Displacement of flora and fauna species from invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	PWMP	Low	Moderate
			Decommissioning		Low	Moderate	PWMP RMP DAMP	Negligible	Low

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
		High	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Dust and light Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Low	Moderate
			Decommissioning		Low	Moderate	Draft EM Plan RMP DAMP	Negligible	Low
		High	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Low	Moderate
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
Limited petroleum activities and Linear activities:	TEC Grasslands QCH TEC Grasslands SQ	High	Construction	Habitat loss from vegetation clearing/removal 1.59% of TEC Grasslands QCH and 1.30% of TEC Grasslands SQ potentially impacted within GFD Project area	Moderate	High	Draft EM Plan	Low	Moderate

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Operations	Habitat loss from vegetation clearing/removal No additional clearing	Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Displacement of flora and fauna species from invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	PWMP	Negligible	Low
			Decommissioning		Low	Moderate	PWMP RMP DAMP	Negligible	Low
		High	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Dust and light Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning		Low	Moderate	Draft EM Plan RMP DAMP	Negligible	Low
		High	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
Limited petroleum activities and Linear activities:	EPBC Act threatened and Migratory fauna species habitat	High	Construction	Habitat loss from vegetation clearing/removal 2.28% potentially impacted within GFD Project area	Moderate	High	Draft EM Plan	Moderate	High
			Operations	Habitat loss from vegetation clearing/removal No additional clearing	Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Fauna species injury or mortality Localised Temporary and short term Could be effectively mitigated	Low	Moderate	SSMP	Low	Moderate
			Operations		Low	Moderate	SSMP	Low	Moderate
			Decommissioning		Low	Moderate	SSMP RMP DAMP	Low	Moderate

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
		High	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Displacement of flora and fauna species from invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	PWMP	Negligible	Low
			Decommissioning		Low	Moderate	PWMP RMP DAMP	Negligible	Low
		High	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Noise, dust, and light Localised	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Decommissioning	Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan RMP DAMP	Negligible	Low
		High	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
Limited petroleum activities and Linear activities:	Cattle egret, Great egret, Squatter pigeon and Rainbow bee-eater habitat	High	Construction	Habitat loss from vegetation clearing/removal 1.82% potentially impacted within GFD Project area	Moderate	High	Draft EM Plan	Low	Moderate
			Operations	Habitat loss from vegetation clearing/removal No additional clearing	Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Fauna species injury or mortality Localised Temporary and short term Could be effectively mitigated	Low	Moderate	SSMP	Low	Moderate
			Operations		Low	Moderate	SSMP	Low	Moderate
			Decommissioning		Low	Moderate	SSMP RMP DAMP	Low	Moderate

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
		High	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Displacement of flora and fauna species from invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	PWMP	Negligible	Low
			Decommissioning		Low	Moderate	PWMP RMP DAMP	Negligible	Low
		High	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Noise, dust, and light Localised	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Decommissioning	Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan RMP DAMP	Negligible	Low
		High	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
Limited petroleum activities and Linear activities:	EPBC Act threatened flora species habitat	High	Construction	Habitat loss from vegetation clearing/removal 1.50% potentially impacted within GFD Project area	Moderate	High	Draft EM Plan	Moderate	High
			Operations	Habitat loss from vegetation clearing/removal No additional clearing	Negligible	Low	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Reduction in biological viability of soil to support growth due to soil compaction Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Displacement of flora and fauna species from	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	PWMP	Negligible	Low

GFD Project activity[1]	Receptors	Sensitivity	Phase	Potential impacts	Pre-mitigated significance		Mitigation measures	Residual significance	
					Magnitude	Significance		Magnitude	Significance
			Decommissioning	invasion of weeds and pest species Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	PWMP RMP DAMP	Negligible	Low
		High	Construction	Biodiversity corridors Edge effects Habitat fragmentation Barrier effects Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations	n/a	n/a	n/a	n/a	n/a	n/a
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a
		High	Construction	Dust and light Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning		Low	Moderate	Draft EM Plan RMP DAMP	Negligible	Low
		High	Construction	Increase in litter (waste) Localised Temporary and short-term Could be effectively mitigated	Low	Moderate	Draft EM Plan	Negligible	Low
			Operations		Low	Moderate	Draft EM Plan	Negligible	Low
			Decommissioning	n/a	n/a	n/a	n/a	n/a	n/a

[1]Limited petroleum activities means any low impact petroleum activity and single well sites (includes observation, pilot, injection and production wells) and associated infrastructure (water pumps and generators, sumps, flare pits or dams) located on the well site, multi-well sites and associated infrastructure (water pumps and generators, sumps, flare pits, dams or tanks) located on the well sites, construction of new access tracks that are required as part of the construction or servicing a petroleum activity, upgrading or maintenance of existing roads or tracks, power and communication lines, gas gathering lines from a well site to the initial compression facility, water gathering lines from a well site to the initial water storage or dam, and camps within well site that may involve sewage treatment works that are a no release works.

[1] Linear activities means linear infrastructure including (but not limited to) gas and water gathering lines, low and high pressure gas and water pipelines, powerlines, communication, roads and access tracks (associated with limited petroleum activities and petroleum activities).

18.8 Conclusions

The assessment of potential impacts on terrestrial ecology, ESAs and MNES values identified the residual risks shown in Table 18-15. The significance assessment found that the residual impacts to terrestrial ecology values over the life of the project are considered to range from negligible to high, and that the GFD Project's management framework (outlined in Table 18-13) would accommodate the majority of impacts to terrestrial ecology, ESAs and MNES values.

Table 18-15 Residual significance – terrestrial ecology, environmentally sensitive areas and MNES

Environmental value	Potential impact	Residual significance		
		Construction	Operations	Decommissioning
Endangered vegetation (RE and HVR)	Habitat loss from vegetation clearing/removal	Moderate	Low	Low
	Reduction in biological viability of soil to support growth due to soil compaction	Low	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Low	Low	Low
	Reduction of biodiversity corridors	Low	n/a	n/a
	Edge effects			
	Habitat fragmentation			
	Barrier effects			
	Dust and light	Low	Low	Low
	Increase in litter (waste)	Low	Low	n/a
Of concern vegetation (RE and HVR)	Habitat loss from vegetation clearing/removal	High	Low	n/a
	Reduction in biological viability of soil to support growth due to soil compaction	Low	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Low	Low	Low
	Reduction of biodiversity corridors	Low	n/a	n/a
	Edge effects			
	Habitat fragmentation			
	Barrier effects			
	Dust and light	Low	Low	Low
	Increase in litter (waste)	Low	Low	n/a
Essential Habitat	Habitat loss from vegetation clearing/removal	Moderate	Low	n/a
	Fauna species injury or mortality	Moderate	Moderate	Moderate
	Reduction in biological viability of soil to support growth due to soil compaction	Low	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Low	Low	Low
	Reduction of biodiversity corridors	Low	n/a	n/a
	Edge effects			
	Habitat fragmentation			

Environmental value	Potential impact	Residual significance		
		Construction	Operations	Decommissioning
	Barrier effects			
	Noise, dust and light	Low	Low	Low
	Increase in litter (waste)	Low	Low	n/a
HES Wetlands	Habitat loss from vegetation clearing/removal	Moderate	Low	n/a
	Fauna species injury or mortality	Moderate	Moderate	n/a
	Reduction in biological viability of soil to support growth due to soil compaction	Low	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Low	Low	Low
	Reduction of biodiversity corridors	Low	n/a	n/a
	Edge effects			
	Habitat fragmentation			
	Barrier effects			
	Noise, dust and light	Low	Low	Low
	Increase in litter (waste)	Low	Low	n/a
	Degradation of water quality due to increased sedimentation	Low	Low	Moderate
HVR flora	Habitat loss from vegetation clearing/removal	High	Low	n/a
	Reduction in biological viability of soil to support growth due to soil compaction	Low	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Low	Low	n/a
	Reduction of biodiversity corridors	Low	n/a	n/a
	Edge effects			
	Habitat fragmentation			
	Barrier effects			
	Dust and light	Low	Low	Low
	Increase in litter (waste)	Low	Low	n/a
Nature Refuges	Habitat loss from vegetation clearing/removal	Low	Low	n/a
	Fauna species injury or mortality	Low	Low	Low
	Reduction in biological viability of soil to support growth due to soil compaction	Low	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Low	Low	Low
	Reduction of biodiversity corridors	Low	n/a	n/a
	Edge effects			
	Habitat fragmentation			
	Barrier effects			

Environmental value	Potential impact	Residual significance		
		Construction	Operations	Decommissioning
	Noise, dust and light	Low	Low	Low
	Increase in litter (waste)	Low	Low	n/a
Resource Reserves	Habitat loss from vegetation clearing/removal	Low	Negligible	n/a
	Fauna species injury or mortality	Negligible	Negligible	Negligible
	Reduction in biological viability of soil to support growth due to soil compaction	Negligible	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Negligible	Negligible	Negligible
	Reduction of biodiversity corridors	Negligible	n/a	n/a
	Edge effects			
	Habitat fragmentation			
	Barrier effects			
	Noise, dust and light	Negligible	Negligible	Negligible
	Increase in litter (waste)	Negligible	Negligible	n/a
State Forest and Timber Reserves	Habitat loss from vegetation clearing/removal	Low	Negligible	n/a
	Fauna species injury or mortality	Low	Low	n/a
	Reduction in biological viability of soil to support growth due to soil compaction	Negligible	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Negligible	Negligible	Negligible
	Reduction of biodiversity corridors	Negligible	n/a	n/a
	Edge effects			
	Habitat fragmentation			
	Barrier effects			
	Dust and light	Negligible	Negligible	Negligible
	Increase in litter (waste)	Negligible	Negligible	n/a
TEC Brigalow	Habitat loss from vegetation clearing/removal	Moderate	Low	n/a
	Reduction in biological viability of soil to support growth due to soil compaction	Low	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Low	Low	Low
	Reduction of biodiversity corridors	Low	n/a	n/a
	Edge effects			
	Habitat fragmentation			
	Barrier effects			
	Dust and light	Low	Low	Low
	Increase in litter (waste)	Low	Low	n/a

Environmental value	Potential impact	Residual significance		
		Construction	Operations	Decommissioning
TEC SEVT	Habitat loss from vegetation clearing/removal	High	Low	n/a
	Fauna species injury or mortality	Moderate	Moderate	Moderate
	Reduction in biological viability of soil to support growth due to soil compaction	Low	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Low	Low	Low
	Reduction of biodiversity corridors	Low	n/a	n/a
	Edge effects			
	Habitat fragmentation			
	Barrier effects			
	Dust and light	Low	Low	Low
	Increase in litter (waste)	Low	Low	n/a
TEC Coolabah TEC Weeping Myall	Habitat loss from vegetation clearing/removal	High	Low	n/a
	Reduction in biological viability of soil to support growth due to soil compaction	Low	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Low	Moderate	Low
	Reduction of biodiversity corridors	Low	n/a	n/a
	Edge effects			
	Habitat fragmentation			
	Barrier effects			
	Dust and light	Low	Moderate	Low
	Increase in litter (waste)	Low	Moderate	n/a
TEC Grasslands Queensland Central Highlands TEC Grasslands southern Queensland	Habitat loss from vegetation clearing/removal	Moderate	Low	n/a
	Reduction in biological viability of soil to support growth due to soil compaction	Low	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Low	Low	Low
	Reduction of biodiversity corridors	Low	n/a	n/a
	Edge effects			
	Habitat fragmentation			
	Barrier effects			
	Dust and light	Low	Low	Low
	Increase in litter (waste)	Low	Low	n/a

Environmental value	Potential impact	Residual significance		
		Construction	Operations	Decommissioning
EPBC Act threatened and Migratory fauna species habitat	Habitat loss from vegetation clearing/removal	High	Low	n/a
	Fauna species injury or mortality	Moderate	Moderate	Moderate
	Reduction in biological viability of soil to support growth due to soil compaction	Low	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Low	Low	Low
	Reduction of biodiversity corridors	Low	n/a	n/a
	Edge effects			
	Habitat fragmentation			
	Barrier effects			
	Noise, dust and light	Low	Low	Low
	Increase in litter (waste)	Low	Low	n/a
Cattle egret, Great egret, Squatter pigeon and Rainbow bee-eater habitat	Habitat loss from vegetation clearing/removal	Moderate	Low	n/a
	Fauna species injury or mortality	Moderate	Moderate	Moderate
	Reduction in biological viability of soil to support growth due to soil compaction	Low	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Low	Low	Low
	Reduction of biodiversity corridors	Low	n/a	n/a
	Edge effects			
	Habitat fragmentation			
	Barrier effects			
	Noise, dust and light	Low	Low	Low
	Increase in litter (waste)	Low	Low	n/a
EPBC Act threatened flora species habitat	Habitat loss from vegetation clearing/removal	High	Low	n/a
	Reduction in biological viability of soil to support growth due to soil compaction	Low	n/a	n/a
	Displacement of flora and fauna species from invasion of weeds and pest species	Low	Low	Low
	Reduction of biodiversity corridors	Low	n/a	n/a
	Edge effects			
	Habitat fragmentation			
	Barrier effects			
	Dust and light	Low	Low	Low
	Increase in litter (waste)	Low	Low	n/a