Santos GLNG Gas Fields Development Project

Stage 1 Offset Plan 2016 - 2021

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Abbreviations

Acronym	Description
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999
CSG	Coal Seam Gas
GLNG	Gladstone Liquefied Natural Gas
GTP	Gas Transmission Pipeline
MNES	Matters of National Environmental Significance
TEC	Threatened Ecological Community
SEVT	Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions
SSMP	Significant Species Management Plan

1.0 Introduction

1.1 The GFD Project

The GFD Project extends the approved GLNG Project's gas fields and will provide additional gas over more than 30 years. In addition to existing approvals, the GFD Project will continue to progressively develop the Arcadia, Fairview, Roma and Scotia gas fields across 35 Santos GLNG petroleum tenures in the Surat and Bowen basins, and associated supporting infrastructure in these tenures and adjacent areas.

This Offset Plan has been developed to meet the requirements provided for in the Santos GLNG Gas Field Development (GFD) Project approval (EPBC 2012/6615) to offset project impacts on Matters of National Environmental Significance (MNES) associated with the progressive development of the GFD Project.

1.2 Purpose

The purpose of this Offset Plan is to outline the management objectives, actions and outcomes necessary to fulfil Santos GLNG's statutory offset requirements. Under the Santos GLNG Gas Field Development (GFD) Project approval (EPBC 2012/6615), Santos GLNG may carry out the action in project stages over time. Santos GLNG must deliver environmental offsets for actual residual significant impacts to matters of national environmental significance over time. This offsets plan has been prepared for the first 5 years of activity for the GFD Project.

1.3 Scope

The GFD Project includes activities in the Scotia Gas Field (See Figure 1). The Scotia field (PL 176) is located approximately 145 km northeast of Roma. Through the implementation of Santos GLNG's comprehensive planning and infrastructure location process all reasonable avoidance measures have been put in place to avoid MNES values.

The offset obligations discussed in this Offset Plan do not include the offset obligations required by the:

- Santos GLNG Gas Fields EPBC Act approval (2008/4059);
- Santos GLNG Gas Transmission Pipeline (GTP) EPBC Act approval (2008/4096); or
- Santos GLNG LNG Facility EPBC Act approval (2008/4057).

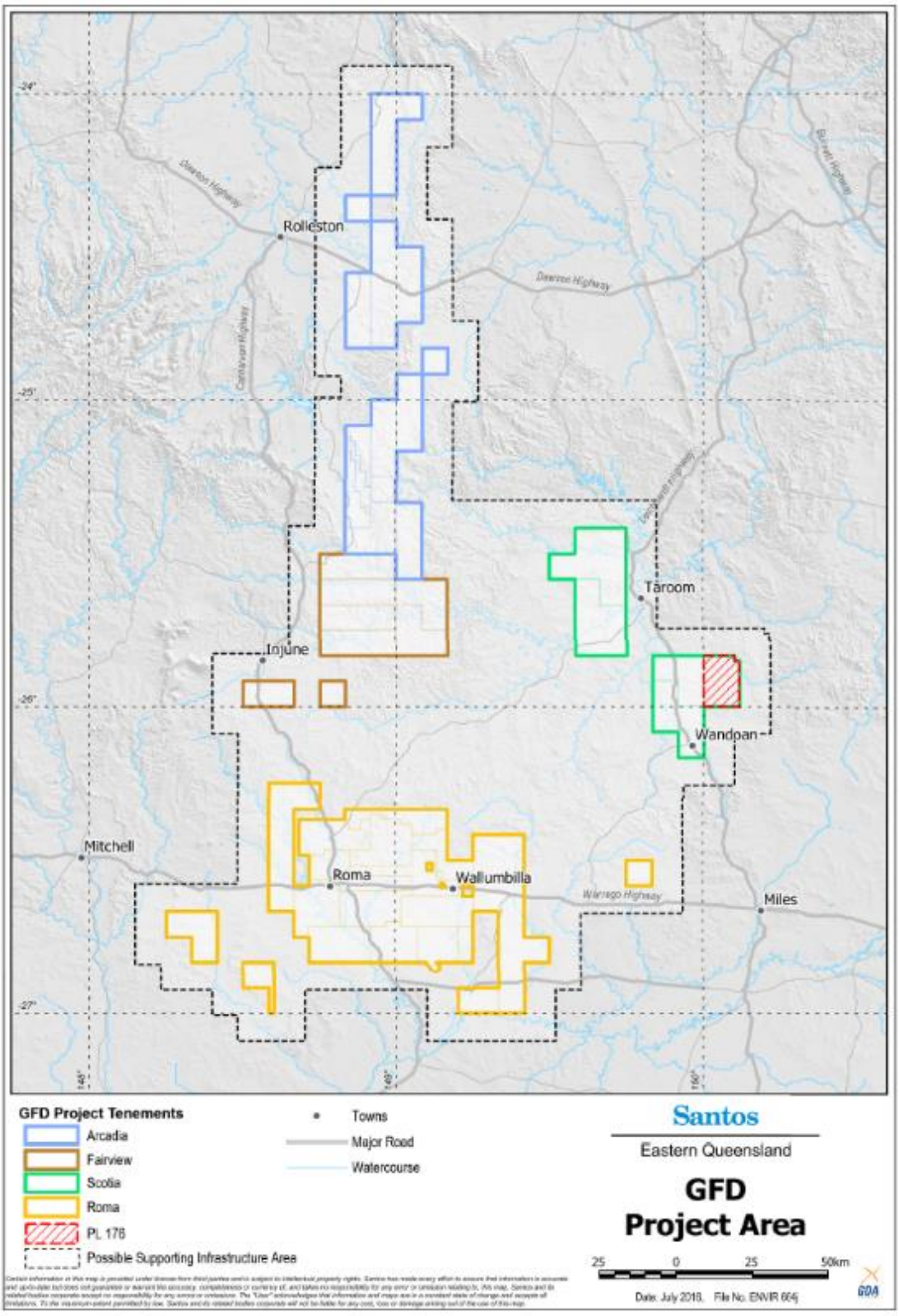

Figure 1: The location of Scotia and PL 176

2.0 Legal and Other Requirements

2.1 The Environmental Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act)

The EPBC Act is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora and fauna species and ecological communities. The EPBC Act focuses Australian Government interests on the protection of Matters of National Environmental Significance (MNES), with the states and territories having responsibility for matters of state and local significance. MNES includes listed threatened species and communities.

The EPBC Act provides the primary source of environmental offset obligations for the Santos GLNG GFD Project via the EPBC Act Approval No EPBC 2012/6615. The approval conditions that relate to offsets and how they are addressed by this plan is provided in Table 1. This approval requires Santos GLNG to offset residual significant impacts. Specifically the EPBC Act Approval 2012/6615 states that the environmental offsets comply with the principles of the EPBC Act Environmental Offsets Policy. The overarching principles that are applied in determining the suitability of offsets are set out in the policy. These principles are listed below.

Suitable offsets must:

1. deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environment law and affected by the proposed action
2. be built around direct offsets but may include other compensatory measures
3. be in proportion to the level of statutory protection that applies to the protected matter
4. be of a size and scale proportionate to the residual impacts on the protected matter
5. effectively account for and manage the risks of the offset not succeeding
6. be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs (this does not preclude the recognition of state or territory offsets that may be suitable as offsets under the EPBC Act for the same action, see section 7.6)
7. be efficient, effective, timely, transparent, scientifically robust and reasonable
8. have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.

In assessing the suitability of an offset, government decision-making will be:

9. informed by scientifically robust information and incorporate the precautionary principle in the absence of scientific certainty
10. conducted in a consistent and transparent manner.

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Table 1: Santos GLNG Gas Field Development Project (EPBC 2012/6615) Offset Conditions

Condition		How the conditions are met
EPBC Act approval 2012/6615		
11	The approval holder must ensure that environmental offsets comply with the principles of the EPBC Act Environmental Offsets Policy.	This plan complies with the principles of the EPBC Act Environmental Offsets Policy and the principles of the EPBC Act Environmental Offsets Policy are discussed in Section 2.1.
12	The approval holder may carry out the action in project stages. The approval holder must deliver environmental offsets for residual significant impacts to matters of national environmental significance for each project stage.	The action will be carried out in stages. This Project Offset Plan covers the 5 year development period from 2016 – 2021.
13	The approval holder must submit an Offset Management Plan for the Minister's written approval. The Offset Management Plan may be prepared and submitted to the Minister for written approval in stages. If the approval holder submits the Offset Management Plan in stages, each stage of the Offset Management Plan must correspond with a project stage.	This plan has been submitted for the Minister's written approval. This Project Offset Plan covers a 5 year development period from 2016 – 2021 (the project stage).
14	The Offset Management Plan must include: a. a method for assessing residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities; b. results from pre-disturbance surveys and/or an alternative approved methodology (if used) for the project stage as required under conditions 4 and 5; c. details of the offset areas required to address residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities for the project stage; d. a survey and description of the current condition (prior to any management activities) of each offset area proposed, including existing vegetation (the baseline condition). This must include a shapefile of each offset property boundary; e. information about how the offset areas provide connectivity with other relevant habitats and biodiversity corridors, including a map depicting the offset areas in relation to other habitats and biodiversity corridors;	a. A method for assessing residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities is provided in Section 3.1, Section 4.1 and Appendix B. b. Details of the relevant field assessment is provided in Section 3.1. The primary field assessment relied upon for the impact site is provided as Appendix A. c. The offset area is the Springwater Offset Area (SOA) details of the SOA are provided in Section 5.0. d. Details of the baseline surveys is provided in Section 5.2. The assessment on Springwater forms part of a combined Biodiversity Offset Assessment for three contiguous properties within the Fairview gas field. These reports were provided as

Condition		How the conditions are met
	f. performance and completion criteria for evaluating the management of the offset area, and criteria for triggering remedial action (if necessary); g. a description of the management measures that will be implemented for the protection of EPBC threatened species, EPBC migratory species and EPBC communities, including a discussion of how measures outlined take into account relevant conservation advice and are consistent with the measures in relevant recovery plans and threat abatement plans; h. a program to monitor and report on the effectiveness of these measures, and progress against the performance and completion criteria; i. a description of potential risks to the successful implementation of the plan, and a description of the contingency measures that would be implemented to mitigate against these risks; j. a timeline for when actions identified in the Offset Management Plan will be implemented for each offset area; and k. the proposed legal mechanism for securing the offset.	additional materials with the submission of the draft Offset Management Plan. e. The connectivity and the landscape context of the SOA are discussed in detail in Section 5.3.1. f. Performance criteria, trigger levels and remedial actions for management activity undertaken in the SOA are discussed Table 19. g. Management measures implemented for the protection of MNES, including how measures outlined take into account relevant conservation advice and are consistent with the measures in relevant recovery plans and threat abatement plans is provided in Section 8.0. h. The monitoring program for the SOA is outlined in Section 9.0. i. Risks to the successful implementation of this plan are outlined in Table 18. j. A column detailing when the activity will be carried out is provided for in Table 19. k. Section 6.3 details how the offset for GFD Project will be legally secured.
15	The approval holder must not commence the action until the Offset Management Plan has been approved by the Minister in writing. The approved Offset Management Plan must be implemented by the approval holder.	This offsets plan complements previous offsets plans and proposals submitted to the department. Once approved, this plan will be implemented.
16	The approval holder must register and legally secure offsets for the first project stage identified in the Offset Management Plan within two years of commencement of the action.	Currently there are no actions proposed within any offset areas subject to this plan.
17	The approval holder must register and legally secure offsets for a project stage which are sufficient to acquit the residual significant impacts of that project stage.	The offset for GFD Project will be secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the Vegetation Management Act 1999. See Section 6.3.

Condition		How the conditions are met
18	If the approval holder submits the Offset Management Plan in stages, the approval holder must prepare and submit an updated Offset Management Plan for each subsequent project stage, for written approval by the Minister. The updated Offset Management Plan must: a. include the information required for the Offset Management Plan at condition 14 for the relevant project stage; b. include a reconciliation of actual residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities against offsets secured for the previous project stage. The reconciled offset obligations may be subtracted from the obligations required for the subsequent project stage; and c. demonstrate how the offset builds on offsets already secured for previous project stages and will contribute to a larger strategic offset for cumulative project impacts.	A new offset plan will be submitted for all subsequent stages of the project.
19	The approval holder must not commence the subsequent project stage until: a. the Offset Management Plan, updated for that project stage, has been approved by the Minister in writing; and b. the offset for that project stage has been registered and legally secured in accordance with Queensland legislation.	This management plan is submitted for the approval of the Minister.

3.0 Offset Assessment Methodology

3.1 Ecological Surveys and Assessments

A detailed review of the species identified in the maximum disturbance limits table (annex 1 of the GFD approval) was conducted to determine what MNES are known or likely to occur within the Scotia development areas. Whether a particular species is expected to occur within the PL 176 was previously assessed and documented in the *SSMP Report Review of the Presence of Fauna and Flora Listed in the Significant Species Management Plan for the Santos GLNG Gas Field Development (GFD) Project* (BOOBOOK (2015)).

A targeted terrestrial ecology assessment was undertaken by AECOM in November and December 2015. The purpose of this assessment was to provide baseline ecological data for the GFD project generally and to inform this offsets plan. The assessment involved a desktop literature review and a field survey. The literature review analysed existing biodiversity data to identify the potential presence of conservation significant values including Regional Ecosystems as well as habitat flora and fauna species. The results of the literature review were used to identify field assessment locations where ecological were values documented. The field assessment methodology included:

- Functional regional ecosystem assessment
- Assessment of significant fauna habitat for a number of significant species
- Vegetation community mapping
- Habitat mapping

The Scotia ecology survey report is provided as Appendix B.

3.2 Methodology for Assessing Residual Significant Impacts

The EPBC Act Environmental Offsets Policy states that 'environmental offsets' are measures that compensate for the residual adverse impacts of an action on the environment and defines residual adverse impacts as those impacts which remain after avoidance and mitigation measures have been implemented. The EPBC Act environmental offsets policy requires residual adverse impacts to be offset if the impact is considered to be 'significant' as defined by the 'Matters of National Environmental Significance – Significant Impact Guidelines Version 1.1' (DotE 2013).

An assessment of residual significant impacts to EPBC Act threatened species, EPBC Act migratory species and EPBC Act communities for the first phase (years 1 – 5) of development was conducted. This assessment involved a review of ecological survey results undertaken by AECOM in November and December 2015 (See Section 3.1) and the relevant significant impact guidelines. Adaptive Strategies Pty Ltd were engaged to assess the residual significant impacts to threatened fauna and threatened ecological communities. The results of the final residual significant impact assessment are provided in Section 4.1.

3.3 The EPBC Act "Offsets Assessment Guide"

The Offsets assessment guide has been developed in order to give effect to the requirements of the EPBC Act environmental offsets policy and utilises a balance sheet approach to estimate impacts, and offsets for threatened species and ecological communities. The guide is a tool to assist expert users in the department in determining the suitability of offset proposals. If the department determines that a proposed offset is not adequate in compensating for a proposed impact, the department will advise the

proponent of this, and the proponent will have an opportunity to revise their offset proposal. The guide is comprised of four parts:

- Matter of National Environmental Significance assessment box,
- Impact calculator,
- Offset calculator,
- Summary box.

The quantum and value of inputs used in the EPBC Act "Offsets Assessment Guide" was guided by the document titled "*How to use the offsets assessment guide*". The key components of the guide are the Impact Calculator and Offset Calculator. Once the inputs have been provided for the Impact Calculator and Offset Calculator the offsets assessment guide provides the results as a percentage of impact offset, where >100% indicates that all of the impact has been offset and >90% indicates that the Minimum (90%) direct offset requirement from the EPBC Act environmental offsets policy has been met. The inputs for the impact calculator and offsets calculator as well as the results are provided in below in Section 6.0.

4.0 GFD Offset Obligations Years 1 – 5

The productive soils that dominate the land surface of Petroleum Lease (PL) 176 have led to significant levels of historic clearing for agriculture and pasture development. The historic land clearing events and agricultural developments in PL 176 result in a highly modified landscape with limited ecological value.

The EPBC Act and Offsets Policy require and residual significant impacts to be offset. The residual significant impact assessment results are discussed in detail below.

4.1 Final Residual Significant Impacts

4.1.1 Migratory Species

All EPBC act listed migratory species with potential to occur within PL 176 can best be described as passage or seasonal migrant or widely distributed and common species'. In 2015, the Department released The *Draft EPBC Act referral guidelines for 14 birds listed migratory under the EPBC Act*. This guideline states that 'In most cases, significant impacts on these 14 birds are unlikely to occur'. Figure 1 of the referral guidelines provides a decision-making process and states that there is a low risk of a significant impact if the proposed activity is **NOT** likely to:

- substantially modify, destroy or isolate an area of important habitat for any of the 14 migratory birds; or
- seriously disrupt the lifecycle of an ecologically significant proportion of a population of one or more of the migratory birds.

In addition, the Draft *EPBC Act Policy Statement 3.21 – Significant Impact Guidelines for 36 Migratory Shorebird Species* states that having considered the threats to migratory shorebirds and their habitats across Australia, and in consultation with species experts, the Department is of the view that the actions contained in Table 2 may constitute a significant impact on migratory shorebirds.

Table 2 Significant Impact Assessment for Migratory Shorebirds

Ecological element affected	Significant impact assessment	Comment
Important habitat	***Loss*** of important habitat	The loss (for example, clearing, infilling or draining) of important habitat areas is likely to have a significant impact on migratory shorebirds when it results in a reduction in the capacity of the habitat to support migratory shorebirds. The magnitude of the impact may increase with the number of shorebirds using the area, the regional significance of the site and/or the extent to which the loss reduces carrying capacity.
	Degradation of important habitat leading to a substantial reduction in migratory shorebirds using the site	Defining substantial reduction will need to be made on a case-by-case basis. Factors to consider will include:

	Increased ***disturbance*** leading to a *substantial reduction* in migratory shorebirds using important habitat	• the number of migratory shorebirds historically using a site (based on surveys and historical data) • likely resultant changes in bird numbers and species diversity • alterations to the value, quality, geographic extent of the site (for example, will the site still be classed as important habitat)
	Direct mortality of birds leading to a *substantial reduction* in migratory shorebirds using important habitat	

The significance test prescribed in these two documents has been applied in consideration of the GFD Project development. All listed migratory species are unlikely to be significantly impacted by the proposed development as activities will not substantially modify, degrade, destroy, destroy or isolate an area of important habitat for any migratory bird species and will not seriously disrupt the lifecycle of an ecologically significant proportion of a population. In addition, the project is not expected to result in the direct mortality of migratory bird species.

There are no residual significant impacts to migratory species that result from Stage 1.

4.1.2 Threatened Ecological Communities

Within PL 176, three REs mapped align with the Brigalow (*Acacia harpophylla* dominant and codominant) EPBC Act TEC, RE 11.3.1, 11.9.1 and 11.9.5. Where these communities are present as functional regrowth, EPBC TEC status also applies. Four polygons within these target REs did not meet the key diagnostic characteristics of the Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC and therefore have been excluded from the TEC mapping. The maximum potential area of impact as a result of Stage 1 is 8.26 ha and is shown in Figure 2.

The final assessment of residual significant impacts indicates that there are no residual significant impacts to TECs that result from Stage 1. The full residual significant impact assessment is provided in Appendix B.

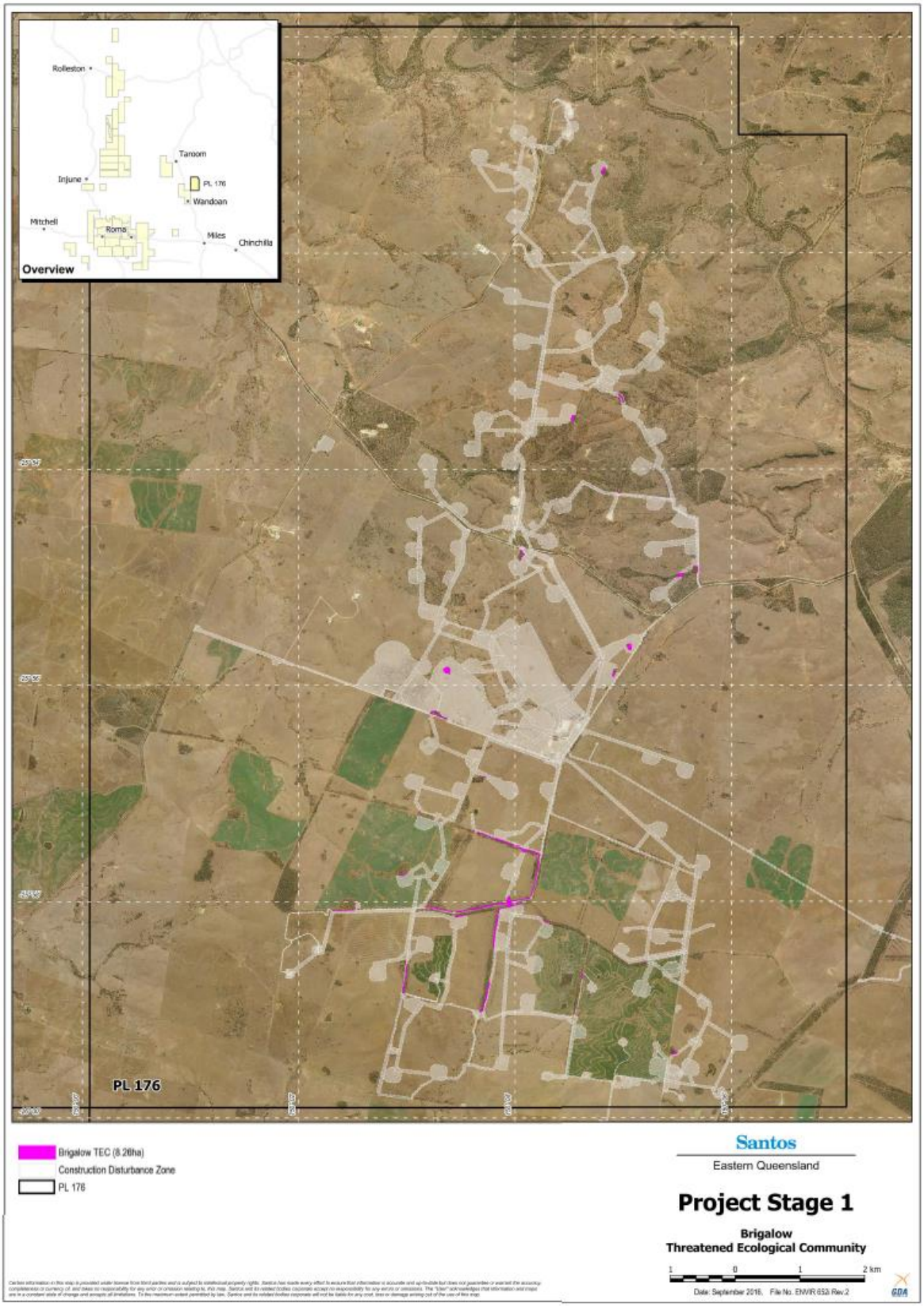

Figure 2: Maximum Potential Area of Impact – Brigalow TEC

4.1.3 Threatened Flora Habitats

Historic clearing for agriculture that dominate Scotia and the number of ecological assessments conducted by Santos GLNG that have failed to locate any EPBC act listed threatened flora species. This indicates that it is unlikely that any EPBC act listed threatened flora species will be impacted by development activities.

The desktop assessment identified *Homopholis belsonii* as potentially occurring within PL 176 however, the location of the project is north of any known records of this species and the extensive historic surveys of PL 176 have failed to identify this species. No areas of *Homopholis belsonii* have been mapped.

There are no residual significant impacts to threatened flora species that result from Stage 1.

4.1.4 Threatened Fauna Habitats

The threatened fauna habitat assessment (AECOM 2015) identified six EPBC Act listed fauna species that are predicted or known to be present within PL176. Of these, five species were mapped as having habitat intersected by development of PL 176. The maximum potential area of impact and the residual significant impact as a result of Stage 1 is provided in Table 3. The extent of habitat in PL176 is shown in Figure 3 to Figure 7.

Table 3: Impacts to Threatened Fauna Species

MNES	EPBC Status*	Predicted or known to be impacted	Estimated Maximum Impact Area (ha)	Residual significant impact
Australian Painted Snipe (*Rostratula australis*)	E	**No** – Suitable habitat is present within PL 176 associated with Bungaban Creek in the north of the tenement. Any development in PL 176 is expected to occur to the south of this order four watercourse and is unlikely to impact this watercourse.	0	0
Ornamental Snake (*Denisonia maculata*)	V	**No** – The southern extent of the distribution of this taxon is poorly known (BOOBOOK unpublished data), reflecting limited survey effort in this area. However, PL 176 is modelled to be at the limits of the species expected range. Suitable habitat is present within PL 176 associated with Bungaban Creek in the north of the tenement. Any development in PL 176 is expected to occur to the south of this order four watercourse and is unlikely to impact this watercourse.	0	0
Grey-headed Flying-fox (*Pteropus poliocephalus*)	V	**No** - Records of this taxon within south central Queensland are marginal to the range of the species, with a single Wildlife Online record (ALA 2015) to the north of ATP803. Its presence within the GFD area is likely to include rare vagrant individuals only (i.e. the species is not resident in this area).	0	0
South-eastern long-eared bat (*Nyctophilus corbeni*)	V	**Yes** - The distribution and habitat preferences of this species are very poorly known (Reardon 2012). It inhabits a range of dry forest types in south central Queensland. In PL176 habitat for this species has been mapped in areas of regrowth or remnant vegetation anywhere where hollow bearing trees are located within 1 km.	**4.38**	**0**
Koala (*Phascolarctos cinereus*)	V	**Yes** – There are records for this species in proximity to PL176 including records upstream and downstream of Bungaban Creek (ALA 2015). In PL176 habitat for this species has been mapped in areas that support koala food trees.	**2.88**	**0**

MNES	EPBC Status*	Predicted or known to be impacted	Estimated Maximum Impact Area (ha)	Residual significant impact
Collared delma (*Delma torquata*)	V	**Yes** - This taxon is difficult to detect due to its fossorial habits. Recent work has greatly expanded both the known distribution and habitat (Peck 2012). However, given the difficult detectability, habitat for this species has been mapped in all areas of regrowth and remnant vegetation that contain features that can be utilised for cover.	**8.80**	**0**
Dunmall's snake (*Furina dunmalli*)	V	**Yes** - The distribution and habitat preferences of this species are very poorly understood though there is some indication that it prefers woodlands and open forests with abundant woody debris (Hobson 2012). However, given the difficult detectability, habitat for this species has been mapped in all areas of regrowth and remnant vegetation that contain features that can be utilised for cover.	**8.80**	**0**
Yakka skink (*Egernia rugosa*)	V	**Yes** – This taxon is considered likely to be widespread in PL 176. Given the Yakka Skink's difficult detectability, habitat for this species has been mapped in areas of regrowth and remnant vegetation that contain significant features that can be utilised for cover (burrow complexes, sink holes, hollow logs).	**7.00**	**0**

The final assessment of residual significant impacts indicates that there are no residual significant impacts to threatened fauna that result from Stage 1. The full residual significant impact assessment is provided in Appendix B.

There are no residual significant impacts to threatened fauna species that result from Stage 1.

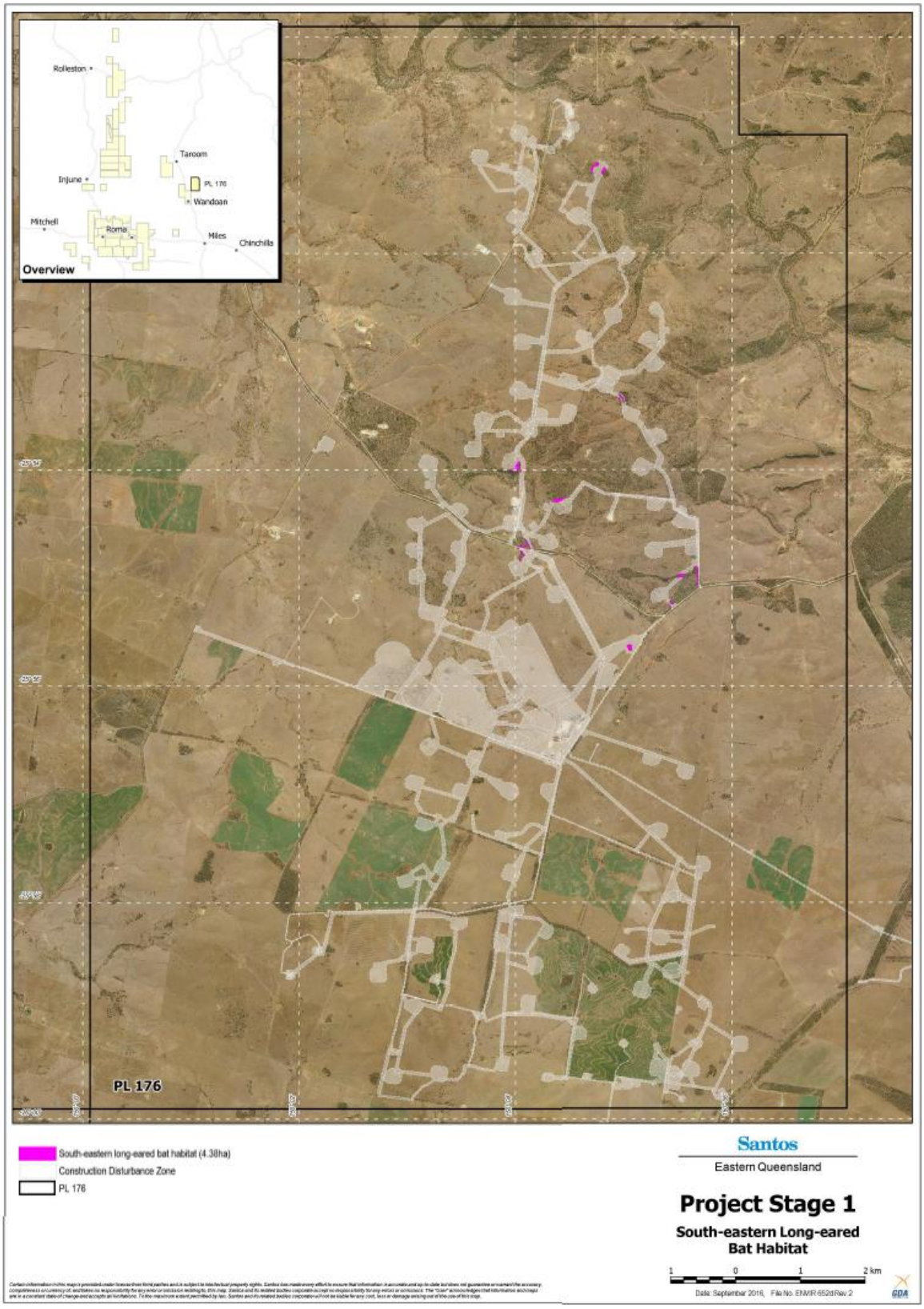

Figure 3: Maximum Potential Area of Impact – South-eastern Long-eared Bat

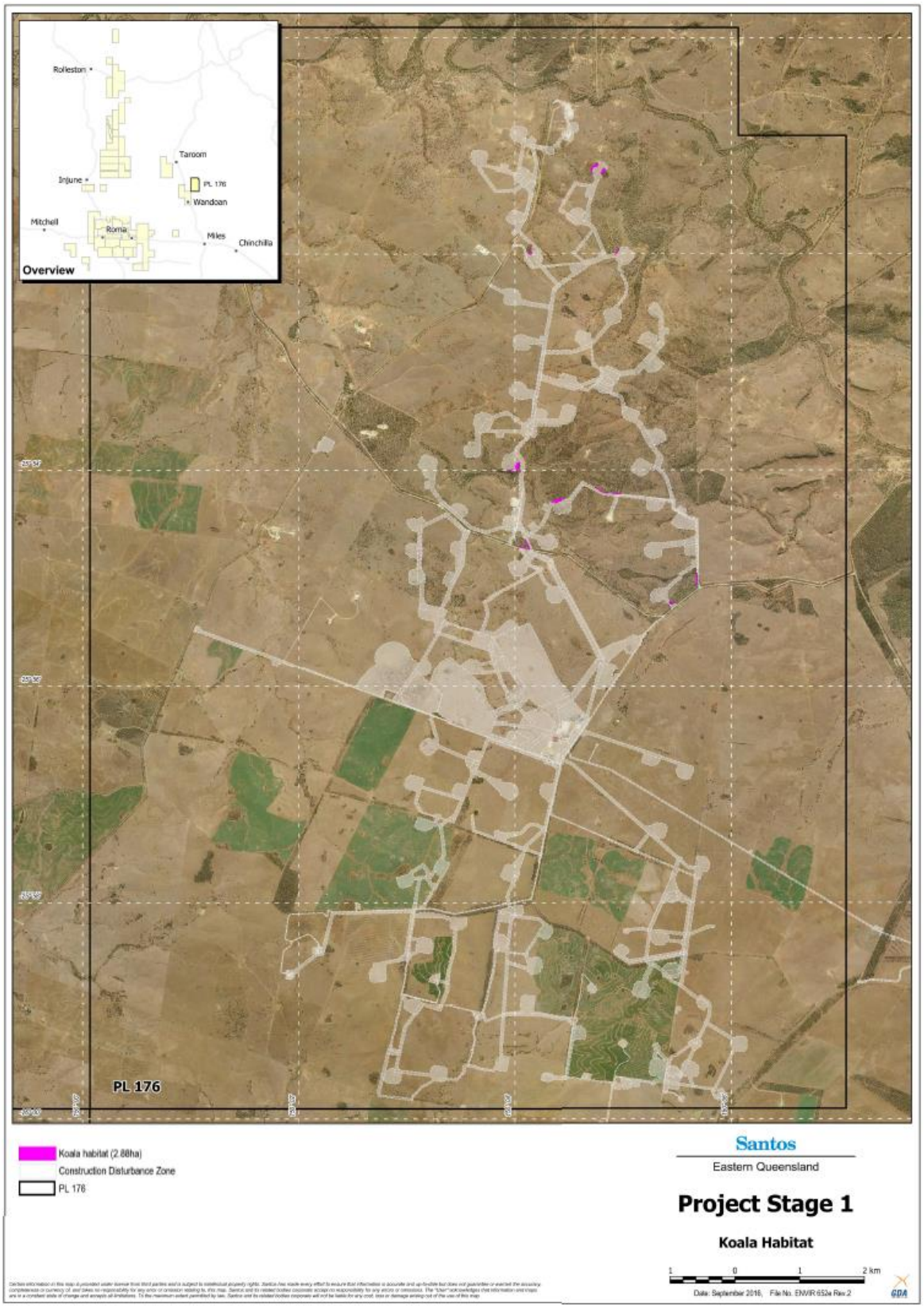

Figure 4: Maximum Potential Area of Impact – Koala

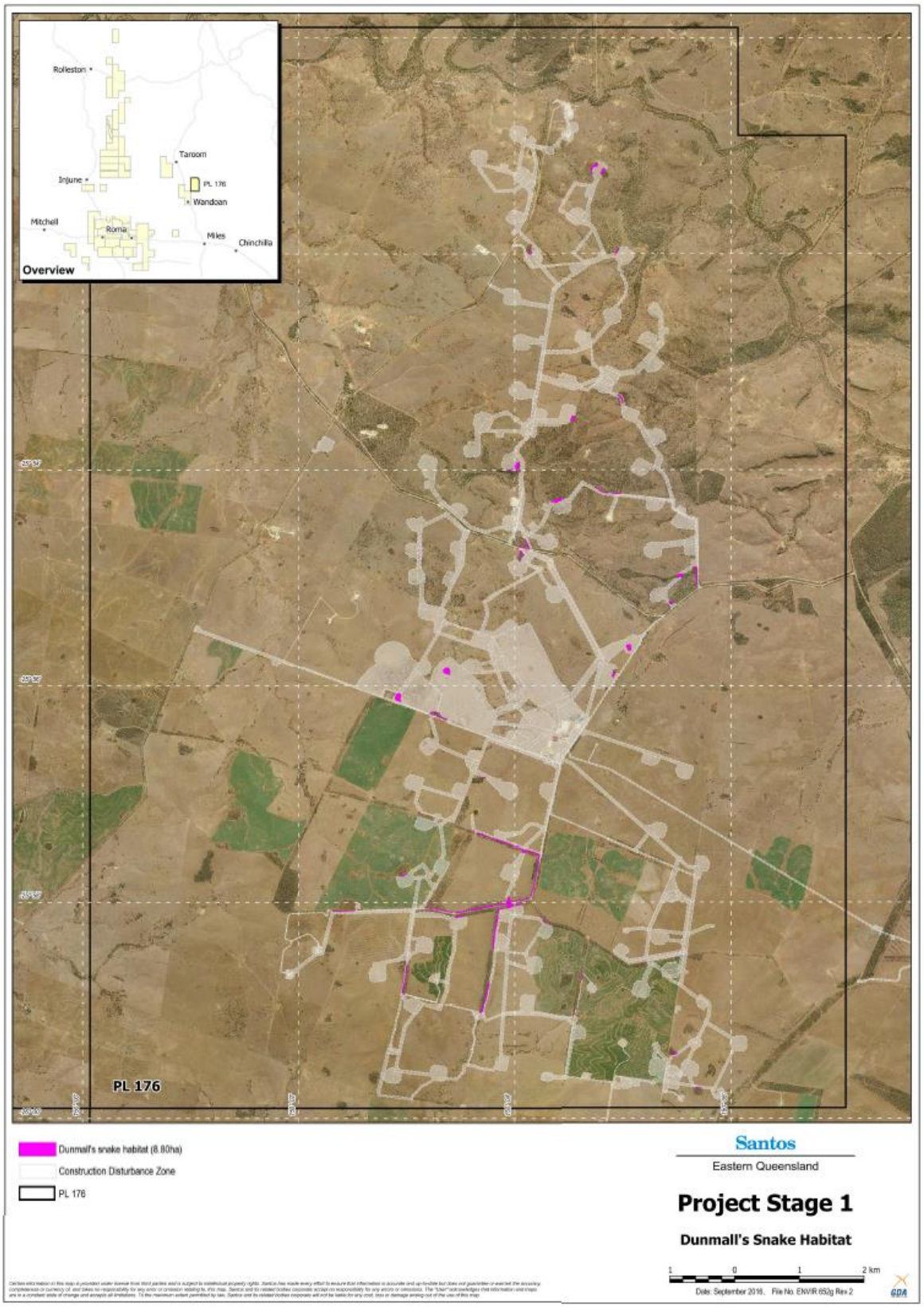

Figure 5: Maximum Potential Area of Impact – Dunmall's Snake

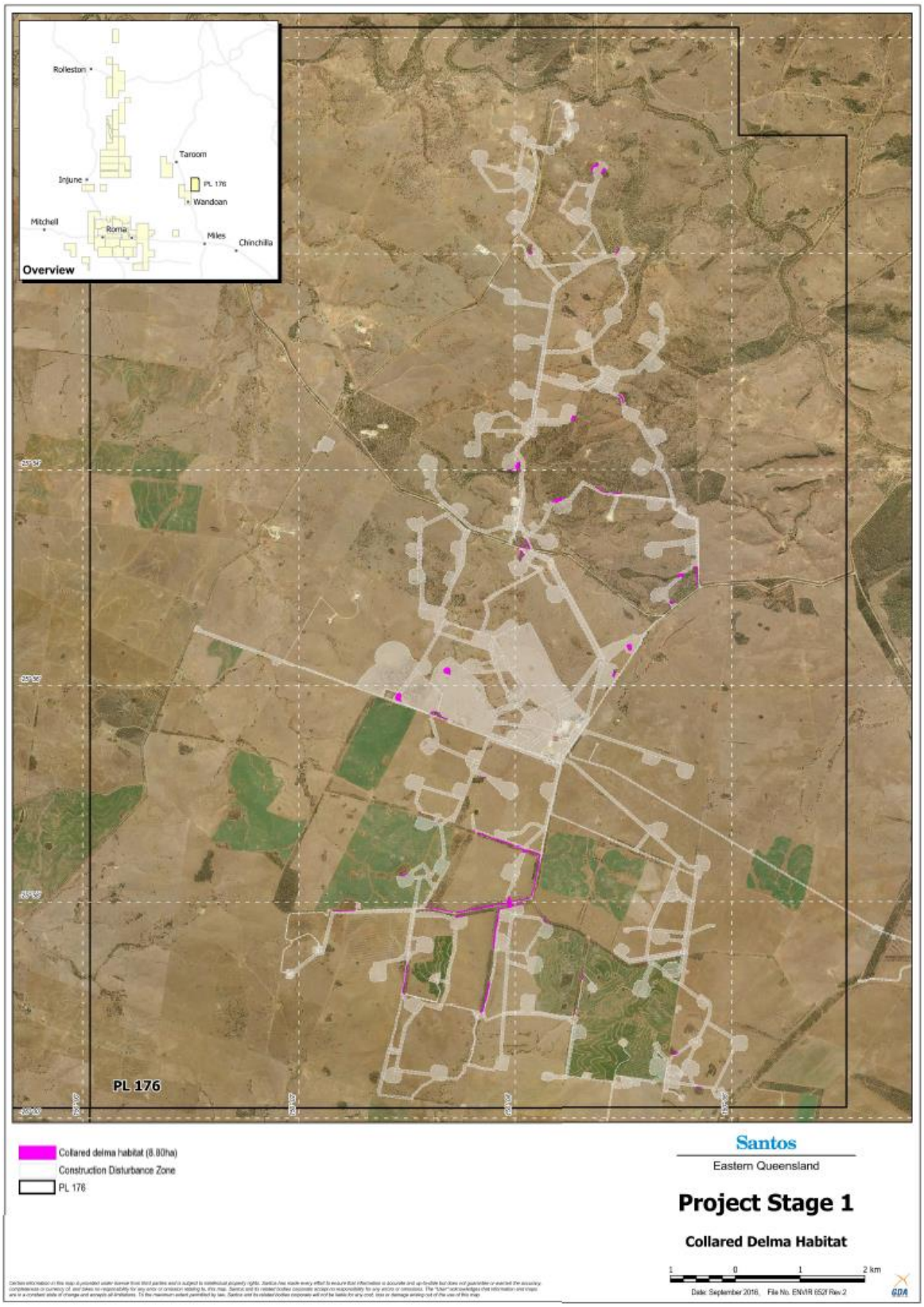

Figure 6: Maximum Potential Area of Impact – Collared Delma

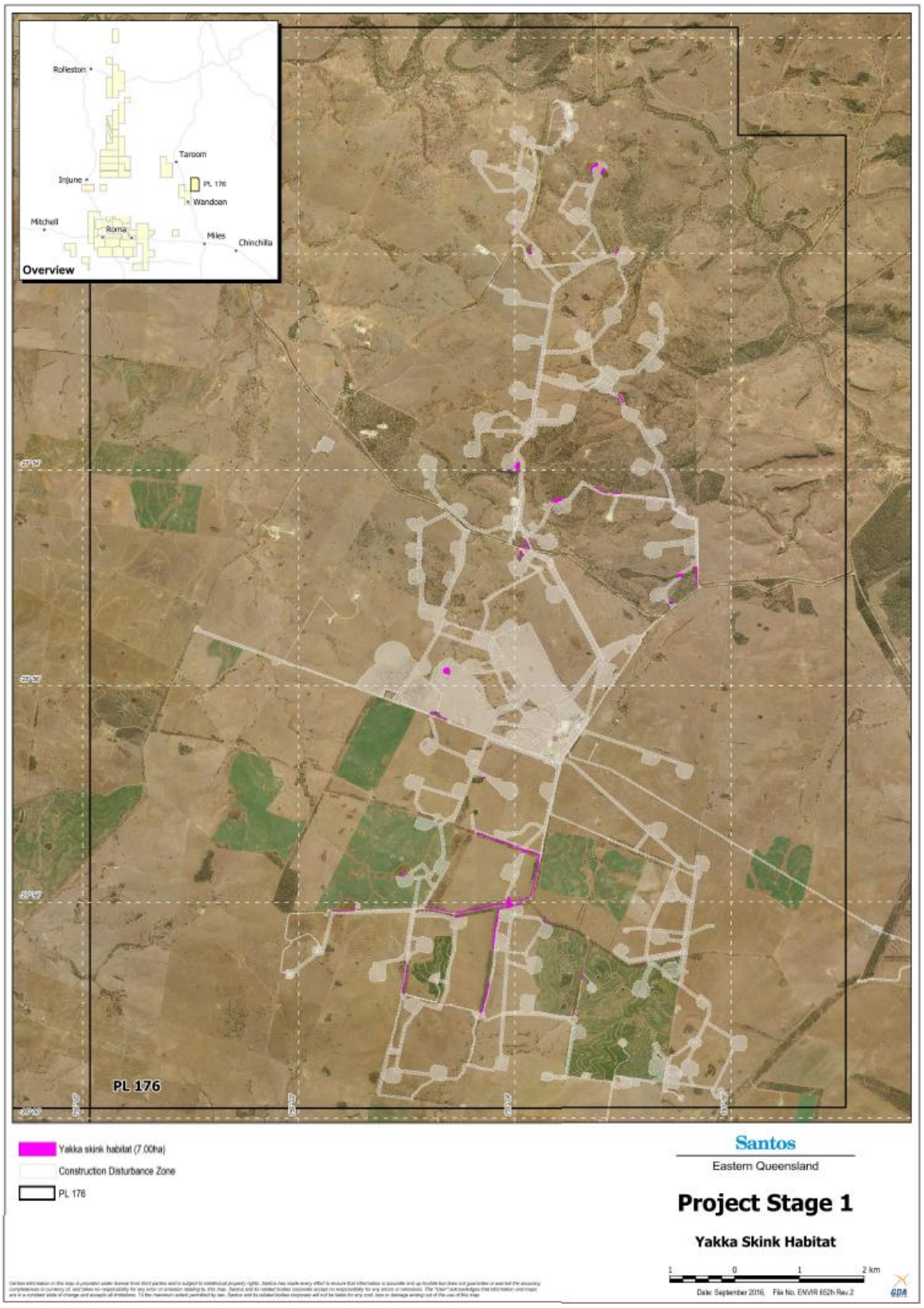

Figure 7: Maximum Potential Area of Impact – Yakka Skink

5.0 Offset delivery – Springwater Property

Santos GLNG has identified the Springwater property as containing suitable environmental values to acquit offset obligations incurred by the development of GFD Project.

5.1 Property Description

Springwater is a 12,636 ha grazing property described as Lot 8 on Plan SP261936 and is located within the local government area of Maranoa Regional Council, approximately 46 km east-northeast of Injune, southern inland Queensland. Figure 8 illustrates the property location in relation to the Santos GLNG tenements.

Springwater is located within subregion 24 (Carnarvon Ranges) of the Brigalow Belt South bioregion (Sattler and Williams 1999). Current land uses at the Site include cattle grazing, irrigated cropping, tree plantations and petroleum activities. The property is contiguous with large areas of remnant vegetation in the north on Beilba State Forest, 'Fairview' Holding and Expedition (Limited Depth) National Park, to the northeast on Expedition Resource Reserve, and to the south on Hallett State Forest. The Site is owned and managed by Santos.

Surface geology mapping for the Springwater property shows that it is comprised entirely of Lower Jurassic sediments (Forbes 1968). The west and much of the southeast of the Site features plateaux of the Boxvale Sandstone Member, falling to valleys and low undulating hills with sandy and clay soils derived from the Evergreen Formation. Plateaux of the Boxvale Formation are also present in the far northeast of the Site. Hutton Creek enters the Site in the central north and cuts a steep gorge eastward through the Precipice Sandstone to meet the Dawson River in the central east of the Site. Soils in this region are coarse sands with expansive areas of surface rock especially within close proximity to Hutton Creek and the Dawson River. Vegetation is dominated by dry sclerophyll Eucalyptus and Acacia woodlands with pockets of semi-evergreen vine thicket (SEVT) in sheltered south-facing parts of the plateau scarps and slopes and within gorges. The dominant land zone (Sattler and Williams 1999) in this area is land zone 10 (coarse-grained sediments) with a small areas of land zone 9 (fine-grained sediments) on slopes and valleys and land zone 3 (alluvium) along Hutton Creek and the Dawson River.

Hutton Creek and the Dawson River are part of the Fitzroy River Basin. The nearest weather station to the Site is at Injune within 46 km of the Site. Yearly average temperatures range from a maximum of 33.6°C in January to a minimum of 3.1°C in July (BOM 2015). Average annual rainfall is 636.3 mm, with the highest monthly average rainfall occurring in December (89.1 mm) and the lowest occurring in August (25.2 mm) (BOM 2015).

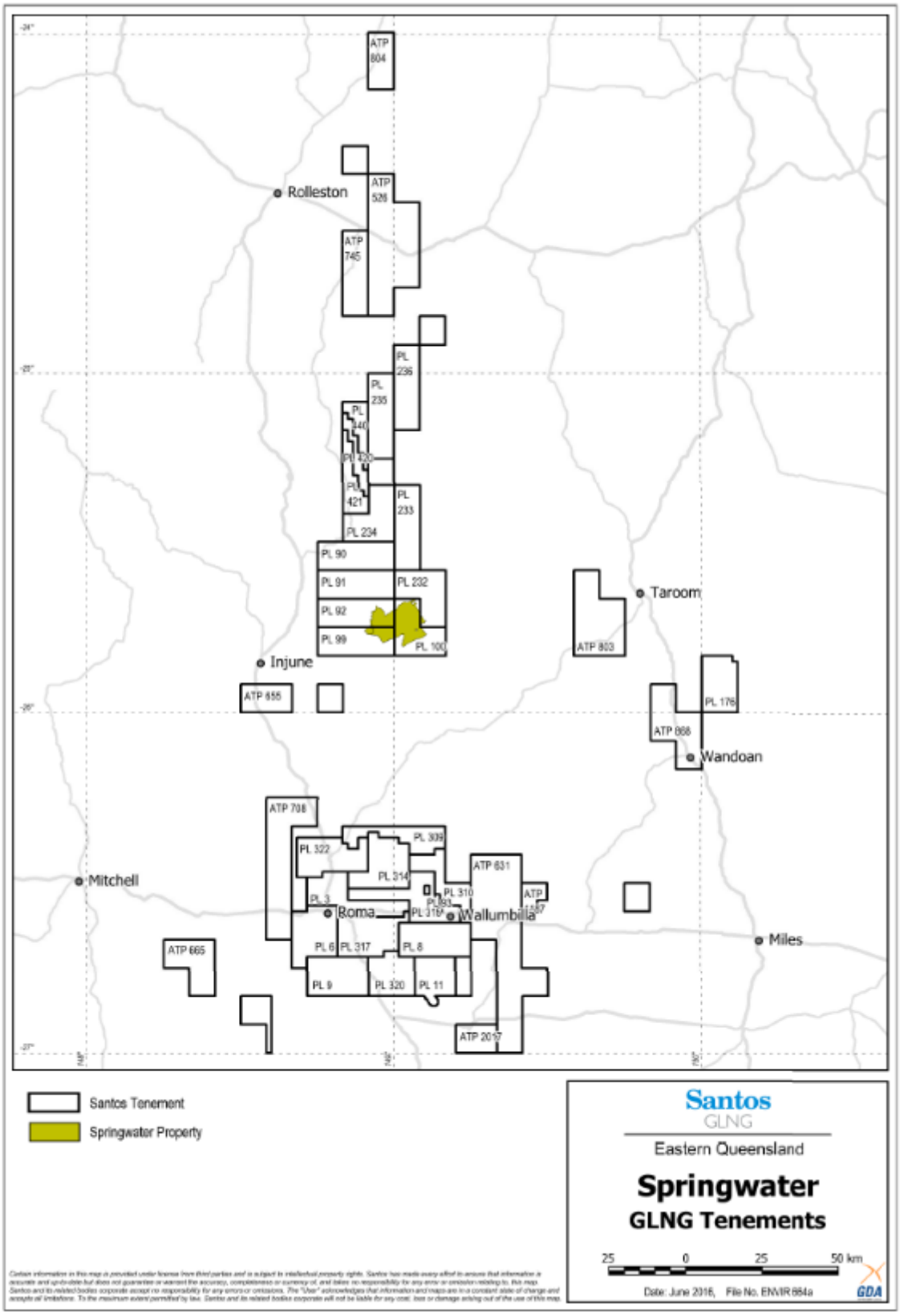

Figure 8: Springwater Location

5.2 Offset Values Assessment

During 2015, Boobook Ecological Consulting were engaged to provide a detailed report of the potential biodiversity offset values at Springwater property. Ecological values of the property were assessed to determine the property's value in terms of meeting offset requirements.

The assessment on Springwater forms part of a combined Biodiversity Offset Assessment for three contiguous properties within the Fairview gas field. In addition to Springwater, assessments were also conducted on Waddy Brae (Boobook 2015a) and Fairview (Boobook 2015b). The properties have very similar geology, topography, vegetation and land use history. For this reason. Assessment Units to determine site quality and context were shared across the three contiguous properties.

To assist in the evaluation of the Site's ecological function and condition and to help inform the EPBC Act environmental offset assessment guide, a series of BioCondition assessments were undertaken. BioCondition assessments were completed at pre-selected within each mapped Assessment Unit (AU) or RE type (DNRM 2015a) or following field inspection of vegetation at the Site. The intent of these surveys was to determine the level of ecological value should the vegetation be managed as a potential offset. BioCondition data relevant to RE at the Site was also obtained in field surveys at the adjacent 'Waddy Brae' and 'Springwater' properties (BOOBOOK 2015a, 2015b). Pooling of data for RE on the three properties, which are contiguous and occur on similar topography, have similar vegetation and patterns of land use, allowed for development of condition benchmarks for several RE which lack published benchmarks (DSITIA 2014). The vegetation communities associated with the scarps in Fairview are uniform. The land management practices and historic clearing events are shared across all three properties. Using the data across all three adjoining properties is unlikely to affect the accuracy of the site quality scores. In addition, the vegetation communities have been split into three condition states (young regrowth, regrowth and remnant) to standardise results.

BioCondition assessments were undertaken as per the methodologies described by Eyre et al. (2011, 2015). This involved the establishment of a 100 m x 50 m transect containing five assessment areas (plots/quadrats) to record values for defined ecological attributes. These values were used as indicators to provide a quantitative measure for the performance of ecosystem function within the context of biodiversity conditions.

5.3 Offset Area

The offset management areas is located in the northeast sections of the Springwater property and will be called the Springwater Offset Area (SOA). The SOA is bounded by the Hutton Creek in the west and the property boundary of Fairview Station in the north and the east.

The sandstone plateaus throughout the SOA have historically been cleared for grazing and are currently utilised for timber plantations. The steep slopes that have formed between the tops of the plateaus and the valleys and gorges associated with Hutton Creek are largely intact remnant and regrowth vegetation. These valleys and gorges as well as the waterway itself provide a natural barrier to prevent cattle access to the SOA from the north, west and east. The presence of Hutton Creek enhances the overall value of the offset area, particularly the narrow patches in the west of the SOA. Much of the riparian vegetation associated with Hutton Creek is not part of the SOA because it falls outside of the Springwater property. However, this vegetation together with the narrow patches of offset in the west of the SOA provides a valuable corridor on a local scale.

Infrastructure in the SOA includes gas-gathering infrastructure predominately located within the timber plantation. Within the areas utilised as an environmental offset there are minor access tracks and fire trails. A large pipeline corridor has been retained along the south-eastern edge of the SOA. This

pipeline corridor has been located to ensure that the connectivity between the SOA and the larger patches of remnant vegetation to the north remains unaffected.

5.3.1 Connectivity and Landscape Context

On a continental scale the SOA forms part of the great eastern ranges (GER) corridor, identified as one of Australia's large-scale connectivity conservation areas. The GER extends more than 2,800 kilometres from the Australian Alps near Melbourne to the Atherton Tablelands near Cairns and beyond in far north Queensland. The location of the Springwater property within the GER is shown in Figure 9 and see (Mackey et al. 2010) for original.

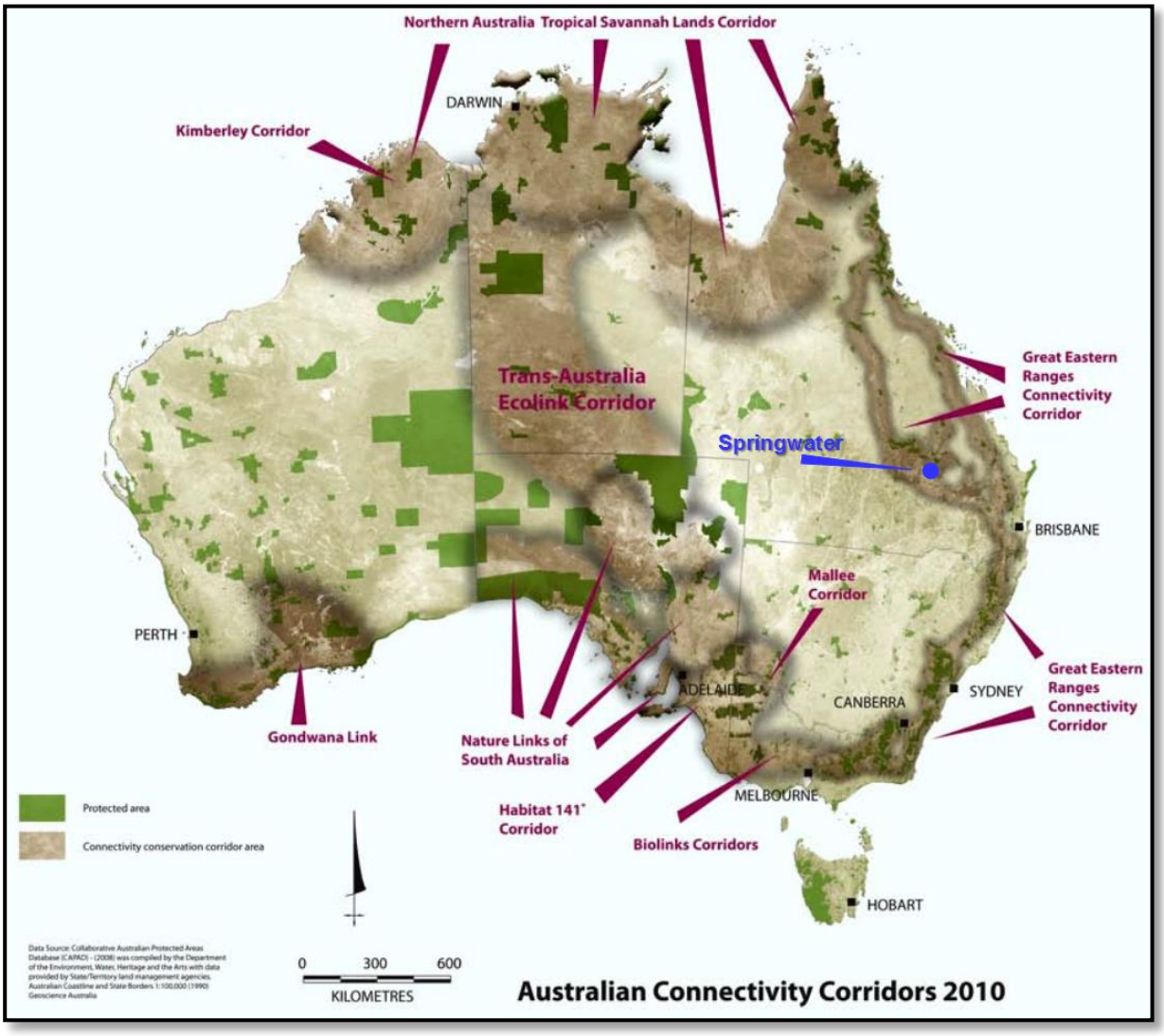

Figure 9: The Location of the Springwater Property within the GER

At a state and regional scale the SOA lies at the southern extent of a large patch of vegetation linking Expedition National Park in the north and Carnarvon National Park in the west. These large tracks of remnant vegetation have been identified in the

A Biodiversity Planning Assessment (BPA) identifies the terrestrial ecological values in a region, or bioregion, according to their conservation significance. A Biodiversity Planning Assessment (BPA) is available for the Brigalow Belt Bioregion and contains the corridors criteria (Criteria J) and the Context and Connection criteria (Criteria G):

> ***Corridors (Criteria J)*** - Areas identified under this criterion qualify either because they are existing vegetated corridors important for contiguity including regrowth, or cleared areas that could serve this purpose if revegetated. Some examples of corridors include riparian habitats, transport corridors and "stepping stones".
>
> ***Context and Connection (Criteria G) –*** this criterion represents the extent to which a Remnant Unit incorporates, borders or buffers areas such as significant wetlands, endangered ecosystems, and the degree to which a Remnant Unit is connected to other vegetation.

A review of this data at a regional scale shows that the SOA is at the southern extent of a large patch of vegetation linking Expedition National Park in the north and Carnarvon National Park in the west. These large tracks of remnant vegetation have predominantly been identified in the BPA data as having “State” or “Regionally” significant corridors (Criteria J) and having a “Very High” or “High” context and connection (Criteria G). The location of the SOA in relation to these BPA areas is shown in Figure 10 below. Any increase in extent or condition of the ecological communities within the SOA will increase the extent and quality of these significant areas of habitat and biodiversity corridors.

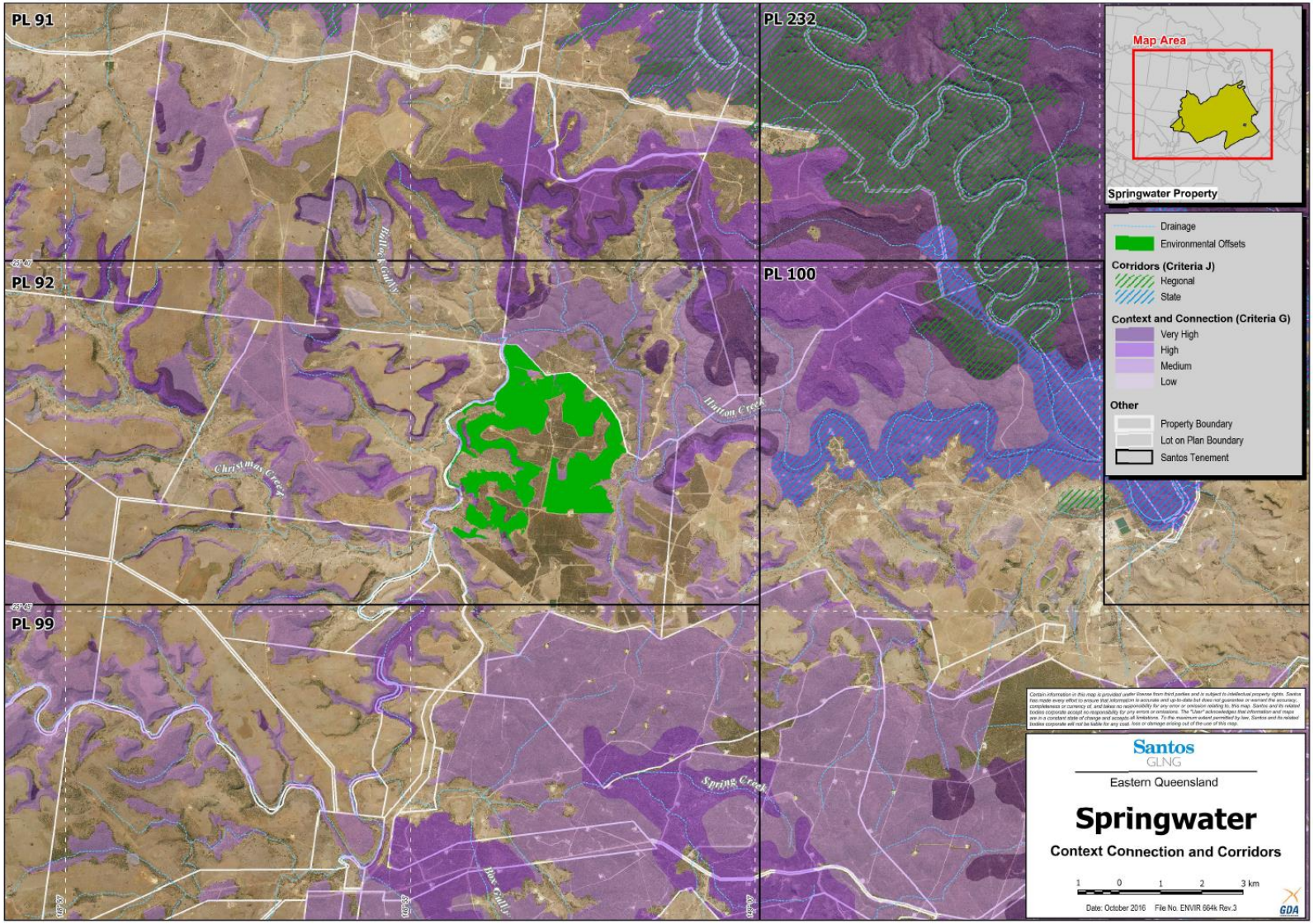

Figure 10: Context Connection and Corridors

5.3.2 Vegetation Communities

The vegetation communities within the SOA have been classified and mapped in accordance with *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner et al. 2012). In addition, the quality of the patches were divided into four categories:

- Remnant: woody vegetation that has not been cleared or vegetation that has been cleared but where the dominant canopy has greater than 70% of the height and greater than 50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy (Neldner et al. 2012).
- Advanced Regrowth: areas previously cleared or disturbed (e.g. by wildfire) and containing well advanced woody vegetation floristically and structurally consistent with the RE but typically <70% of the height and <50% density of the RE. Such regrowth with appropriate management will likely achieve remnant status.
- Young regrowth: areas previously cleared or disturbed (e.g. by wildfire) and containing varying densities of woody vegetation floristically consistent with the RE type. These areas may represent potential future biodiversity offset areas.
- Non-remnant: areas previously cleared or otherwise significantly disturbed which have little or no woody vegetation present and are currently unsuitable as biodiversity offsets.

The SOA contains five regional ecosystem vegetation communities. A summary of the vegetation communities present, the relevant biocondition scores and whether the vegetation community is also an EPBC Act listed TEC are discussed in Table 4 below.

Table 4: Summary of Offset Values within the SOA

Veg Unit	General vegetation description	Area (ha)	Survey sites	Biocondition Scores		
				Site	Land-scape	Final Score
VC1 11.10.7 Remnant	*Eucalyptus crebra* and *E. melanophloia* woodland with associated *Callitris glaucophylla*; midlayer composed of C. *glaucophylla, Acacia decora* and *A. longispicata*; shrub layer composed of *Hovea longipes, Notelaea microcarpa* and *Cryptandra amara*; grassy ground layer composed of *Aristida spp*., *Chrysopogon fallax* and *Ancistrachne uncinulata*.	342.4	FV04	0.76	0.90	0.80
			FV09	0.83	0.90	0.85
			FV20	0.95	0.55	0.88
VC2 11.10.7 Regrowth	*Eucalyptus melanophloia* low woodland; midlayer composed of *Psydrax johnsonii, Notelaea microcarpa, Eremophila mitchellii* and *Callitris glaucophylla*; grassy ground layer dominated by *Themeda triandra*.	48.6	SW23	0.78	0.80	0.79
VC3 11.10.7	*Eucalyptus crebra* and / or *E. melanophloia, Acacia longispicata* low open forest (young regrowth); sparse midlayer dominated by	9.1	FV01	0.57	0.95	0.65

Veg Unit	General vegetation description	Area (ha)	Survey sites	Biocondition Scores		
				Site	Land-scape	Final Score
Young Regrowth	*Alphitonia excelsa* and canopy recruits; grassy ground layer dominated by *Aristida* spp. and *Eremochloa bimaculata*		FV08	0.57	0.90	0.64
VC4[1] 11.9.5 Remnant	*Acacia harpophylla* open woodland; midlayer composed of canopy recruits, *Eremophila mitchellii, Geijera parviflora* and *Pittosporum spinescens*; low shrub layer dominated by *Carissa ovata*; grassy ground layer composed of *Paspalidium caespitosum, Enteropogon ramosus, Ancistrachne uncinulata* and *Aristida sp*.	307.5	SW22	0.91	0.90	0.91
			SW12	0.85	0.55	0.80
			G1WB	0.86	0.65	0.82
VC5 11.9.5[1] Regrowth	*Acacia harpophylla* low open forest (advanced regrowth); very sparse shrub layer of canopy recruits; very sparse ground layer of *Paspalidium caespitosum*.	38.3	FV16	0.68	0.55	0.66
VC6 11.9.5 Young Regrowth	*Acacia harpophylla* low woodland (young regrowth); shrub layer composed of *Carissa harpophylla, Eremophila mitchellii* and canopy recruits; grassy ground layer dominated by *Cenchrus ciliaris*.	18.9	FV17	0.43	0.40	0.42
VC7 11.3.25 Remnant	*Angophora floribunda, Eucalyptus camaldulensis* and *Casuarina cunninghamiana* fringing woodland; midlayer (confined to channel edges) composed of *Melaleuca viminalis;* dense ground layer dominated by *Lomandra longifolia, Imperata cylindrica* and *Entolasia marginata.*	11.6	SW06	0.71	1.00	0.78
			SW20	0.87	0.95	0.89
VC8[2] 11.9.4 Remnant	Semi-evergreen vine thicket	57.5	B1WB	0.80	1.00	0.85
			FV15	0.84	0.90	0.86
VC9 11.9.7 Remnant	*Eucalyptus populnea* woodland; midlayer comprised of canopy recruits, *Eremophila mitchellii, Geijera parviflora, Atalaya hemiglauca, Psydrax odorata* and *Denhamia oleaster*; shrub layer composed of *Hovea longipes* and *Carissa ovata*; grassy ground layer dominated by *Aristida* sp., *Bothriochloa decipiens, Themeda triandra* and *Chloris ventricosa*.	31.6	SW17	0.87	0.55	0.81
VC10 11.9.7 Young Regrowth	*Eucalyptus populnea* low woodland; midlayer dominated by *Eremophila mitchellii;* grassy ground layer composed of *Cenchrus ciliaris* and *Aristida* sp.	9.9	SW13	0.53	0.20	0.47

[1] **VC4** and **VC5** meet the condition requirements of the EPBC Act Threatened Ecological Community - Brigalow (*Acacia harpophylla* dominant and codominant) Threatened Ecological Community

[2] **VC8** meets the condition requirements of the EPBC Act Threatened Ecological Community - Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions

5.3.3 Flora and Fauna Species

Habitat for MNES flora habitat is determined by the presence a particular species. Historically a number of ecological assessments have occurred within the Springwater and neighbouring properties including detailed flora surveys conducted in accordance with the Queensland *Flora Survey Guidelines – Protected Plants* (DEHP 2014). These surveys have identified EVNT flora species including a population of the EPBC Act listed Bertya (*Bertya opponens*). However, detailed flora habitat mapping has not been completed for the SOA. Dedicated and targeted flora surveys will be conducted as part of the SOA monitoring program. These surveys will assess, map and quantify the MNES flora habitats present within the SOA.

Fauna habitat assessments were undertaken at each of the 23 BioCondition survey sites conducted across the Springwater property. Not all fauna habitat features likely to be utilised by threatened fauna are measured under the BioCondition methodology so additional microhabitat features were documented and used to generate fauna habitat mapping for all of the SOA. The location of MNES fauna habitat within the SOA is shown in Figure 11 to Figure 16 and the total area of offset for each MNES fauna species provided in Table 5

Table 5: Area (ha) of MNES Fauna Habitat within the SOA

Species	Area (ha) of Habitat within the SOA
Australasian bittern *(Botaurus poiciloptilus)*	11.6
Australian painted snipe *(Rostratula australis)*	11.6
Black-breasted button-quail *(Turnix melanogaster)*	57.5
Red goshawk *(Erythrotriorchis radiatus)*	837.5
Squatter pigeon (southern) *(Geophaps scripta scripta)*	780.0
South-eastern long-eared bat *(Nyctophilus corbent)*	837.5
Koala *(Phascolarctos cinereus* (combined populations of Qld, NSW and the ACT))	434.2
Large-eared pied bat (*Chalinolobus dwyeri)*	837.5
Northern quoll *(Dasyurus hallucatus)*	837.5
Collared delma *(Delma torquata)*	768.4
Dunmall's snake *(Furina dunmalli)*	780.0
Yakka skink (*Egernia rugosa)*	768.4

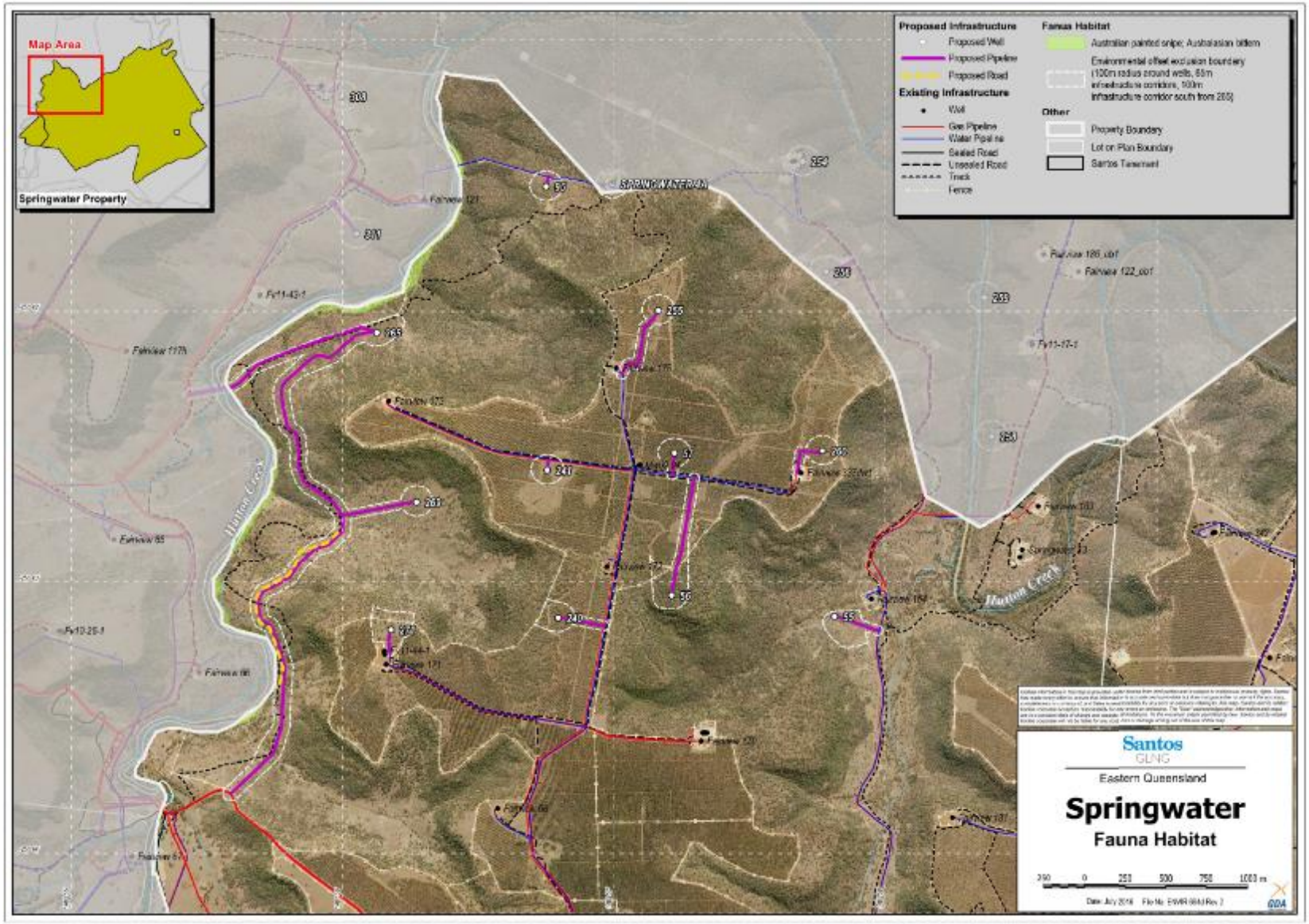

Figure 11: Habitat for Australian Painted Snipe and Australian Bittern

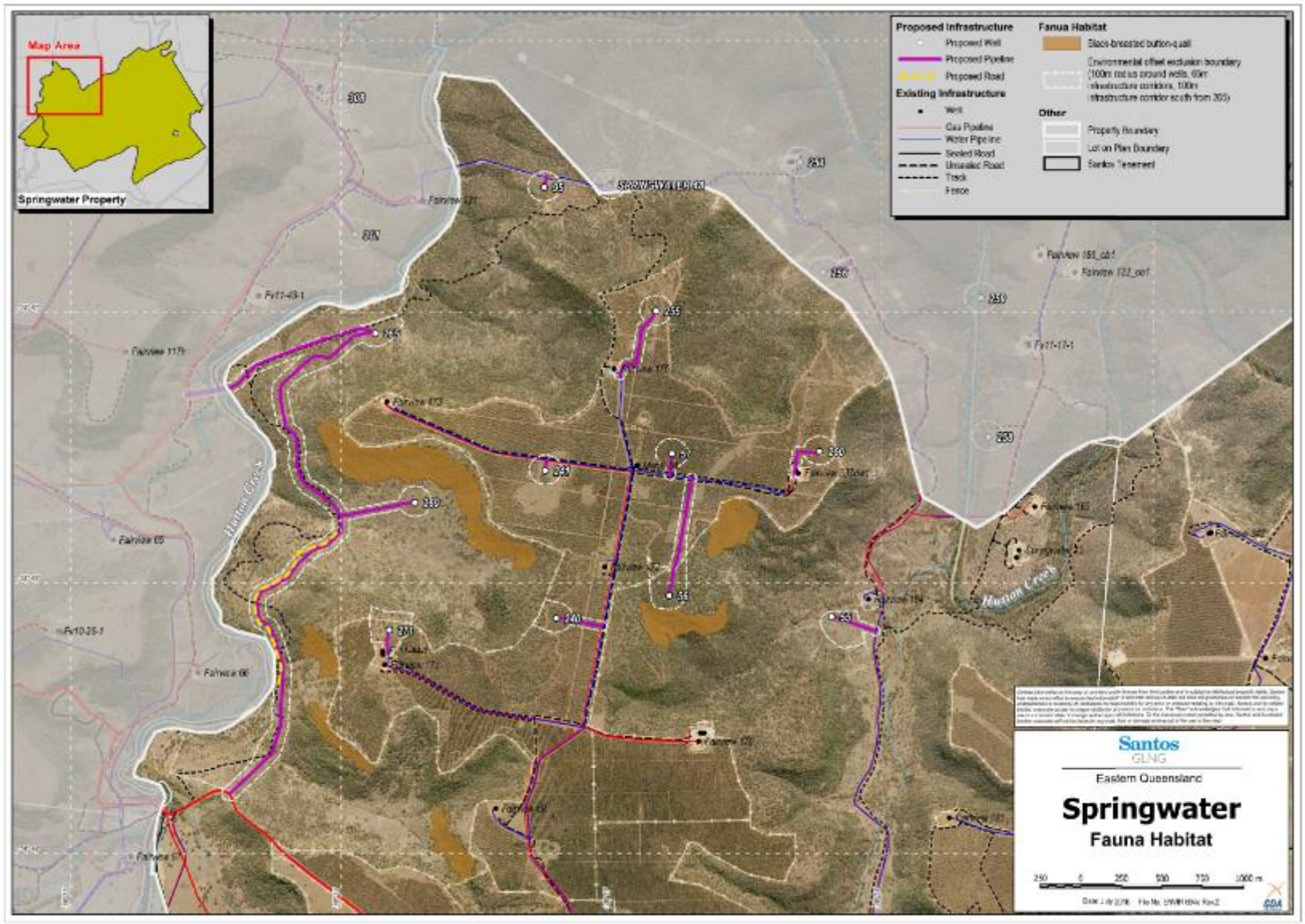

Figure 12: Habitat for Black-breasted Button-quail

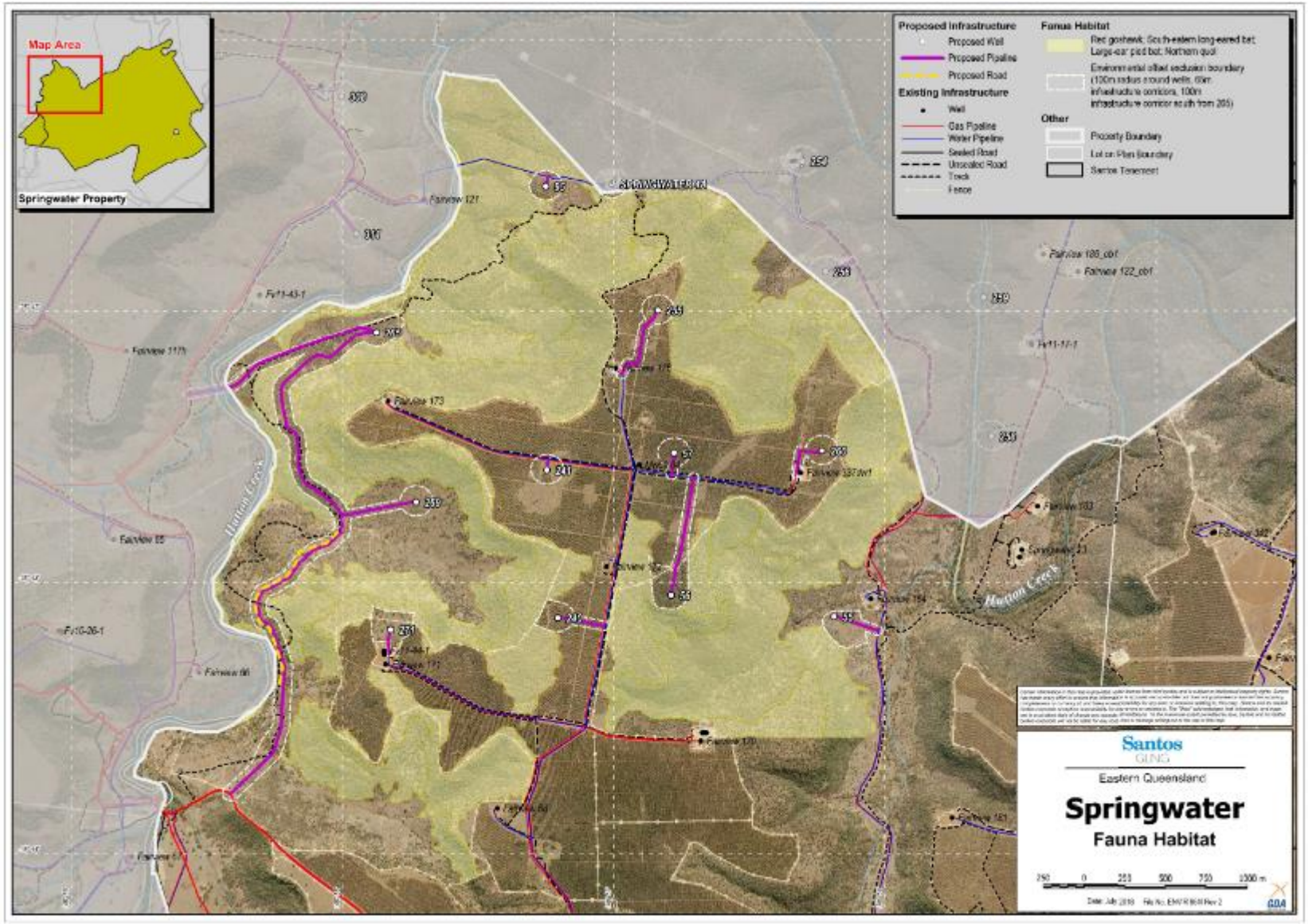

Figure 13: Habitat for Red goshawk, SE long-eared Bat, Large-eared Pied Bat and Northern Quoll

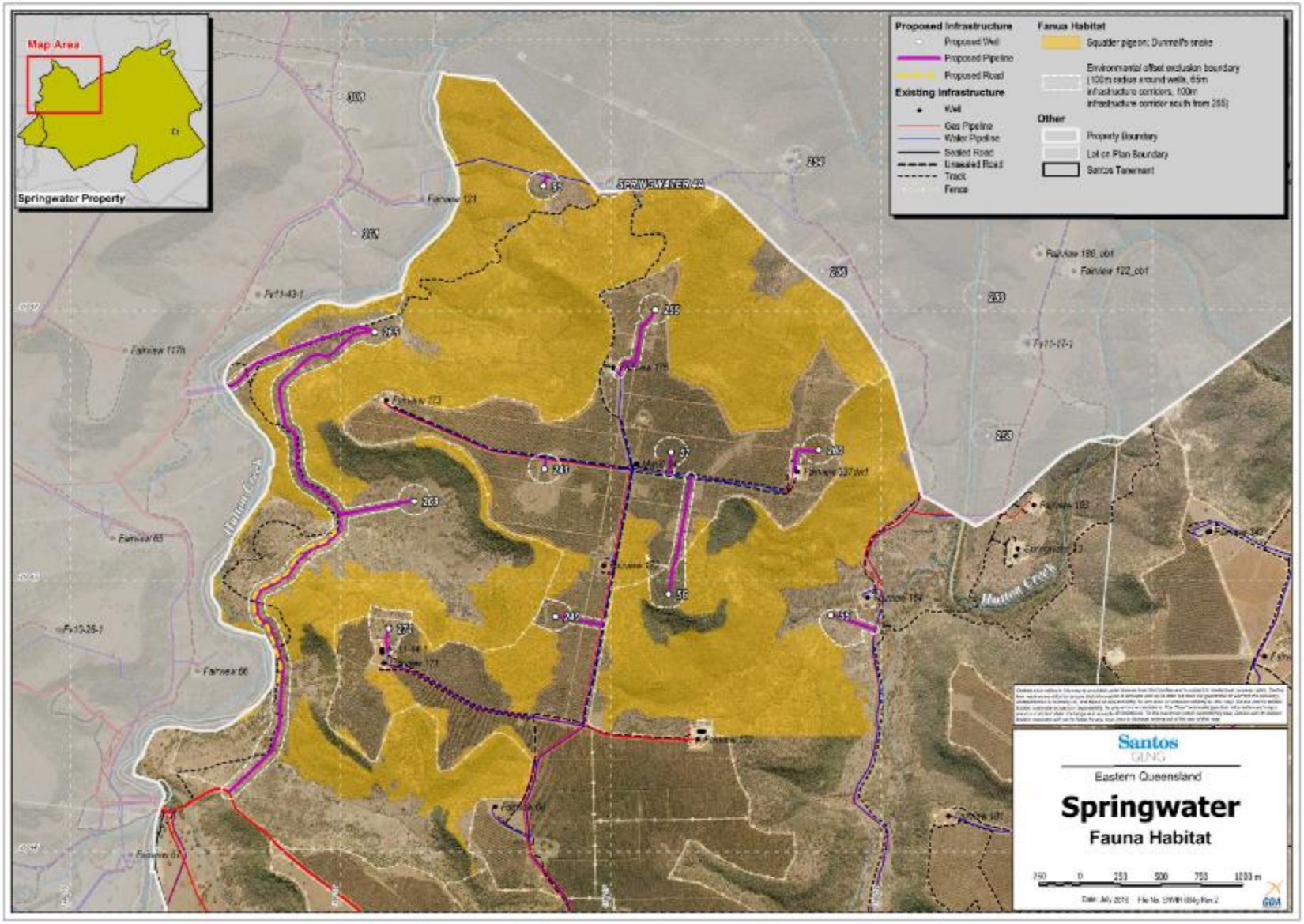

Figure 14: Habitat for Squatter Pigeon and Dunmall's Snake

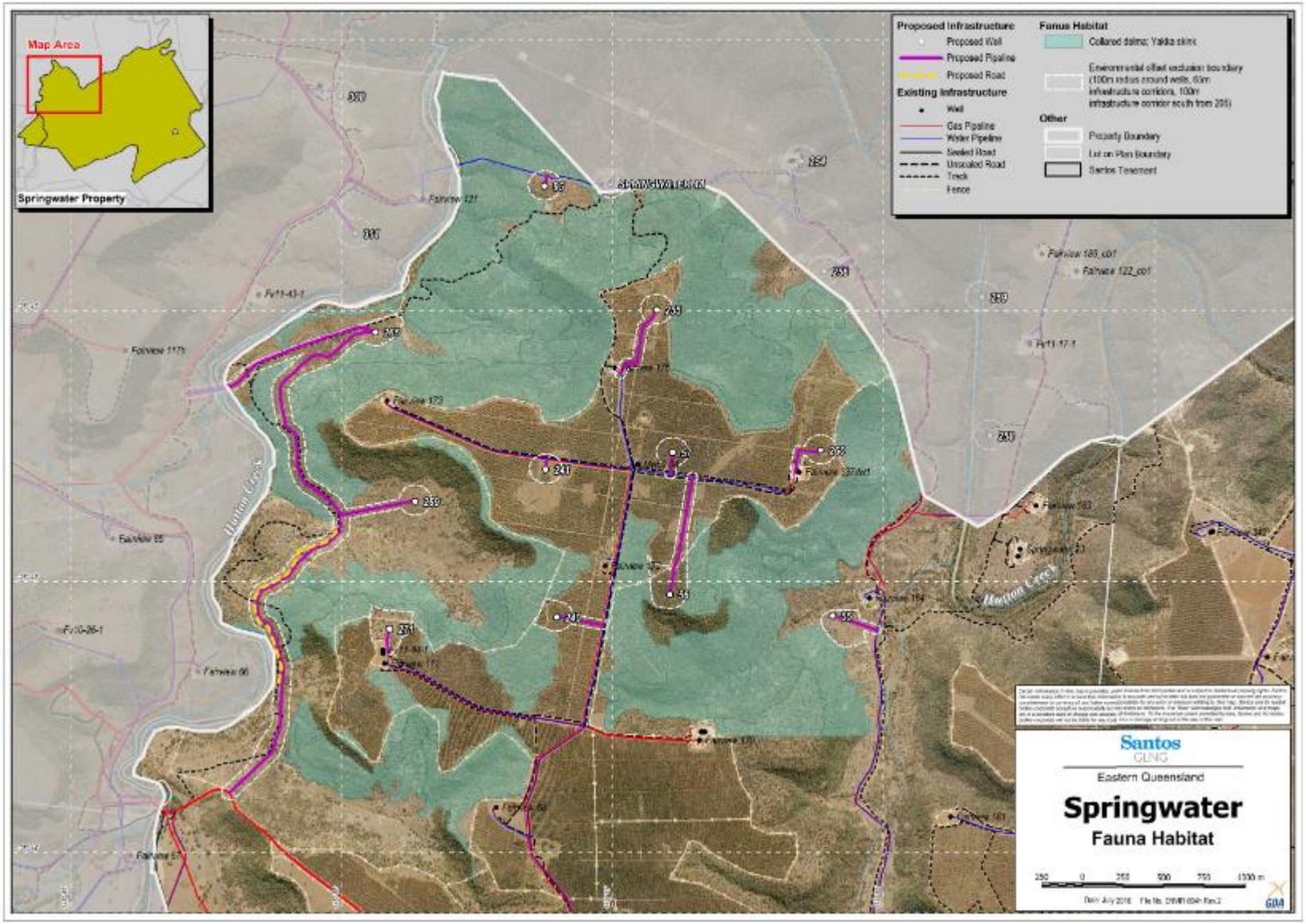

Figure 15: Fauna Habitat for Collared Delma and Yakka Skink

Santos GLNG

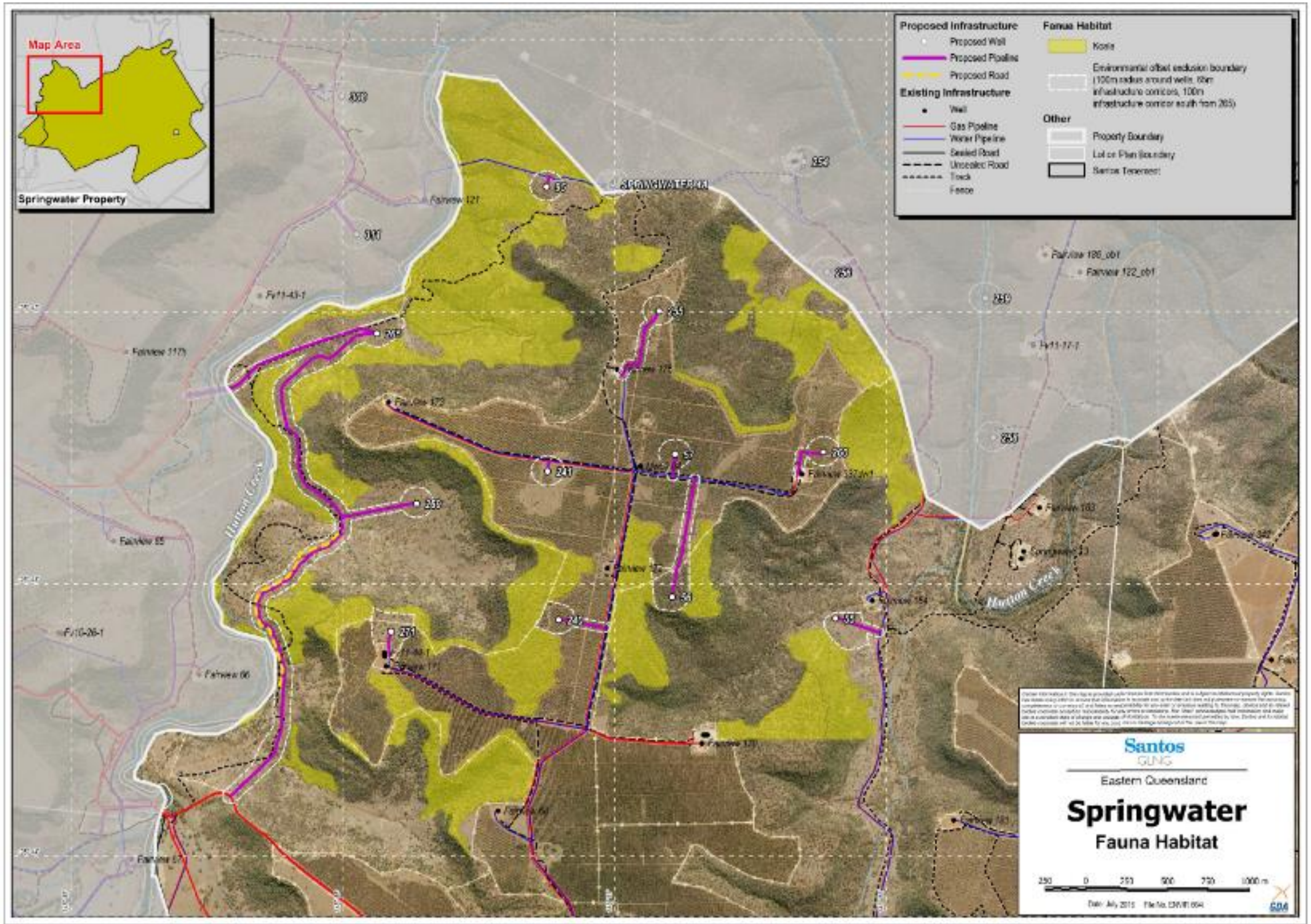

Figure 16: Habitat for Koala

6.0 Offset Acquittal

The offset acquittal process is done using the EPBC Act Offsets assessment guide. The EPBC Act Offsets assessment guide requires the key ecological attributes of the species or ecological community to be quantified. The inputs and results are detailed below.

6.1 Impact Calculator Inputs

The results of the final residual significant impact assessment (Section 4.1) indicate that there is no residual impact to MNES as a result of Stage 1, therefore there are no impact calculator inputs required for Project Stage 1.

6.2 Offsets Calculator Inputs

The offset calculator input values and detailed justification for these inputs for each MNES represented within the SOA is provided in Table 6 to Table 17 below.

Table 6: Brigalow TEC Offsets Calculator Inputs

<table>
<tr><td rowspan="2">Time horizon (years)</td><td>Risk-related time horizon</td><td>20 years</td></tr>
<tr><td>Time until ecological benefit</td><td>10 years - The ecological benefit following the implementation of the management actions in Table 20 is predicted to be achieved in 10 years. In this time remnant areas will re-establish a sub-canopy and understorey as well as increase the amount of fallen woody debris. This period of time will enable the regrowth to attain a greater canopy cover and density reducing the exotic grass cover.</td></tr>
<tr><td rowspan="2">Start area quality</td><td>Start area (hectares)</td><td>348.8</td></tr>
<tr><td>Start quality (scale of 0-10)</td><td>Weighting – Site condition and site context both account for 50% of the overall weighting. Brigalow is more resilient than most TEC communities, therefore its condition state is of relative lesser value.

Site Condition – The RE mapped within SOA that is analogous with Brigalow TEC is RE 11.9.5. The Brigalow vegetation in this area has been divided into three separate condition states (remnant, regrowth and young regrowth). Five biocondition benchmark sites have been assessed across Springwater and neighbouring properties to assess the condition and quality of this Brigalow offset. This data has been utilised to inform the site condition score inputs for the offsets assessment guide. The average site condition adapted from the biocondition “site” scores for each of the three condition states are:

<table>
<tr><th>Brigalow</th><th>Mean Score</th><th>Final weighted (50%) Mean Site Condition Score</th></tr>
<tr><td>Remnant</td><td>8.7</td><td>4.35</td></tr>
<tr><td>Regrowth</td><td>6.8</td><td>3.4</td></tr>
<tr><td>Young Regrowth</td><td>4.3</td><td>2.15</td></tr>
</table>

Site Context – The SOA exists as one connected piece of vegetation. It links existing remnant and regrowth patches of Brigalow TEC that occurring on the undulating plains that fall away from the sandstone plateaus present throughout the Springwater property. The site context score is taken from the landscape score at biocondition site SW12. Site context score = 5.5/10 (50% weight on final score) = 2.75</td></tr>
</table>

		Remnant Final Start Quality = 7 (7.1) **Regrowth Final Start Quality = 6 (6.15)** **Young Regrowth Final Start Quality = 5 (4.9)**
Future area and quality without offset	**Risk of loss (%) without offset**	Brigalow vegetation communities are not fire tolerant and there is significant evidence of recent fire impact. Provided these Brigalow communities are not destroyed by fire, or grazing pressures are increased, then it is considered likely that the existing ecological value of these communities would persist.
	Future quality without offset (scale of 0-10)	Other than the protections afforded to the some of the remnant areas correctly mapped under the Queensland Regulated Vegetation Map, there remains large areas of remnant and regrowth vegetation being utilised as the Brigalow offset that are not protected from clearing due to the area being incorrectly mapped on the Queensland Regulated Vegetation Map. In addition, there is little statutory protection for the areas of young regrowth and under both state and federal environmental law. Santos GLNG also generates revenue from grazing. If the area is not maintained for the purposes of environmental offset, all opportunities to increase grazing potential will be met. Much of this vegetation can be lawfully cleared for grazing. Without intervention, these areas are also likely to be subjected to aerial herbicide application in the future. For this reason, the risk of loss is high and future quality is expected to fall slightly. • **Risk of loss (%) without offset = 80%** • **Future quality without offset = 6**
Future area and quality with offset	**Risk of loss (%) with offset**	As discussed in Section 6.3, the SOA will be secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the *Vegetation Management Act 1999*. This legal security mechanism significantly reduces the risk of loss. • **Risk of loss with offset = 10%**
	Future quality with offset (scale of 0-10)	It is expected that the implementation of the management actions prescribed in Table 19 result in the following improvements in quality and condition of habitat for Brigalow TEC within the SOA, in particular: • Regrowth and young regrowth vegetation will be restored, with improved condition. • Areas in good condition will increase in spatial extent and regrowth in various stages will be able to attain maturity. • The condition of pre-existing remnant vegetation communities will improve floristic diversity through natural recruitment and regeneration will increase. This is particularly true for ground layer where fire induced weed encroachment will be minimised. Future quality of offset will depend on the start state quality: Remnant = 10; Regrowth = 9 and Young regrowth = 7 • **Mean future quality of offset = 9** (Rounded from 8.6)

Santos GLNG

Table 7: Semi Evergreen Vine Thicket TEC Offsets Calculator Inputs

Time horizon (years)	**Risk-related time horizon**	**20 years**
	Time until ecological benefit	**10 years** - The ecological benefit following the implementation of the management actions in Table 20 is predicted to be achieved in 10 years. It is estimated that the edge of these communities will recover from the existing high intensity fire regime that has developed due to the presence of exotic pasture grasses. The amount of fallen woody debris and leaf litter in SEVT communities is expected to increase.
Start area quality	**Start area (hectares)**	**57.5**
	Start quality (scale of 0-10)	*Weighting* – Site condition accounts for 60% of the overall weighting. This highlights that SEVT is not a resilient community and the starting condition is a more valuable than the context. *Site Condition* – The RE mapped within SOA that is analogous with SEVT TEC is RE 11.9.4. The SEVT vegetation is remnant with no areas of regrowth or young regrowth. Two biocondition benchmark sites have been assessed across Springwater and neighbouring properties to assess the condition and quality of this SEVT offset. During the biocondition assessment of these two patches the following relevant microhabitat features were recorded: Embedded and loose rocks, boulders, crevices and ledges, fallen bark, leaf litter, ground cover, coarse woody debris, hollow logs, trees/logs with loose bark, mistletoe, cliffs within 5km. The average site condition adapted from the biocondition site scores for the two remnant vegetation patches was used to provide the site condition input. *Site condition = 8.2.* *Site Context* - The SOA exists as one connected piece of vegetation. It links existing remnant and regrowth patches of SEVT TEC that occur on the south facing escarpments that fall away from the sandstone plateaus present throughout the Springwater property. The site context score is taken from the landscape score at biocondition site SW12 *Site context score = 5.5* Site condition mean = 8.2/10 (60% weight on final score) = 4.92 Site context = 5.5/10 (40% weight on final score) = 2.2 • **Final Start Quality = 7** (Rounded from 7.12)
Future area and quality without offset	**Risk of loss (%) without offset**	Protection is afforded to the some of the remnant areas correctly mapped under the Queensland Regulated Vegetation Map. However, areas of remnant RE 11.9.4 in the SOA is not protected from clearing due to the area being incorrectly mapped on the Queensland Regulated Vegetation Map. Santos GLNG also generates revenue from grazing. If the area is not maintained for the purposes of environmental offset, all opportunities to increase grazing potential will be met. Without intervention, these areas may be subjected to aerial herbicide application in the future and are more likely to be impacted by fire. For this reason, the risk of loss is high and future quality is expected to fall slightly. • **Risk of loss (%) without offset = 80%** • **Future quality without offset = 6**
	Future quality without offset (scale of 0-10)	
Future area and quality with offset	**Risk of loss (%) with offset**	As discussed in Section 6.3, the SOA will be secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the *Vegetation Management Act 1999*. This legal security mechanism significantly reduces the risk of loss. • **Risk of loss with offset = 10%**
	Future quality with offset (scale of 0-10)	It is expected that the implementation of the management actions prescribed in Table 19 result in the following improvements in quality and condition of habitat for SEVT TEC within the SOA, in particular: • Existing remnant vegetation in poor condition will recover. • The total number and variety of microhabitat features such as Embedded and loose rocks, boulders, crevices and ledges, fallen bark,

		leaf litter, ground cover, coarse woody debris, hollow logs, trees/logs with loose bark and mistletoe will increase • The risk of mechanical and chemical control and inappropriate or increased will be eliminated. Future quality of offset will depend on the start state quality: Remnant = 9. • **Future quality of offset = 9**

Table 8: Australian Bittern and Australian Painted Snipe Offsets Calculator Inputs

Time horizon (years)	**Risk-related time horizon**	**20 years**
	Time until ecological benefit	**10 years** - The ecological benefit following the implementation of the management actions in Table 19 is predicted to be achieved in 10 years. Ten years will allow the understorey and wetland plant species to recover from cattle trampling. In addition, weed removal along Hutton creek will also allow the preferred dense native understory to develop.
Start area quality	**Start area (hectares)**	**11.6**
	Start quality (scale of 0-10)	*Weighting* – Site condition accounts for 50% of the overall weighting. This highlights that the condition and the presence of microhabitat features is a significant factor for this species. The species stocking rate and site context are considered of similar value with slight emphasis (30%) placed on the stocking rate. *Site Condition* – In the Santos GLNG gas fields, the Australian Bittern and Australian Painted Snipe are habitat specialists and require well-vegetated permanent and ephemeral freshwater wetlands dominated by sedges, rushes. In the SOA these habitat requirements are provided in the riparian areas associated with Hutton Creek (RE 11.3.25). Within the remnant patches of RE 11.3.25, two biocondition benchmark sites have been assessed across Springwater and neighbouring properties. The average site condition adapted from the biocondition site scores for the two remnant vegetation patches was used to provide the site condition input. *Site condition = 7.9.* *Site Context* - The SOA exists as one connected piece of vegetation. It includes a corridor of riparian vegetation associated with Hutton Creek and links existing remnant and regrowth patches of habitat that occur to the north and south. The site context score is taken from the landscape score at biocondition site SW12 *Site context score = 5.5* *Species Stocking Rate* – The Australian Bittern or Australian Painted Snipe are difficult to detect species. No records occur within the SOA, however, both species have been recorded in the Dawson River catchment downstream of the SOA. Given these species occurs within the Dawson River catchment and the relevant microhabitat features are present these species are expected to occur within the SOA. *Species Stocking Rate = 5* Site condition mean = 7.9/10 (50% weight on final score) = 3.95 Site context = 5.5/10 (20% weight on final score) = 1.1 Species Stocking Rate = 5/10 (30% weight on the final score) = 1.5 • **Final Start Quality = 7** (Rounded from 6.55)
Future area and quality	**Risk of loss (%) without offset**	Protection is afforded to the some of the remnant areas correctly mapped under the Queensland Regulated Vegetation Map. However, large areas of RE 11.3.25 in the SOA being utilised as the offset for these species is not protected from clearing due to the area being incorrectly mapped on the Queensland

without offset	**Future quality without offset (scale of 0-10)**	Regulated Vegetation Map. Santos GLNG also generates revenue from grazing. If the area is not maintained for the purposes of environmental offset, all opportunities to increase grazing potential will be met. Without intervention, these wetland environments are likely to be subjected to cattle that will use the wetlands as a source of water during dry periods. Through trampling wetland vegetation, cattle will significantly degrade the quality of habitat for Australian Bittern and Australian Painted Snipe. For this reason, the risk of loss is high and future quality is expected to fall slightly. • **Risk of loss (%) without offset = 80%** • **Future quality without offset = 5**
Future area and quality with offset	**Risk of loss (%) with offset**	As discussed in Section 6.3, the SOA will be secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the *Vegetation Management Act 1999*. This legal security mechanism significantly reduces the risk of loss. • **Risk of loss with offset = 10%**
	Future quality with offset (scale of 0-10)	It is expected that the implementation of the management actions prescribed in Table 19 result in the following improvements in quality and condition of habitat for Australian Bittern and Australian Painted Snipe within the SOA, in particular: • Existing remnant vegetation with understorey and ground layer in poor condition will recover. This is particularly important for the recovery of the sedges and rushes. • The total number and variety of microhabitat features such as wetland vegetation (sedges and rushes) will increase • The risk of degradation caused by cattle will be eliminated. • The increased the width, quality and connectedness of the existing fauna corridor associated with Hutton Creek will provide more fauna movement options and a potentially a greater carrying capacity. Future quality of offset will depend on the start state quality: Remnant = 9 and Regrowth = 9. The mean is used as the calculator input. • **Mean future quality of offset = 9**

Table 9: Black-breasted Button-quail Offsets Calculator Inputs

Time horizon (years)	**Risk-related time horizon**	**20 years**
	Time until ecological benefit	**10 years** - The ecological benefit following the implementation of the management actions in Table 19 is predicted to be achieved in 10 years. It is estimated that the edge of these communities will recover from the existing high intensity fire regime due to the presence of exotic pasture grasses. The SEVT communities will also increase the amount of fallen woody debris and leaf litter microhabitat requirements for this species.
Start area quality	**Start area (hectares)**	**57.5**
	Start quality (scale of 0-10)	*Weighting* – Site condition accounts for 50% of the overall weighting. This highlights that the condition of the SEVT communities is a significant factor for this species. The species stocking rate and site context are considered of similar value with slight emphasis (30%) placed on the stocking rate. *Site Condition* – The RE mapped within SOA that is analogous with habitat for the Black-breasted button-quail is the SEVT vegetation communities associated with RE 11.9.4. Two biocondition benchmark sites have been assessed across Springwater and neighbouring properties to assess the condition and quality of this vegetation. The biocondition assessment of these two patches identified the following relevant microhabitat features: Embedded and loose rocks, boulders, crevices and ledges, fallen bark, leaf litter, ground cover, coarse woody debris, hollow logs, trees/logs with loose bark, mistletoe, cliffs within 5km. The average site condition adapted from the biocondition site scores for the two remnant

		vegetation patches was used to provide the site condition input. *Site condition = 8.2.* *Site Context* - The SOA exists as one connected piece of vegetation offsets. It links existing remnant and regrowth patches of SEVT TEC that occur on the south facing escarpments that fall away from the sandstone plateaus present throughout the Springwater property. The site context score is taken from the landscape score at biocondition site SW12 *Site context score = 5.5* *Species Stocking Rate* – The Black-breasted button-quail is a difficult to detect species. No records occur within the SOA and no records are present within the vicinity of the Springwater property. If present, the SOA would be the most westerly extant of the Black-breasted button-quail's known distribution. This species is considered to potentially occur within the SOA. *Species Stocking Rate = 4* Site condition mean = 8.2/10 (50% weight on final score) = 4.1 Site context = 5.5/10 (20% weight on final score) = 1.1 Species stocking rate = 4/10 (30% weight on the final score) = 1.2 • **Final Start Quality = 6** (Rounded from 6.4)
Future area and quality without offset	**Risk of loss (%) without offset**	Protection is afforded to the some of the remnant areas correctly mapped under the Queensland Regulated Vegetation Map. However, areas of remnant RE 11.9.4 in the SOA is not protected from clearing due to the area being incorrectly mapped on the Queensland Regulated Vegetation Map. Santos GLNG also generates revenue from grazing. If the area is not maintained for the purposes of environmental offset, all opportunities to increase grazing potential will be met. Without intervention, these areas may be subjected to aerial herbicide application in the future and are more likely to be impacted by fire. For this reason, the risk of loss is high and future quality is expected to fall slightly. • **Risk of loss (%) without offset = 80%** • **Future quality without offset = 6**
	Future quality without offset (scale of 0-10)	
Future area and quality with offset	**Risk of loss (%) with offset**	As discussed in Section 6.3, the SOA will be secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the *Vegetation Management Act 1999*. This legal security mechanism significantly reduces the risk of loss. • **Risk of loss with offset = 10%**
	Future quality with offset (scale of 0-10)	It is expected that the implementation of the management actions prescribed in Table 19 result in the following improvements in quality and condition of habitat for Black-breasted Button-quail within the SOA, in particular: • Existing remnant vegetation in poor condition will recover. • The total number and variety of microhabitat features such as Embedded and loose rocks, boulders, crevices and ledges, fallen bark, leaf litter, ground cover, coarse woody debris, hollow logs, trees/logs with loose bark and mistletoe will increase • The risk of mechanical and chemical control and inappropriate or increased will be eliminated. Future quality of offset is high given the already high start state. • **Future quality of offset = 9**

Table 10: Squatter Pigeon (southern) Offsets Calculator Inputs

<table>
<tr><td rowspan="2">Time horizon (years)</td><td>Risk-related time horizon</td><td>20 years</td></tr>
<tr><td>Time until ecological benefit</td><td>10 years - The ecological benefit following the implementation of the management actions in Table 19 is predicted to be achieved in 10 years. The remnant and regrowth vegetation provides suitable roosting resources for the Squatter pigeon. There are also suitable areas to support breeding for the species. 10 years of pest fauna monitoring and trapping, weed control and vegetation growth will result in improved breeding and roosting resources.</td></tr>
<tr><td rowspan="2">Start area quality `</td><td>Start area (hectares)</td><td>780.0</td></tr>
<tr><td>Start quality (scale of 0-10)</td><td>
Weighting – The distribution of weighting for this species has been done to recognise that site condition, site context and species stocking rate are all considered of similar value for this species with a slightly higher value placed on the condition of the site (40%).

Site Condition –The squatter pigeon habitat includes all vegetation including regrowth vegetation where suitable open forest to woodland vegetation occurs. In the SOA open forest to woodland vegetation includes all REs except the densely vegetated SEVT associated with RE 11.9.4. The biocondition assessment in all other vegetation identified the relevant broad habitat requirements: open grassy woodlands with Hutton Creek providing a permanent water source. The areas of young regrowth are not utilised as offsets for Squatter pigeon, however these areas may be used in the future. The average site condition adapted from the biocondition site scores for each of the remnant and regrowth vegetation are shown below. .

<table>
<tr><th>Regional Ecosystem</th><th>Mean Score</th><th>Final weighted (30%) Mean Site Condition Score</th></tr>
<tr><td>11.9.5 – Remnant</td><td>8.7</td><td>3.48</td></tr>
<tr><td>11.9.5 – Regrowth</td><td>6.8</td><td>2.72</td></tr>
<tr><td>11.10.7 – Remnant</td><td>8.4</td><td>3.36</td></tr>
<tr><td>11.10.7 – Regrowth</td><td>7.8</td><td>3.12</td></tr>
<tr><td>11.3.25 - Remnant</td><td>7.9</td><td>3.16</td></tr>
<tr><td>11.9.7 - Remnant</td><td>8.7</td><td>3.48</td></tr>
</table>

Site Context - The SOA exists as one connected piece of vegetation offsets. It links existing remnant and regrowth patches of habitat that occur on the undulating plains that fall away from the sandstone plateaus present throughout the Springwater property. The site context score is taken from the landscape score at biocondition site SW12 Site context score = 5.5/10 (30% weight on final score) = 1.65

Species Stocking Rate – The squatter pigeon has previously been recorded on Springwater during field surveys and there are a number of records for this species on neighbouring properties. Species Stocking Rate = 10/10 (30% weight on the final score) = 3

Final Start Quality 11.9.5 – Remnant = 8 (8.13)
Final Start Quality 11.9.5 – Regrowth = 7 (7.37)
Final Start Quality 11.10.7 – Remnant = 8 (8.01)
Final Start Quality 11.10.7 – Regrowth = 8 (7.77)
Final Start Quality 11.3.25 – Remnant = 8 (7.81)
Final Start Quality 11.9.7 – Remnant = 8 (8.13)
</td></tr>
</table>

Future area and quality without offset	**Risk of loss (%) without offset**	Protection is afforded to the some of the remnant areas correctly mapped under the Queensland Regulated Vegetation Map. However, large areas of remnant and regrowth being utilised as the offset for Squatter pigeon is not protected from clearing due to the area being incorrectly mapped on the Queensland Regulated Vegetation Map. In addition, there is little statutory protection for the areas of regrowth and under both state and federal environmental law. Santos GLNG also generates revenue from grazing. If the area is not maintained for the purposes of environmental offset, all opportunities to increase grazing potential will be met. Much of this vegetation can be lawfully cleared for grazing. Without intervention, these areas are also likely to be subjected to aerial herbicide application in the future. For this reason, the risk of loss is high and future quality is expected to fall slightly. • **Risk of loss (%) without offset = 80%** • **Future quality without offset = 5**
	Future quality without offset (scale of 0-10)	
Future area and quality with offset	**Risk of loss (%) with offset**	As discussed in Section 6.3, the SOA will be secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the *Vegetation Management Act 1999*. This legal security mechanism significantly reduces the risk of loss. • **Risk of loss with offset = 10%**
	Future quality with offset (scale of 0-10)	It is expected that the implementation of the management actions prescribed in Table 19 result in the following improvements in quality and condition of habitat for Squatter Pigeon within the SOA, in particular: • Regrowth and young regrowth vegetation will be restored, with improved condition particularly an increase in quality and quantity of ground layer foraging and breeding resources. • Areas in good condition will increase in spatial extent and regrowth in various stages will be able to attain maturity • When the condition of pre-existing remnant vegetation communities improves so will the abundance and diversity of foraging and breeding habitat (native, perennial tussock grasses, forbs and shrubs). Future quality of offset will depend on the start state quality: Remnant = 9 and Regrowth = 9. The mean is used as the calculator input. • **Mean future quality of offset = 9**

Table 11: South-eastern Long-eared Bat Offsets Calculator Inputs

Time horizon (years)	**Risk-related time horizon**	**20 years**
	Time until ecological benefit	**10 years** - The ecological benefit following the implementation of the management actions in Table 19 is predicted to be achieved in 10 years. The remnant and mature regrowth vegetation provides suitable roosting breeding resources for the species. 10 years of weed control and vegetation growth will result in improved feeding, breeding and roosting resources within the SOA for this species.
Start area quality `	**Start area (hectares)**	**837.5**
	Start quality (scale of 0-10)	*Weighting* – The distribution of weighting for this species has been done to recognise that site condition, site context and species stocking rate are all considered of similar value for this species with a slightly higher value placed on the condition of the site (40%). *Site Condition* – Habitat for the South-eastern long-eared bat is considered to occur in all vegetation including regrowth vegetation where hollow bearing trees occur within 1km. All vegetation communities in remnant or regrowth condition within the SOA either contain hollows or are located within 1km of vegetation that contains hollows. Within the relevant REs, 13 biocondition benchmark sites have been assessed across Springwater and neighbouring properties. The

biocondition data was collected for three different condition states Remnant, regrowth and young regrowth. The areas of young regrowth are not utilised as offsets for Large-eared pied bat, however these areas may be used in the future. The average site condition adapted from the biocondition site scores for each of the remnant and regrowth vegetation are shown below. The total mean site condition score will be used.

Regional Ecosystem	Mean Score	Final weighted (40%) Mean Site Condition Score
11.9.5 – Remnant	8.7	3.48
11.9.5 – Regrowth	6.8	2.72
11.10.7 – Remnant	8.4	3.36
11.10.7 – Regrowth	7.8	3.12
11.3.25 - Remnant	7.9	3.16
11.9.4 - Remnant	8.2	3.28
11.9.7 - Remnant	8.7	3.48

Site Context - The SOA exists as one connected piece of vegetation offsets. It links existing remnant and regrowth patches of habitat that occur on the undulating plains that fall away from the sandstone plateaus present throughout the Springwater property. The site context score is taken from the landscape score at biocondition site SW12 *Site context score = 5.5/10 (30% weight on final score) = 1.65*

Species Stocking Rate - No South-eastern long-eared bat records occur within the SOA however, this species has been recorded in the vicinity. Given the species occurs in the area and the relevant microhabitat features are present this species are expected to occur within the SOA. *Species Stocking Rate = 5/10 (30% weight on the final score) = 1.5*

Final Start Quality 11.9.5 – Remnant = 7 (6.63)
Final Start Quality 11.9.5 – Regrowth = 6 (5.87)
Final Start Quality 11.10.7 – Remnant = 7 (6.51)
Final Start Quality 11.10.7 – Regrowth = 6 (6.27)
Final Start Quality 11.3.25 – Remnant = 6 (6.31)
Final Start Quality 11.9.4 – Remnant = 6 (6.43)
Final Start Quality 11.9.7 – Remnant = 7 (6.63)

Future area and quality without offset

Risk of loss (%) without offset

Future quality without offset (scale of 0-10)

Protection is afforded to the some of the remnant areas correctly mapped under the Queensland Regulated Vegetation Map. However, large areas of remnant and regrowth being utilised as the offset for South-eastern long-eared bat is not protected from clearing due to the area being incorrectly mapped on the Queensland Regulated Vegetation Map. In addition, there is little statutory protection for the areas of regrowth and under both state and federal environmental law. Santos GLNG also generates revenue from grazing. If the area is not maintained for the purposes of environmental offset, all opportunities to increase grazing potential will be met. Much of this vegetation can be lawfully cleared for grazing. Without intervention, these areas are also likely to be subjected to aerial herbicide application in the future. For this reason, the risk of loss is high and future quality is expected to fall slightly

- **Risk of loss (%) without offset = 80%**
- **Future quality without offset = 5**

Future area and quality with offset

Risk of loss (%) with offset

As discussed in Section 6.3, the SOA will be secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the *Vegetation Management Act 1999*. This legal security mechanism significantly reduces the risk of loss.

- **Risk of loss with offset = 10%**

	Future quality with offset (scale of 0-10)	It is expected that the implementation of the management actions prescribed in Table 19 result in the following improvements in quality and condition of habitat for South-eastern Long-eared within the SOA, in particular: • Regrowth and young regrowth vegetation will be restored, with improved condition. • Areas in good condition will increase in spatial extent and regrowth in various stages will be able to attain maturity • As condition improves over time density of hollows will also increase • When the condition of pre-existing remnant vegetation communities improves so will the abundance and diversity of prey. Future quality of offset will depend on the start state quality: Remnant = 9 and Regrowth = 9. The mean is used as the calculator input. • **Mean future quality of offset = 9**

Table 12: Koala Offsets Calculator Inputs

Time horizon (years)	**Risk-related time horizon**	**20 years**
	Time until ecological benefit	**10 years** - The ecological benefit following the implementation of the management actions in Table 19 is predicted to be achieved in 10 years. Ten years of fire reduction and weed control will result in vegetation growth and increased food resources for this species. Increases in food resources and reduced pest fauna species will benefit this species.
Start area quality	**Start area (hectares)**	**434.2**
	Start quality (scale of 0-10)	*Weighting* – The distribution of weighting for this species has been done to recognise that site condition, site context and species stocking rate are all considered of similar value to this species with a slightly higher value placed on the site context (40%). This takes into account the resilience of koalas in poor habitat areas where there is good connectivity with habitat in other locations. *Site Condition* – The REs mapped within SOA that are utilised for the koala habitat offset are 11.10.7, 11.9.7 and RE11.3.25. The vegetation in this area has been divided into three separate condition states, however areas of young regrowth are not utilised as Koala offset because the mean canopy height of the 2 sites was 3.5m and 7m. These trees are considered too immature to permanently support Koalas. Within the Koala habitat REs, eight biocondition benchmark sites have been assessed across Springwater and neighbouring properties. This data has been utilised to inform the site condition score inputs for the offsets assessment guide. The average site condition adapted from the biocondition site scores for each of the remnant and regrowth vegetation are shown below. The total mean site condition score will be used.

Regional Ecosystem	Mean Score	Final weighted (30%) Mean Site Condition Score
11.10.7 – Remnant	8.4	2.52
11.10.7 – Regrowth	7.8	2.34
11.3.25 - Remnant	7.9	2.37
11.9.7 - Remnant	8.7	2.61

Site Context – The SOA exists as one connected piece of vegetation. It links existing remnant and regrowth patches of habitat that occur on the undulating plains that fall away from the sandstone plateaus present throughout the Springwater property. The site context score is taken from the landscape score at biocondition site SW12, however, an addition 1.5 has been added to the score Given SOA connects to the riparian vegetation associated with Hutton Creek. This vegetation contains additional preferred food tree species' including Forest

		Red Gum (*Eucalyptus tereticornis*) (RE 11.3.25) *Site context score = 7/10 (40% weight on final score) = 2.8* *Species Stocking Rate* - No Koalas have been observed within the SOA. However, the Koala has been previously recorded in the vicinity of the site. Given the species occurs in the area and the relevant microhabitat features are present these species are expected to occur within the SOA. *Species Stocking Rate = 5/10 (30% weight on the final score) = 1.5* **Final Start Quality 11.10.7 – Remnant = 6 (6.17)** **Final Start Quality 11.10.7 – Regrowth = 6 (5.99)** **Final Start Quality 11.3.25 – Remnant = 6 (6.02)** **Final Start Quality 11.9.7 – Remnant = 6 (6.26)**
Future area and quality without offset	**Risk of loss (%) without offset**	Other than the protections afforded to the some of the remnant areas correctly mapped under the Queensland Regulated Vegetation Map, there remains large areas of remnant and regrowth Koala habitat in the SOA that is not protected from clearing due to the area being incorrectly mapped on the Queensland Regulated Vegetation Map. In addition, there is little statutory protection for the areas of regrowth and under both state and federal environmental law. Santos GLNG also generates revenue from grazing. If the area is not maintained for the purposes of environmental offset, all opportunities to increase grazing potential will be met. Much of this vegetation can be lawfully cleared for grazing. Without intervention, these areas are also likely to be subjected to aerial herbicide application in the future. For this reason, the risk of loss is high and future quality is expected to fall slightly. • **Risk of loss (%) without offset = 80%** • **Future quality without offset = 5**
	Future quality without offset (scale of 0-10)	
Future area and quality with offset	**Risk of loss (%) with offset**	As discussed in Section 6.3, the SOA will be secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the *Vegetation Management Act 1999*. This legal security mechanism significantly reduces the risk of loss. • **Risk of loss with offset = 10%**
	Future quality with offset (scale of 0-10)	It is expected that the implementation of the management actions prescribed in Table 19 result in the following improvements in quality and condition of habitat for Koala within the SOA, in particular: • Regrowth of koala food trees will be restored and improved. • Condition and quality of existing remnant areas will be improved • The risk of mechanical and chemical control of woody vegetation, in particular regrowth food trees will be eliminated. • Increase the connectedness of the existing fauna corridor associated with Hutton Creek. Given the presence of one of the Koalas preferred food trees, it is highly likely that the species travels through this riparian vegetation. Future quality of offset will depend on the start state quality: Remnant = 9 and Regrowth = 9. The mean is used as the calculator input. • **Mean future quality of offset = 9**

Table 13: Large-eared Pied Bat Offsets Calculator Inputs

<table>
<tr><td rowspan="2">Time horizon (years)</td><td>Risk-related time horizon</td><td>20 years</td></tr>
<tr><td>Time until ecological benefit</td><td>10 years - The ecological benefit following the implementation of the management actions in Table 19 is predicted to be achieved in 10 years. The open forest and woodland vegetation communities provide habitat for the insectivorous food resources of this species. 10 years of weed control and vegetation growth will result in improved feeding resources within the SOA for this species.</td></tr>
<tr><td rowspan="2">Start area quality `</td><td>Start area (hectares)</td><td>837.5</td></tr>
<tr><td>Start quality (scale of 0-10)</td><td>Weighting – The distribution of weighting for this species has been done to recognise that site condition, site context and species stocking rate are all considered of similar value for this species with a slightly higher value placed on the condition of the site (40%).

Site Condition – Habitat for the Large-eared pied bat is considered to occur in all vegetation including regrowth vegetation adjacent caves and overhangs of cliffs and rocky hills. Due to the nearby sandstone escarpments, all vegetation in remnant or regrowth condition within the SOA are considered habitat for the Large-eared pied bat. Within the relevant REs, 13 biocondition benchmark sites have been assessed across Springwater and neighbouring properties. The biocondition data was collected for three different condition states Remnant, regrowth and young regrowth. The areas of young regrowth are not utilised as offsets for Large-eared pied bat, however these areas may be used in the future. The average site condition adapted from the biocondition site scores for each of the remnant and regrowth vegetation are shown below. The total mean site condition score will be used.

<table>
<tr><th>Regional Ecosystem</th><th>Mean Score</th><th>Final weighted (40%) Mean Site Condition Score</th></tr>
<tr><td>11.9.5 – Remnant</td><td>8.7</td><td>3.48</td></tr>
<tr><td>11.9.5 – Regrowth</td><td>6.8</td><td>2.72</td></tr>
<tr><td>11.10.7 – Remnant</td><td>8.4</td><td>3.36</td></tr>
<tr><td>11.10.7 – Regrowth</td><td>7.8</td><td>3.12</td></tr>
<tr><td>11.3.25 - Remnant</td><td>7.9</td><td>3.16</td></tr>
<tr><td>11.9.4 – Remnant</td><td>8.2</td><td>3.28</td></tr>
<tr><td>11.9.7 - Remnant</td><td>8.7</td><td>3.48</td></tr>
</table>

Site Context - The SOA exists as one connected piece of vegetation offsets. It links existing remnant and regrowth patches of habitat that occur on the undulating plains that fall away from the sandstone plateaus present throughout the Springwater property. The site context score is taken from the landscape score at biocondition site SW12 Site context score = 5.5/10 (30% weight on final score) = 1.65

Species Stocking Rate - No Large-eared pied bat records occur within the SOA however, this species has been recorded in the vicinity (Expedition National Park). Given the species occurs in the area and the relevant microhabitat features are present this species are expected to occur within the SOA. Species Stocking Rate = 5/10 (30% weight on the final score) = 1.5
Final Start Quality 11.9.5 – Remnant = 7 (6.63)
Final Start Quality 11.9.5 – Regrowth = 6 (5.87)
Final Start Quality 11.10.7 – Remnant = 7 (6.51)
Final Start Quality 11.10.7 – Regrowth = 6 (6.27)
Final Start Quality 11.3.25 – Remnant = 6 (6.31)
Final Start Quality 11.9.4 – Remnant = 6 (6.43)
Final Start Quality 11.9.7 – Remnant = 7 (6.63)</td></tr>
</table>

Future area and quality without offset	**Risk of loss (%) without offset**	Protection is afforded to the some of the remnant areas correctly mapped under the Queensland Regulated Vegetation Map. However, large areas of remnant and regrowth vegetation in the SOA being utilised as the offset for Large-eared pied bat is not protected from clearing due to the area being incorrectly mapped on the Queensland Regulated Vegetation Map. In addition, there is little statutory protection for the areas of regrowth and under both state and federal environmental law. Santos GLNG also generates revenue from grazing. If the area is not maintained for the purposes of environmental offset, all opportunities to increase grazing potential will be met. Much of this vegetation can be lawfully cleared for grazing. Without intervention, these areas are also likely to be subjected to aerial herbicide application in the future. For this reason, the risk of loss is high and future quality is expected to fall slightly. • **Risk of loss (%) without offset = 80%** • **Future quality without offset = 5**
	Future quality without offset (scale of 0-10)	
Future area and quality with offset	**Risk of loss (%) with offset**	As discussed in Section 6.3, the SOA will be secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the *Vegetation Management Act 1999*. This legal security mechanism significantly reduces the risk of loss. • **Risk of loss with offset = 10%**
	Future quality with offset (scale of 0-10)	It is expected that the implementation of the management actions prescribed in Table 19 result in the following improvements in quality and condition of habitat for Large-eared Pied Bat within the SOA, in particular: • Regrowth and young regrowth vegetation will be restored, with improved condition. • Areas in good condition will increase in spatial extent and regrowth in various stages will be able to attain maturity • As condition improves over time density of hollows will also increase • When the condition of pre-existing remnant vegetation communities improves so will the abundance and diversity of prey. Future quality of offset will depend on the start state quality: Remnant = 9 and Regrowth = 9. The mean is used as the calculator input. • **Mean future quality of offset = 9**

Table 14: Northern Quoll Offsets Calculator Inputs

Time horizon (years)	**Risk-related time horizon**	**20 years**
	Time until ecological benefit	**10 years** - The ecological benefit following the implementation of the management actions in Table 19 is predicted to be achieved in 10 years. Ten years of pest fauna control will result in reduced mortality from predation and increases in food resources. Increases in food resources and reduced pest fauna species will benefit this species.
Start area quality `	**Start area (hectares)**	**837.5**
	Start quality (scale of 0-10)	*Weighting* – The distribution of weighting for this species has been done to recognise that site condition, site context and species stocking rate are all considered of similar value for this species with a slightly higher value placed on the condition of the site (40%). *Site Condition* – Habitat for the Northern Quoll is considered to occur in all vegetation including regrowth vegetation containing denning habitat features including hollow logs, caves and overhangs of cliffs and rocky hills. Due to the nearby sandstone escarpments and presence of hollow logs, all vegetation in remnant or regrowth condition within the SOA are considered habitat for the Northern Quoll. Within the relevant REs, 13 biocondition benchmark sites have been assessed across Springwater and neighbouring properties. The biocondition data was collected for three different condition states Remnant,

<table>
<tr><td></td><td></td><td>regrowth and young regrowth. The areas of young regrowth are not utilised as offsets for Northern Quoll, however these areas may be used in the future. The average site condition adapted from the biocondition site scores for each of the remnant and regrowth vegetation are shown below. The total mean site condition score will be used.

<table>
<tr><th>Regional Ecosystem</th><th>Mean Score</th><th>Final weighted (40%) Mean Site Condition Score</th></tr>
<tr><td>11.9.5 – Remnant</td><td>8.7</td><td>3.48</td></tr>
<tr><td>11.9.5 – Regrowth</td><td>6.8</td><td>2.72</td></tr>
<tr><td>11.10.7 – Remnant</td><td>8.4</td><td>3.36</td></tr>
<tr><td>11.10.7 – Regrowth</td><td>7.8</td><td>3.12</td></tr>
<tr><td>11.3.25 - Remnant</td><td>7.9</td><td>3.16</td></tr>
<tr><td>11.9.4 – Remnant</td><td>8.2</td><td>3.28</td></tr>
<tr><td>11.9.7 - Remnant</td><td>8.7</td><td>3.48</td></tr>
</table>

Site Context - The SOA exists as one connected piece of vegetation offsets. It links existing remnant and regrowth patches of habitat that occur on the undulating plains that fall away from the sandstone plateaus present throughout the Springwater property. The site context score is taken from the landscape score at biocondition site SW12. Site context score = 5.5/10 (30% weight on final score) = 1.65

Species Stocking Rate - No Northern Quoll records occur within the SOA. Historic records for this species occur to the north of the SOA, however, recent records are lacking. Given the relevant microhabitat features are present this species may occur within the SOA. Species Stocking Rate = 4/10 (30% weight on the final score) = 1.2

Final Start Quality 11.9.5 – Remnant = 6 (6.33)
Final Start Quality 11.9.5 – Regrowth = 6 (5.57)
Final Start Quality 11.10.7 – Remnant = 6 (6.21)
Final Start Quality 11.10.7 – Regrowth = 6 (5.97)
Final Start Quality 11.3.25 – Remnant = 6 (6.01)
Final Start Quality 11.9.4 – Remnant = 6 (6.13)
Final Start Quality 11.9.7 – Remnant = 6 (6.33)</td></tr>
<tr><td rowspan="2">Future area and quality without offset</td><td>Risk of loss (%) without offset</td><td rowspan="2">Protection is afforded to the some of the remnant areas correctly mapped under the Queensland Regulated Vegetation Map. However, large areas of remnant and regrowth vegetation in the SOA being utilised as the offset for Northern Quoll is not protected from clearing due to the area being incorrectly mapped on the Queensland Regulated Vegetation Map. In addition, there is little statutory protection for the areas of regrowth and under both state and federal environmental law. Santos GLNG also generates revenue from grazing. If the area is not maintained for the purposes of environmental offset, all opportunities to increase grazing potential will be met. Much of this vegetation can be lawfully cleared for grazing. Without intervention, these areas are also likely to be subjected to aerial herbicide application in the future. For this reason, the risk of loss is high and future quality is expected to fall slightly.
• Risk of loss (%) without offset = 80%
• Future quality without offset = 5</td></tr>
<tr><td>Future quality without offset (scale of 0-10)</td></tr>
<tr><td>Future area and quality with offset</td><td>Risk of loss (%) with offset</td><td>As discussed in Section 6.3, the SOA will be secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the Vegetation Management Act 1999. This legal security mechanism significantly reduces the risk of loss.
• Risk of loss with offset = 10%</td></tr>
</table>

	Future quality with offset (scale of 0-10)	It is expected that the implementation of the management actions prescribed in Table 19 result in the following improvements in quality and condition of habitat for Northern Quoll within the SOA, in particular: • Regrowth and young regrowth vegetation will be restored, with improved condition. • Areas in good condition will increase in spatial extent and regrowth in various stages will be able to attain maturity • As condition improves over time density of hollows will also increase • When the condition of pre-existing remnant vegetation communities improves so will the abundance and diversity of prey and the number of potential denning logs will increase. Future quality of offset will depend on the start state quality: Remnant = 9 and Regrowth = 9. The mean is used as the calculator input. • **Mean future quality of offset = 9**

Table 15: Collared Delma Offsets Calculator Inputs

Time horizon (years)	**Risk-related time horizon**	**20 years**
	Time until ecological benefit	**10 years** - The ecological benefit following the implementation of the management actions in Table 19 is predicted to be achieved in 10 years. In this time remnant areas will re-establish a sub-canopy and understorey as well as increase the amount of fallen woody debris (key microhabitat for this species). The removal of fire in regrowth areas will ensure coarse woody material is not destroyed.
Start area quality	**Start area (hectares)**	**768.4 ha**
	Start quality (scale of 0-10)	*Weighting* – Site condition accounts for 50% of the overall weighting. This highlights that the condition and the presence of microhabitat features is a significant factor for this species. The species stocking rate and site context are considered of similar value with slight emphasis (30%) placed on the stocking rate. *Site Condition* – Habitat for the Collared Delma is considered to occur in all vegetation containing the relevant microhabitat features: Leaf litter, ground cover, sinkholes/tunnel erosion, coarse woody debris and hollow logs. In the SOA habitat for the Collared Delma includes all REs except the densely vegetated SEVT associated with RE 11.9.4 and the riparian vegetation associated with RE 11.3.25. The areas of young regrowth are not utilised as offsets for Collared Delma, however these areas may be used in the future. The average site condition adapted from the biocondition site scores for each of the remnant and regrowth vegetation are shown below. Within the relevant REs, nine biocondition benchmark sites have been assessed across Springwater and neighbouring properties. The average site condition adapted from the biocondition site scores for each of the remnant and regrowth vegetation are shown below. The total mean site condition score will be used.

Regional Ecosystem	Mean Score	Final weighted (50%) Mean Site Condition Score
11.9.5 – Remnant	8.7	4.35
11.9.5 – Regrowth	6.8	3.40
11.10.7 – Remnant	8.4	4.20
11.10.7 – Regrowth	7.8	3.90
11.9.7 - Remnant	8.7	4.35

Site Context - The SOA exists as one connected piece of vegetation offsets. It links existing remnant and regrowth patches of habitat that occur on the

		undulating plains that fall away from the sandstone plateaus present throughout the Springwater property. The site context score is taken from the landscape score at biocondition site SW12 *Site context score = 5.5/10 (20% weight on final score) = 1.1* *Species Stocking Rate* - No Collared Delma records occur within the SOA however, both species have been recorded in the vicinity. Given the species occurs in the area and the relevant microhabitat features are present this species are expected to occur within the SOA. *Species Stocking Rate = 5/10 (30% weight on the final score) = 1.5* **Final Start Quality 11.9.5 – Remnant = 7 (6.95)** **Final Start Quality 11.9.5 – Regrowth = 6 (6)** **Final Start Quality 11.10.7 – Remnant = 7 (6.8)** **Final Start Quality 11.10.7 – Regrowth = 7 (6.5)** **Final Start Quality 11.9.7 – Remnant = 7 (6.95)**
Future area and quality without offset	**Risk of loss (%) without offset**	Protection is afforded to the some of the remnant areas correctly mapped under the Queensland Regulated Vegetation Map. However, large areas of remnant and regrowth Collared Delma habitat in the SOA is not protected from clearing due to the area being incorrectly mapped on the Queensland Regulated Vegetation Map. In addition, there is little statutory protection for the areas of regrowth and under both state and federal environmental law. Santos GLNG also generates revenue from grazing. If the area is not maintained for the purposes of environmental offset, all opportunities to increase grazing potential will be met. Much of this vegetation can be lawfully cleared for grazing. Without intervention, these areas are also likely to be subjected to aerial herbicide application in the future. For this reason, the risk of loss is high and future quality is expected to fall slightly. • **Risk of loss (%) without offset = 80%** • **Future quality without offset = 5**
	Future quality without offset (scale of 0-10)	
Future area and quality with offset	**Risk of loss (%) with offset**	As discussed in Section 6.3, the SOA will be secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the *Vegetation Management Act 1999*. This legal security mechanism significantly reduces the risk of loss. • **Risk of loss with offset = 10%**
	Future quality with offset (scale of 0-10)	It is expected that the implementation of the management actions prescribed in Table 19 result in the following improvements in quality and condition of habitat for Collared Delma within the SOA, in particular: • Existing remnant vegetation with understorey and ground layer in poor condition will recover. • The total number and variety of microhabitat features such as loose rocks, boulders, fallen bark, leaf litter, ground cover, coarse woody debris, hollow logs, hollow-bearing trees, trees/logs will increase • The risk of mechanical and chemical control of woody vegetation will be eliminated. • Increase the connectedness of the existing fauna corridor associated with Hutton Creek. Future quality of offset will depend on the start state quality: Remnant = 9 and Regrowth = 9. The mean is used as the calculator input. • **Mean future quality of offset = 9**

Table 16: Dunmall's Snake Offsets Calculator Inputs

<table>
<tr><td rowspan="2">Time horizon (years)</td><td>Risk-related time horizon</td><td>20 years</td></tr>
<tr><td>Time until ecological benefit</td><td>10 years - The ecological benefit following the implementation of the management actions in Table 19 is predicted to be achieved in 10 years. In this time remnant areas will re-establish a sub-canopy and understorey as well as increase the amount of fallen woody debris (key microhabitat for this species). The removal of fire in regrowth areas will ensure coarse woody material is not destroyed.</td></tr>
<tr><td rowspan="2">Start area quality</td><td>Start area (hectares)</td><td>780.0 ha</td></tr>
<tr><td>Start quality (scale of 0-10)</td><td>Weighting – Site condition accounts for 50% of the overall weighting. This highlights that the condition and the presence of microhabitat features is a significant factor for this species. The species stocking rate and site context are considered of similar value with slight emphasis (30%) places on the stocking rate.

Site Condition – Habitat for Dunmall's snake is considered to occur in all vegetation containing the relevant microhabitat features: Leaf litter, ground cover, sinkholes/tunnel erosion, coarse woody debris and hollow logs. In the SOA habitat for Dunmall's snake includes all REs except the densely vegetated SEVT associated with RE 11.9.4. The areas of young regrowth are not utilised as offsets for Dunmall's snake, however these areas may be used in the future. The average site condition adapted from the biocondition site scores for each of the remnant and regrowth vegetation are shown below. Within the relevant REs, 11 biocondition benchmark sites have been assessed across Springwater and neighbouring properties. The average site condition adapted from the biocondition site scores for each of the remnant and regrowth vegetation are shown below. The total mean site condition score will be used.

<table>
<tr><th>Regional Ecosystem</th><th>Mean Score</th><th>Final weighted (50%) Mean Site Condition Score</th></tr>
<tr><td>11.9.5 – Remnant</td><td>8.7</td><td>4.35</td></tr>
<tr><td>11.9.5 – Regrowth</td><td>6.8</td><td>3.40</td></tr>
<tr><td>11.10.7 – Remnant</td><td>8.4</td><td>4.20</td></tr>
<tr><td>11.10.7 – Regrowth</td><td>7.8</td><td>3.90</td></tr>
<tr><td>11.3.25 – Remnant</td><td>7.9</td><td>3.95</td></tr>
<tr><td>11.9.7 - Remnant</td><td>8.7</td><td>4.35</td></tr>
</table>

Site Context - The SOA exists as one connected piece of vegetation offsets. It links existing remnant and regrowth patches of habitat that occur on the undulating plains that fall away from the sandstone plateaus present throughout the Springwater property. The site context score is taken from the landscape score at biocondition site SW12 Site context score = 5.5 /10 (20% weight on final score) = 1.1

Species Stocking Rate - No Dunmall's snake records occur within the SOA however, both species have been recorded in the vicinity. Given the species occurs in the area and the relevant microhabitat features are present this species are expected to occur within the SOA. Species Stocking Rate = 5/10 (30% weight on the final score) = 1.5

Final Start Quality 11.9.5 – Remnant = 7 (6.95)
Final Start Quality 11.9.5 – Regrowth = 6 (6)
Final Start Quality 11.10.7 – Remnant = 7 (6.8)
Final Start Quality 11.10.7 – Regrowth = 7 (6.5)
Final Start Quality 11.3.25 – Remnant = 7 (6.55)
Final Start Quality 11.9.7 – Remnant = 7 (6.95)</td></tr>
</table>

Future area and quality without offset	**Risk of loss (%) without offset**	Protection is afforded to the some of the remnant areas correctly mapped under the Queensland Regulated Vegetation Map. However, large areas of remnant and regrowth Dunmall's snake habitat in the SOA is not protected from clearing due to the area being incorrectly mapped on the Queensland Regulated Vegetation Map. In addition, there is little statutory protection for the areas of regrowth and under both state and federal environmental law. Santos GLNGalso generates revenue from grazing. If the area is not maintained for the purposes of environmental offset, all opportunities to increase grazing potential will be met. Much of this vegetation can be lawfully cleared for grazing. Without intervention, these areas are also likely to be subjected to aerial herbicide application in the future. For this reason, the risk of loss is high and future quality is expected to fall slightly. • **Risk of loss (%) without offset = 80%** • **Future quality without offset = 5**
	Future quality without offset (scale of 0-10)	
Future area and quality with offset	**Risk of loss (%) with offset**	As discussed in Section 6.3, the SOA will be secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the *Vegetation Management Act 1999*. This legal security mechanism significantly reduces the risk of loss. • **Risk of loss with offset = 10%**
	Future quality with offset (scale of 0-10)	It is expected that the implementation of the management actions prescribed in Table 19 result in the following improvements in quality and condition of habitat for Dunmall's Snake within the SOA, in particular: • Existing remnant vegetation with understorey and ground layer in poor condition will recover. • The total number and variety of microhabitat features such as loose rocks, boulders, fallen bark, leaf litter, ground cover, coarse woody debris, hollow logs, hollow-bearing trees, trees/logs will increase • The risk of mechanical and chemical control of woody vegetation will be eliminated. • Increase the connectedness of the existing fauna corridor associated with Hutton Creek. Future quality of offset will depend on the start state quality: Remnant = 9 and Regrowth = 9. The mean is used as the calculator input. • **Mean future quality of offset = 9**

Table 17: Yakka Skink Offsets Calculator Inputs

Time horizon (years)	**Risk-related time horizon**	**20 years**
	Time until ecological benefit	**10 years** - The ecological benefit following the implementation of the management actions in Table 19 is predicted to be achieved in 10 years. In this time remnant areas will re-establish a sub-canopy and understorey as well as increase the amount of fallen woody debris (key microhabitat for this species). The removal of fire in regrowth areas will ensure coarse woody material is not destroyed.
Start area quality	**Start area (hectares)**	**768.4 ha**
	Start quality (scale of 0-10)	*Weighting* – Site condition accounts for 50% of the overall weighting. This highlights that the condition and the presence of microhabitat features is a significant factor for this species. The species stocking rate and site context are considered of similar value with slight emphasis (30%) placed on the stocking rate. *Site Condition* – Habitat for Yakka Skink is considered to occur in all vegetation containing the relevant microhabitat features: Leaf litter, ground cover, sinkholes/tunnel erosion, coarse woody debris and hollow logs. In the SOA habitat for Yakka Skink includes all REs except the densely vegetated SEVT

<table>
<tr><td colspan="2"></td><td>associated with RE 11.9.4 and the riparian vegetation associated with RE 11.3.25. The areas of young regrowth are not utilised as offsets for Yakka Skink, however these areas may be used in the future. The average site condition adapted from the biocondition site scores for each of the remnant and regrowth vegetation are shown below. Within the relevant REs, nine biocondition benchmark sites have been assessed across Springwater and neighbouring properties. The average site condition adapted from the biocondition site scores for each of the remnant and regrowth vegetation are shown below. The total mean site condition score will be used.

<table>
<tr><th>Regional Ecosystem</th><th>Mean Score</th><th>Final weighted (50%) Mean Site Condition Score</th></tr>
<tr><td>11.9.5 – Remnant</td><td>8.7</td><td>4.35</td></tr>
<tr><td>11.9.5 – Regrowth</td><td>6.8</td><td>3.40</td></tr>
<tr><td>11.10.7 – Remnant</td><td>8.4</td><td>4.20</td></tr>
<tr><td>11.10.7 – Regrowth</td><td>7.8</td><td>3.90</td></tr>
<tr><td>11.9.7 - Remnant</td><td>8.7</td><td>4.35</td></tr>
</table>

Site Context - The SOA exists as one connected piece of vegetation offsets. It links existing remnant and regrowth patches of habitat that occur on the undulating plains that fall away from the sandstone plateaus present throughout the Springwater property. The site context score is taken from the landscape score at biocondition site SW12 *Site context score = 5.5 /10 (20% weight on final score) = 1.1*

Species Stocking Rate - No Yakka Skink records occur within the SOA however, both species have been recorded in the vicinity. Given the species occurs in the area and the relevant microhabitat features are present this species are expected to occur within the SOA. *Species Stocking Rate = 5/10 (30% weight on the final score) = 1.5*

Final Start Quality 11.9.5 – Remnant = 7 (6.95)
Final Start Quality 11.9.5 – Regrowth = 6 (6)
Final Start Quality 11.10.7 – Remnant = 7 (6.8)
Final Start Quality 11.10.7 – Regrowth = 7 (6.5)
Final Start Quality 11.9.7 – Remnant = 7 (6.95)</td></tr>
<tr><td rowspan="2">Future area and quality without offset</td><td>Risk of loss (%) without offset</td><td rowspan="2">Protection is afforded to the some of the remnant areas correctly mapped under the Queensland Regulated Vegetation Map. However, large areas of remnant and regrowth Yakka Skink habitat in the SOA is not protected from clearing due to the area being incorrectly mapped on the Queensland Regulated Vegetation Map. In addition, there is little statutory protection for the areas of regrowth and under both state and federal environmental law. Santos GLNG also generates revenue from grazing. If the area is not maintained for the purposes of environmental offset, all opportunities to increase grazing potential will be met. Much of this vegetation can be lawfully cleared for grazing. Without intervention, these areas are also likely to be subjected to aerial herbicide application in the future. For this reason, the risk of loss is high and future quality is expected to fall slightly.
• Risk of loss (%) without offset = 80%
• Future quality without offset = 5</td></tr>
<tr><td>Future quality without offset (scale of 0-10)</td></tr>
<tr><td rowspan="2">Future area and quality with offset</td><td>Risk of loss (%) with offset</td><td>As discussed in Section 6.3, the SOA will be secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the Vegetation Management Act 1999. This legal security mechanism significantly reduces the risk of loss.
• Risk of loss with offset = 10%</td></tr>
<tr><td>Future quality with offset (scale of 0-10)</td><td>It is expected that the implementation of the management actions prescribed in Table 19 result in the following improvements in quality and condition of habitat for Yakka Skink within the SOA, in particular:
• Existing remnant vegetation with understorey and ground layer in poor condition will recover.</td></tr>
</table>

	• The total number and variety of microhabitat features such suitable soils for burrows, sinkholes, abandoned rabbit warrens or large fallen woody material for shelter. • The risk of mechanical and chemical control of woody vegetation will be eliminated. • Increase the connectedness of the existing fauna corridor associated with Hutton Creek. Future quality of offset will depend on the start state quality: Remnant = 9 and Regrowth = 9. The mean is used as the calculator input. • **Mean future quality of offset = 9**

6.2.1 Offsets Assessment Guide Results

There are no significant residual offsets predicted to occur as a result of Stage 1 (See Appendix B). As there are no significant residual impacts, no offsets are proposed for the Stage 1. The SOA will be utilised by Santos GLNG as an advanced offset for future project disturbances. A discussion on Santos GLNG advanced offset approach is provided in Section 7.0.

6.3 Legal Security Mechanism

Under Queensland legislation, the following legal security mechanisms exist for offsetting impacts to the terrestrial environments:

- An environmental offset protection area under section 30 of the *Environmental Offsets Act 2014*;
- An area declared as an area of high nature conservation value under section 19F of the *Vegetation Management Act 1999*, where it is secured for the purposes of an environmental offset
- An area declared as a nature refuge under section 46 of the *Nature Conservation Act 1992*, where it is secured for the purposes of an environmental offset
- An area declared as a protected area under section 29(1) of the *Nature Conservation Act 1992*, where it is secured for the purposes of an environmental offset; or
- An area secured as a statutory covenant for environmental purposes under the *Land Act 1994* or *Land Title Act 1994*;

The offset for GFD Project will be secured as an area of high nature conservation value secured for the purposes of an environmental offset under section 19F of the *Vegetation Management Act 1999*. A Voluntary Declaration will be registered on the property title and the offset area will be mapped as a Category A area on the Property Map of Assessable Vegetation (**PMAV**). A Category A area on a PMAV is described as an “Area subject to compliance not ices, offsets and voluntary declarations”.

7.0 Advanced Offsets

Advanced environmental offsets are a supply of offsets for future use. Unlike conventional offsets, which are generally put in place ***after*** a significant residual adverse impact has occurred, advanced offsets are established ***prior*** to any impact occurring.

Environmental offsets for the Santos GFD project will be acquitted in stages. The SOA contains advanced offset area for all MNES assessed. The surplus offset values will be utilised to acquit future development of the GFD Project disturbances in accordance with the EPBC Act document "*Policy statement: Advanced environmental offsets under the Environment Protection and Biodiversity Conservation Act 1999*".

Upon approval of this management plan, the management actions provided in Section 8.0 will be implemented. The time to ecological benefit input in the offsets assessment guide will reduce as time progresses and subsequent developments will benefit from this advanced offset provision. Santos will draw down upon the advanced offsets for each relevant matter (Section 5.0) until the offsets provided for in the SOA have been exhausted.

8.0 Offset Area Management

8.1 Risks

A number of potential risks threaten the SOA. These risks are assessed below in Table 18.

Table 18: Risk Analysis

Risk	Inherent Risk Level (Extreme, High, Moderate, Low)	Actions to Minimise Risk
Access	**Low**	The location of the SOA is on private land and is not accessible via public roads. Fences will be installed restricting vehicle access.
Fire	**High**	Maintain fire breaks around likely to facilitate fie movement. In addition, Hutton Creek boarders the site on three sides and provides a natural firebreak.
Grazing	**High**	Maintain fences in stockproof condition.
Clearing	**Low**	The SOA is located on land owned by Santos. No clearing or timber harvesting will be permitted. In addition, the location of the SOA is difficult to access and any illegal clearing is considered very unlikely.
Weed Control	**Moderate**	Existing weed cover in the SOA is considered relatively low (compared to other areas). While complete eradication of all weeds is unlikely to be possible, chemical and/or mechanical control measures will ensure weed cover is reduced.
Pest Animal control	**Low**	Offset area will be fenced and pest animals will be controlled in conjunction with the existing Council/regional pest animal control programs.
Brigalow TEC regrowth stalling	**Moderate**	The regrowth in the area currently appears to be developing without the high density of thickening required for stalling.

8.2 Management Actions

Santos GLNG is proposing to utilise the SOA as an advanced offset to acquit against future disturbances. To allow for this advanced offset approach, the management actions prescribed below will be undertaken across the entire of the SOA. The SOA and the cattle exclusion zone surrounding the SOA are shown in Figure 17.

The management actions presented in this Section will be implemented to manage the risks / threats discussed in Table 19. In addition, an assessment of how the measures outlined in this section take into account relevant conservation advice and are consistent with the measures in relevant recovery plans and threat abatement plans is provided in Appendix C. This analysis aligns all the relevant threats from recovery plans and threat abatement plans and with the management measure taken to address the threat.

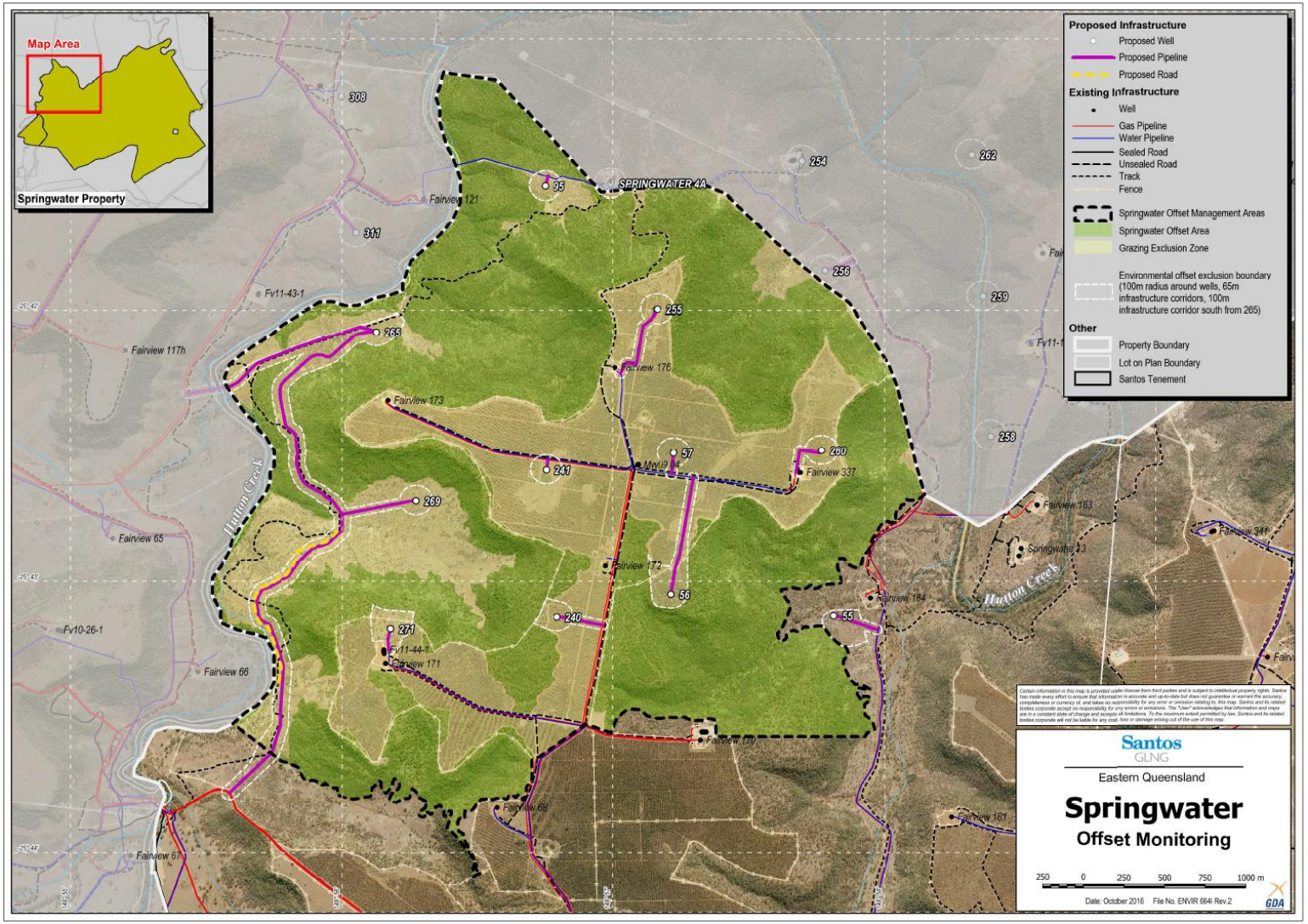

Figure 17: Springwater Offset Management Areas

Santos GLNG

Table 19: Springwater Offset Area Management Actions

Management activity	How the activity will be carried out	Where the activity will be carried out	When the activity will be carried out	Performance Criteria	Trigger levels	Remedial Action	Monitoring Mechanism
Access and Development to be limited	The SOA will appear as an exclusion zone in the Santos GIS. Fences will be installed along southern perimeter and Hutton Creek provides a natural access barrier to the north, west and east.	All of SOA	At all times	No unauthorised access or development	Any unauthorised access or development	Upgrade fencing as required. Investigate how unauthorised access and development could be prevented in the future	Rapid monitoring events and detailed monitoring events. All field monitoring will report on whether the presence of any unauthorised Access and Development.
Fire to be Excluded	Given the high proportion of fire intolerant TECs (Brigalow and SEVT) present in the SOA, fire is to be excluded. A firebreak will be maintained around the SOA.	Where potential fire risks have been identified	At least one per year to clear firebreak, remove overhanging trees or fallen debris in mid to late autumn or early spring.	Firebreaks must be established and be clearly visible, free of dense vegetation.	Any unintended encroachment of fire on the SOA	Undertake firebreak maintenance.	Rapid monitoring events and detailed monitoring events. All field monitoring will report on any potential fire damage that may have been observed.
Grazing to be Excluded	All grazing within the offset area will be prohibited. Fences will be maintained to ensure that stock do not occur within the SOA.	All of the SOA	At all times	No evidence of stock access within the SOA.	Ensure offset area fencing is maintained in stock proof condition at all times	Repair fencing as needed.	Rapid monitoring events and detailed monitoring events. All field monitoring will report on the condition of fences observed.
Clearing Prohibition	Broad-scale clearing will be excluded from the offset area through demarcation and protection by means of Voluntary Declaration under the VM Act. Clearing for timber gathering and development will also be excluded.	All of the SOA	At all times	No evidence of clearing within the offset area. Area mapped as Category A on PMAV	Any clearing or tree removal	Dedicated revegetation project to re-instate cleared vegetation. Illegal clearing will be reported	Rapid monitoring events and detailed monitoring events. In particular, flora surveys and bio-condition assessments

Management activity	How the activity will be carried out	Where the activity will be carried out	When the activity will be carried out	Performance Criteria	Trigger levels	Remedial Action	Monitoring Mechanism
Weed Control	Using chemical and/or mechanical control.	All of the SOA	Annually during early to mid Spring or as determined by monitoring	Locations of class 1-3 declared weed populations known and being monitored / controlled.	New infestations of weeds or establishment of new declared weeds. Failure of previous weed control attempts.	Isolation of area and chemical treatment to control any outbreaks. Increase monitoring if required.	Rapid monitoring events and detailed monitoring events. In particular, annual flora surveys and bio condition assessments
Pest Animal Control	Trapping or shooting by licensed shooters	All of the SOA	Twice annually for pigs, dogs and cats. Ongoing basis for other species as required.	Feral animals are under control and not impacting on the offset management area.	Increase in abundance for pigs, dogs and cats. Evidence of new pest species.	Development of additional measures to manage pest animals	Pest animal monitoring.
Regrowth Thinning of Brigalow TEC	Restoration thinning can accelerate structural development. Selective thinning may be required where regrowth of Brigalow TEC occurs at >10,000 stems per hectare	Regrowth Brigalow TEC where thickening has occurred to >10,000 stems per hectare	As necessary and informed by ongoing ecological monitoring	Areas regrowth stalling progression to remnant vegetation must be controlled	Brigalow regrowth with >10,000 stems/ha	Undertake selective thinning.	Rapid monitoring events and detailed monitoring events. In particular, flora surveys and bio-condition assessments.

9.0 Monitoring

A program to monitor and report on the effectiveness of the management measures and progress against the performance and completion criteria outlined in Table 19 has been developed.

Ongoing monitoring is required to ensure the objectives of this management plan are achieved. Monitoring activities must link back to the improvements listed in the "future area and quality with offset" for each MNES as listed in Section 6.2. The frequency of monitoring and nature of monitoring activities will depend on the management activities required for the area. This management plan prescribes rapid and detailing monitoring events. The frequency of monitoring is discussed in more detail in Section 9.4.

At all times, management must be pro-active and flexible. Management of the SOA will consistently be guided by the results of monitoring, visual observations and climatic conditions with the prime focus being the improvement of the ecological values on the property. Monitoring will be undertaken by suitably qualified persons. Santos GLNG will be responsible for implementing the management and monitoring proposed in this offsets plan.

9.1 Rapid Monitoring Event

9.1.1 GIS Canopy Analysis

Detailed GIS analysis will be conducted to assess the canopy cover percentages across the Brigalow regrowth areas within the SOA. The GIS analysis will measure the total canopy area of regrowth Brigalow and total area of pasture grasses. An assessment of percentage of total cover for Brigalow trees and shrubs compared to the total cover of pasture grass will be undertaken to ensure the overall canopy area of the trees is increasing. The results of the GIS canopy analysis will inform the timing and location for when Rapid Community Assessment monitoring is required.

9.1.2 Field Assessment

Field assessments of the SOA will be conducted during spring and early summer to coincide with the optimal time of year for flora and fauna surveys in the Brigalow Belt Bioregion (Eyre et al. 2014). The location of the field assessment will be informed by the results of the annual GIS canopy analysis and previous assessments. During each rapid monitoring field assessment, the following will conducted:

- Fences tracks and existing gas field infrastructure will be inspected to ensure grazing has been excluded from all of the Springwater Management Areas and access and development has been excluded from the SOA.
- An unbounded timed meander flora and fauna survey will be conducted. The survey will be conducted in accordance with the timed meander survey methodology contained within the Queensland Department of Environment and Heritage Protection's Flora Survey Guidelines. The following will be conducted:
    - An assessment of the presence and abundance of dominant flora and fauna species.
    - A dedicated flora survey of the ground layer to assess groundcover species richness and recruitment of native flora species.
    - The presence and abundance of weed species.
    - The presence of pest fauna.
    - Photos will be taken at designated and fixed photo monitoring points.

- General observations regarding the presence and condition of erosion, the presence and extent of any other threatening processes.
- The condition of regrowth Brigalow and the presence of any areas containing >10,000 stems per hectare that may requiring thinning.
- The presence and extent of any other threatening processes.

- Pest plant monitoring will be conducted. The pest plant monitoring will target the declared and environmental weeds known to occur over Springwater: Buffel Grass (*Cenchrus ciliaris*), Green Panic (*Megathyrsus maximus*), Parthenium (*Parthenium hysterophorus*) and Harrisia Cactus (*Harrisia martinii*). The results of the monitoring will determine treatment. In addition to the rapid monitoring for pest plants, non-native plant cover is also assessed in the Bio-Condition Assessment methodology detailed in Section 9.2.1.

9.2 Detailed Monitoring Event

9.2.1 Bio-Condition Assessment

Bio-Condition sites will be established in all major vegetation assessment units. Fixed transect monitoring of Bio-condition assessable attributes will take place during each monitoring year using the Bio-Condition classes and scores derived from the *Bio-Condition – A Terrestrial Vegetation Condition Assessment Tool for Biodiversity in QLD*. In accordance with the bio-condition methodology the following site based condition attributes will be assessed:

- Presence of large trees;
- Tree canopy height;
- Recruitment of canopy species;
- Tree canopy cover (%);
- Shrub layer cover (%);
- Coarse woody debris;
- Native plant species richness for four life forms;
- Non-native plant cover;
- Native perennial grass cover (%); and
- Litter cover

At all Bio-condition sites photo monitoring points will be established. Photos will be clearly marked with the date, location, direction, time of day and type of camera used.

The condition of each site will be compared to the benchmark data provided for each RE. Benchmarks will be obtained from either Santos' internal bio-condition results or from the DEHP website at http://www.qld.gov.au/environment/plants-animals/biodiversity/benchmarks/#benchmarks.

To determine ongoing effectiveness of management, the transect data collected from the previous monitoring event will be used as a baseline and compared both to the earlier monitoring results and the Benchmark communities.

9.2.2 Targeted Flora Surveys and Habitat Mapping

Targeted threatened flora surveys will be conducted throughout the SOA. A timed meander survey will be conducted in each of the vegetation units listed in Table 4 to identify and locate EVNT plants potentially impacted by a project. The timed meander survey will be conducted in accordance with Section 4.1 of the *Queensland Department of Environment and Heritage Protection's Flora Survey*

Guidelines - Protected Plants - Nature Conservation Act 1992, located here: https://www.ehp.qld.gov.au/licences-permits/plants-animals/documents/flora-survey-guidelines.pdf

It is expected that the majority of vascular plant species (including weeds) will be identified during these surveys. Once completed, detailed habitat mapping will be created for all EPBC Act listed threatened flora species. This mapping will complement the fauna habitat mapping already completed and shown in Figure 11 to Figure 16. Once the targeted flora surveys and habitat mapping is completed and threatened fauna species are identified, the management measures undertaken will be amended, to reflect the relevant conservation advices, recovery plans and threat abatement plans.

9.2.3 Targeted Fauna Surveys

Targeted fauna surveys will be conducted to assess fauna species richness of the SOA. The targeted fauna survey methods will focus on the relevant specific significant species that are unlikely to be detected effectively during the rapid assessment surveys due to cryptic behaviour or localised habitat requirements. Targeted surveys for species are based on the ecology, habitat requirements and behavioural aspects of the species of interest. The targeted fauna surveys may include the following survey techniques:

- Camera traps
- Cage trapping
- Pitfall and funnel trapping
- Ultrasonic Bat call detection
- Harp Trapping
- Active searching
- Spotlighting
- Active Koala searches and scat analysis

Trapping sites will be selected using existing knowledge to identify locations with either a high number or a diversity of habitat features. The locations of these sites will be refined on subsequent field visits.

9.3 Pest Animal Monitoring

In partnership with the Queensland Murray-Darling Committee (QMDC), Santos GLNG conduct a feral animal research, monitoring and control project for the Fairview gas field. The methodology employed in this program is discussed below.

9.3.1 Wild dog, fox and feral cat

On-ground investigations and remote camera monitoring stations are identify ‘hot spots’ to ensure maximum effectiveness and distribution of control activities. Trapping at ‘hot spots’ involves lure attractants, and rubber jawed and off set traps are employed to allow for ‘humane capture’, minimising skin damage to the trapped animal. These traps allow for safe release of any non-target species captured.

9.3.2 Feral Pigs

To gauge current ‘hot spot’ locations remote cameras are established both at sites identified during the benchmarking process and at additional sites where feral pig activity was identified. Traps are

deployed in suitable humane locations and free fed for at least two weeks to encourage pigs to enter the traps. This process maximises capture numbers.

In addition to the above program, evidence of pest fauna species is documented during the rapid monitoring events and the detailed monitoring events. Where required, monitoring will be undertaken each time a pest animal control program is run and reporting will follow post the control operations being completed.

9.4 Monitoring Frequency

The frequency of the monitoring events described above are outlined in Table 20 below. The monitoring program will continue for life of the approval to ensure that once it achieves the planned improved condition the offset remains conserved for the life of the approval.

Table 20: Monitoring Frequency for Each of the Monitoring Events

Monitoring Event	Set Up / Baseline Monitoring	Ongoing Monitoring
Rapid Monitoring Event		
GIS Canopy Analysis	Data collection completed August / September 2016	Completed annually
Field Assessment	None	Completed annually
Detailed Monitoring Event		
Targeted Flora Surveys and Habitat Mapping	Completed 2017	Every five years
Bio-condition Assessment	Completed 2017	Every five years
Targeted Fauna Surveys	Completed 2017	Every five years
Pest Animal Monitoring/ Trapping	To be done as part of the existing program. Twice annually for pigs, dogs and cats. Ongoing basis for other species as required	

In addition to the monitoring events prescribed in Table 20, the fences, access tracks and gas field infrastructure within and surrounding the SOA will be regularly inspected by Santos field personnel as part of day-to-day operations. As a part of these inspections, there will be opportunities to assess whether cattle remain successfully excluded from the SOA and/or if any unauthorised access has been gained. Inspections of operational infrastructure will occur at least twice annually and typically occur following severe weather events.

9.5 Monitoring Results

The monitoring will inform the management requirements and help meet the goals of this management plan. The principle goal of the management plan is to:

- Assist in the development of a structure consistent with a Brigalow, and mixed Eucalypt / Brigalow communities;
- Manage the overall area for wildlife; and

Where the results of the monitoring indicate that the desired outcomes are not being achieved corrective actions will be developed and implemented.

10.0 Reporting

Reports detailing the progress against the proposed management outcomes will be required following each monitoring event. Reporting is to be completed by the personnel conducting monitoring and following the completion of each monitoring event. The report will contain:

- A description of the monitoring conducted (Detailed and/or rapid assessment);
- A discussion of the weather in the lead up to and during the monitoring;
- Photos of the relevant photo monitoring points;
- Site data including site description and location and results for all site based condition attributes listed in Section 9.0.
- Rapid assessment site data including site description and location and results;
- Results of the GIS canopy analysis;
- An overview of the progress of the management area in achieving the management outcomes and how any risks or threats have impacted on the area;
- An indication of any risks or potential threats that have become apparent to the management area since the development of the this management plan, and activities to be undertaken to manage these threats and/or risks; and

10.1 Duration of the Management Agreement

In order to achieve the goals of this Offset Area Management Plan, the plan, or updated revisions will continue in force until the completion of 20 years.

11.0 References

AECOM (2016), Scotia Ecological Survey, Report Produced for Santos GLNG.

Aurecon (2010), *Ecological Assessment Report- Scotia Well Site (214416)*. This report provided the results of ecological assessments on the Scotia 33 well lease.

Aurecon (2014) *Gas Field Development Project Environmental Impact Assessment Project EIS* -

Eyre TJ, Ferguson DJ, Hourigan CL, Smith GC, Mathieson MT, Kelly, AL, Venz MF, Hogan, LD & Rowland, J. 2014. *Terrestrial Vertebrate Fauna Survey Assessment Guidelines for Queensland. Department of Science,* Information Technology, Innovation and the Arts, Queensland Government, Brisbane

Mackey B, Watson J and Worboys GL of ANU Enterprises Pty Ltd (2010), *Connectivity conservation and the Great Eastern Ranges corridor, an independent report to the Interstate Agency Working Group (Alps to Atherton Connectivity Conservation Working Group).* Convened under the Environment Heritage and Protection Council/Natural Resource Management Ministerial Council.

Worboys GL and Pulsford I. (2011) *Connectivity conservation in Australian landscapes*. Report prepared for the Australian Government Department of Sustainability, Environment, Water, Population and Communities on behalf of the State of the Environment 2011 Committee. Canberra: DSEWPaC, 2011.

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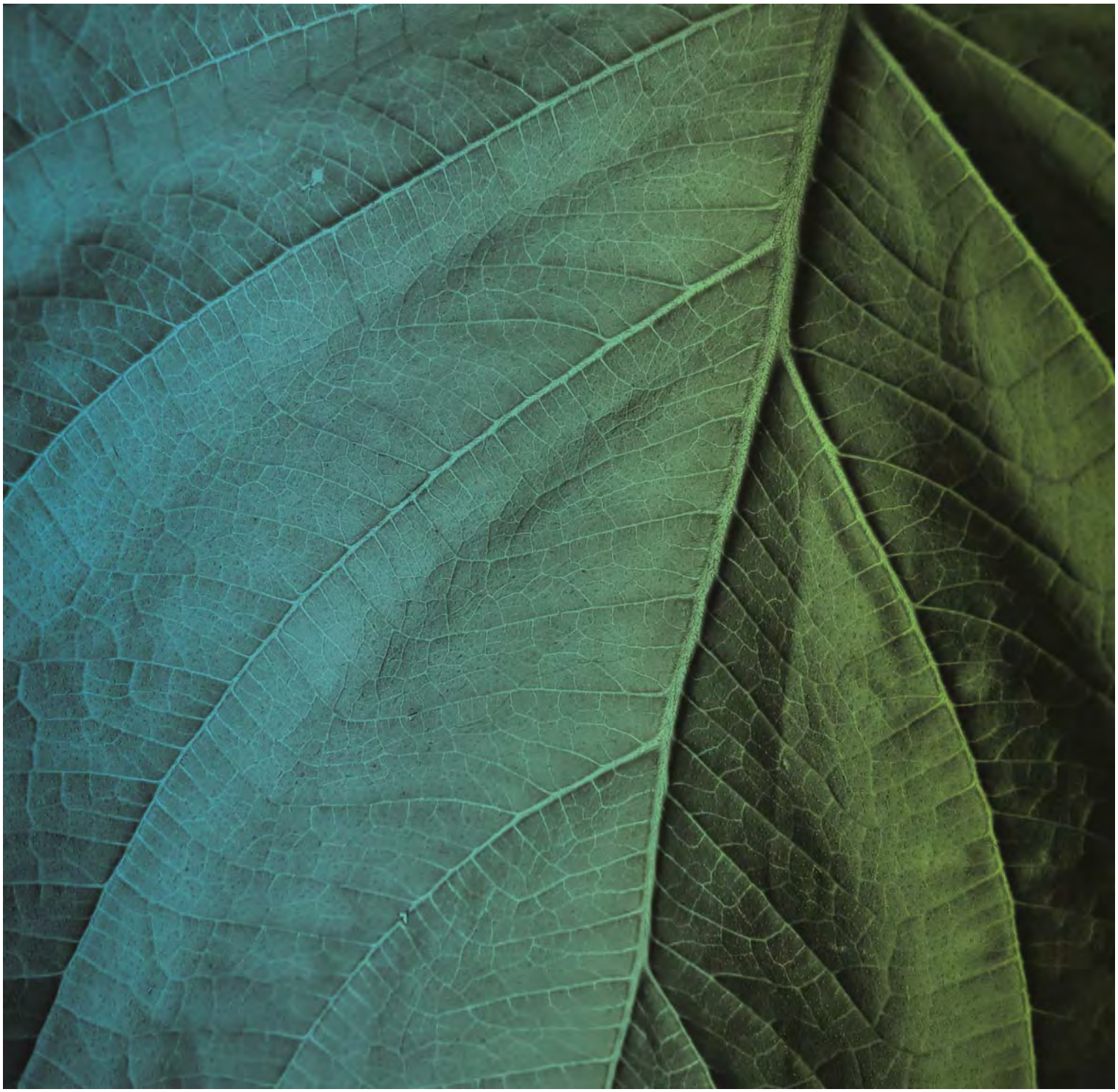
APPENDIX A

Scotia Ecology Survey Report –

Santos Ltd
07-Apr-2016

Scotia Ecology Survey



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APPENDIX B

Residual Significant Impact Assessment for Threatened Fauna and Ecological Communities-

Memorandum

Date 6 September 2016

To **Daniel Rose, Santos Ltd**

From Tom Kaveney, Director, Adaptive Strategies Pty Ltd

Subject: **Scotia Gas Field Development – impacts to matters of National Environmental Significance**

Purpose

The purpose of this memo is to provide:

1. advice on whether impacts from the Scotia Gas Field Development should be considered "*residual significant impacts*",
2. reasoning for any findings based on science, policy guidance, precedent and experience.

Background and context

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) establishes a requirement for Australian Government environmental assessment and approval of, amongst other things, actions that are likely to have a significant impact on matters of national environmental significance (commonly referred to as matters of NES or MNES).

There are nine MNES listed under the EPBC Act. Of these, the only matter relevant to the proposed Scotia Gas Field Development is 'listed threatened species and ecological communities'.

The Santos GLNG Gas Field Development Project (which is a larger project incorporating the Scotia Gas Field development and a series of subsequent stages) was referred to the Commonwealth Government and following a detailed assessment, was approved in March 2016. The approval contains 41 primary conditions that Santos must comply with. Of particular relevance to this advice are Conditions 3 and 14.

Condition 3 establishes a maximum level of clearance for each MNES likely to be impacted. Annex 1 to the approval lists each MNES and the hectare area that may be cleared. In EPBC Act parlance these limits constitute the "acceptable level of impact" of the project, taking into account mitigation and offset measures. Importantly, these limits of clearing are detailed at the full project scale relating to all stages of the project. The limits apply to all clearing undertaken as part of the project, irrespective of the significance of the clearing and associated impact.

Condition 14, which has sub-points a) to k), details the requirements for an Offset Management Plan; which includes at sub-point a) the development of a method for assessing residual significant impacts.

Conditions 15 to 19 also relate to the delivery of offset for residual significant impacts, however, these will not be dealt with in detail here.

In delivering on these approval conditions the main question to be answered is:

> ***At what point do the impacts of the Scotia Gas Field Development (stage 1), if at all, constitute a residual significant impact?***

Scotia Gas Field Impacts

The predicted residual impacts from the Scotia Gas Field development are provided in the table below.

MNES	EPBC Status	Impact Area (ha)
Brigalow (*Acacia harpophylla* dominant and co-dominant)	Endangered	8.26
South-eastern long-eared bat (*Nyctophilus corbeni*)	Vulnerable	4.38
Koala (*Phascolarctos cinereus*)	Vulnerable	2.88
Collared delma (*Delma torquata*)	Vulnerable	8.80
Dunmall's snake (*Furina dunmalli*)	Vulnerable	8.80
Yakka skink (*Egernia rugosa*)	Vulnerable	7.00

Note: these figures have been updated based on current project development footprint.

The occurrence of these listed matters overlaps considerably; accordingly the actual total area of MNES occurrence/habitat to be impacted by Stage 1 is 10.69 ha.

Residual Significant Impacts

In determining what constitutes a "residual significant impact" for the purposes of post approval application (as required by the approval conditions) consideration needs to be given to a number of varying elements.

Prescribed limits

There is no formal advice related to the application of the term "residual significant impact" in a post approval context. The Santos GLNG approval does not provide a definition for the term or prescribe any limits.

The Santos GLNG approval prescribed maximum clearing limits for each MNES. However, as discussed earlier these values are for the whole or larger project and are not detailed for individual stages. It can only be assumed that the point of residual significant impact is a point somewhere on the scale between zero and the maximum clearing limit.

Published thresholds

The Australian Government has issued significant impact guidelines (Policy Statements) to help clarify what may constitute a significant impact on MNES. These are in the form of a generic guideline (Policy Statement 1.1) and specific guidelines for individual MNES. The guidance is designed to assist proponents determine if they should refer a proposed action and does not necessarily translate directly to post approval management.

In a small number of cases quantitative information is provided on what might constitute a significant impact, for example: the percentage of migratory bird populations affected; or the noise levels likely to disturb whale species. Threshold limits for the clearing of habitat or ecological communities is rarely provided and often a more qualitative approach is required. None of the entities to be impacted by the Scotia Gas Field development have prescribed quantitative thresholds. The Koala is a slight exception as there is a semi-quantified habitat assessment tool used for determining if referral is necessary.

In the absence of prescribed limits or published thresholds it is necessary to look to precedence and ecological information to determine what might constitute significant impact

Referral precedence

Brigalow TEC

Referrals involving impacts on Brigalow TEC have been deemed controlled actions for direct losses for as little as four (4) hectares. This however should be considered a coarse measure as scenarios of greater total area, but where impacts are isolated and the TEC is in poor condition, have been deemed not significant. Controlled actions for impacts less than 4ha are rare.

It should also be noted that the EPBC Act web database cannot be automatically searched and information is based on manual searches and practitioner experience. While 4ha provides an informal guide, it should be noted that other factors such as the condition, patch size and connectivity, as well as remnant or regrowth status may influence whether impacts are significant.

Collared delma, Dunmall's snake, Yakka skink

Specific or individual referral precedence for these three species are difficult to find as any controlled actions involving these species almost always includes Brigalow TEC due to the overlapping habitat preference with Brigalow vegetation. As such, significant impact thresholds are difficult to determine separate to those of Brigalow TEC.

South-eastern long-eared bat

As with the reptile species above, referrals for this species are often associated with Brigalow TEC. In cases where the species has been the sole trigger it has involved tens to thousands of hectares of potential impact. Accordingly, a minimum threshold limit is difficult to determine.

Koala

The Koala is a relatively recent listing under the EPBC Act and therefore determining precedence values is difficult, particularly as most relevant referrals have related to large areas of habitat, 10s-100s of hectares. Adding to this is the conservative nature of the referral guidelines published for Koalas. These guidelines contain a habitat assessment tool that uses a number of criteria to determine the value of potential habitat.

Case law precedence

Further advice can potentially be drawn from the various EPBC Act legal cases that have been through the Federal Court. There are 20 EPBC Act law cases listed on the Department of the Environment's website (https://www.environment.gov.au/epbc/compliance-and-enforcement/case-judgments). A review of this case law reveals:

- There have been no legal cases involving the MNES related to the Scotia Gas Felid development.
- The majority of cases involve impacts to species and ecological communities listed as *critically endangered*.
- There is one case solely related to listed vulnerable species, which involved the clearing of 8ha of Striped legless lizard habitat in Victoria in 2007.
- Minimum impacts to listed endangered species are: 4 ha of Swift parrot habitat in Tasmania; and 6.7 ha for Black cockatoo habitat in Western Australia.
- No Queensland located cases are listed.

Limited conclusions or parallels can be drawn from the case law, especially as none of the relevant Scotia Gas Field MNES have been the subject of legal action. Other factors, such as the defendant's

intent, wilfulness and past legal history, may also have been considerations of the court in these cases.

Ecology

The final factor that needs consideration is the actual ecology of the species, habitat or vegetation community and how impacts may affect the viability, life cycle or behaviour of the entity.

For vegetation communities and habitat areas the key concept considered is usually patch viability. Viability is determined by a number of factors including:

- Size
- Connectivity to other areas of habitat
- Shape – edge to area ratios (long-thin patches being more susceptible to weed, fire, storm damage, and incremental clearing than squarer polygons that offer more buffer and integrity)
- Condition – plant density, age range, weediness, canopy cover
- Recruitment – ability for propagation/pollination of new plants or animal breeding.

These factors are particularly worth considering in the Scotia Gas Field development scenario given the small size, number and scattered location of the impacted areas.

Analysis of Significant Impacts

Using the project's environmental information and the concepts and precedence outlined above, an analysis of each MNES has been undertaken to determine if residual significant impacts will occur from the Scotia Gas Field Development (Stage 1).

Brigalow TEC

Area: a total of 8.26 ha will be impacted, noting that this is in excess of the coarse referral precedence for significant impacts.

Patch viability: the 8.26 ha are in 22 separate patches ranging in size from 0.01 to 1.82 ha. Only two of these patches are connected by non-impacted Brigalow TEC. None of the patches provide connectivity between large viable patches of Brigalow TEC or notable habitat areas for other listed MNES. The largest impacted area (1.82 ha) is a linear area adjacent to existing roadways and surrounded by cleared paddocks. It has a very poor edge to area ratio and is subject to various edge related impacts.

Context: within the Gas Field area the four largest patches (with greatest viability) will not be impacted. The scale of impacts will not affect the long-term presence of Brigalow TEC within the study area or surrounding region.

Conclusion: based on the number, size and viability of patches impacted and the relatively small total area impacted, residual significant impacts are unlikely.

Collared delma and Dunmall's snake,

Area: a total of 8.80 ha will be impacted.

Patch viability: the 8.80 ha are in 26 separate habitat areas ranging in size from 0.01 to 1.36 ha. A number of the smaller areas, particularly in the north of the development area, are connected to larger areas of habitat, however impacts will not reduce the viability of these habitat areas. The largest impacted habitat area (1.36 ha) is a linear area adjacent to existing roadways and surrounded by cleared paddocks. It has a very poor edge to area ratio and is subject to various edge related impacts.

Context: within the Gas Field area the largest patches (with greatest viability) of potential habitat will not be impacted.

Conclusion: based on the number and viability of patches impacted and the relatively small total area, residual significant impacts are unlikely.

Yakka skink

Area: a total of 7.00 ha will be impacted.

Patch viability: the 7 ha are in 19 separate habitat areas ranging in size from 0.01 to 1.36 ha. A number of the smaller areas, particularly in the north of the development area, are connected to larger areas of habitat, however impacts will not reduce the viability of these habitat areas. The largest impacted patch (1.36 ha) is a linear area adjacent to existing roadways and surrounded by cleared paddocks. It has a very poor edge to area ratio and is subject to various edge related impacts.

Context: within the Gas Field area the largest patches (with greatest viability) of potential habitat will not be impacted.

Conclusion: based on the number and viability of patches impacted and the relatively small total area, residual significant impacts are unlikely.

South-eastern long-eared bat

Area: a total of 4.38 ha will be impacted.

Patch viability: the 4.38 ha are in 9 separate habitat areas ranging in size from 0.16 to 0.77 ha. A number of the smaller areas, particularly in the north of the development area, are connected to larger areas of habitat, however impacts will not reduce the viability of these habitat areas.

Context: within the Gas Field area the largest patches (with greatest viability) of potential habitat will not be impacted.

Conclusion: based on the number and viability of patches impacted and the relatively small total area, residual significant impacts are unlikely.

Koala

Area: a total of 2.88 ha will be impacted.

Patch viability: the 2.88 ha are in 9 separate habitat areas ranging in size from 0.09 to 0.73 ha. A number of the smaller areas, particularly in the north of the development area, are connected to larger areas of habitat, however impacts will not reduce the viability of these habitat areas. None of the patches provide connectivity between larger viable patches of habitat.

Assessment tool: Using the EPBC Assessment tool the habitat within the Scotia Gas Field development scores a 4, which ranks it as non-critical habitat.

Context: within the Gas Field area the largest patches (with greatest viability) of potential habitat will not be impacted.

Conclusion: based on the number and viability of patches impacted, the small total area, absence of critical habitat plus the result if the assessment tool, residual significant impacts are unlikely.

Findings

Based on the information above, and professional judgement, the following conclusions have been drawn:

1. The Scotia Gas Field development (Stage 1) is not likely to have a residual significant impact on matters of National Environmental Significance as contained in Condition 12 of the approval.
2. The impacts on MNES from the Scotia Gas Field development (Stage 1), while not considered significant, will need to be acquitted against the maximum clearing levels as stipulated in Condition 3 and Annex 1 of the approval.

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APPENDIX C

How the Management Activities (Section 8.0) meet the Identified Species' Threats -

Species	Species threats identified in relevant conservation advices and threat abatement plans	Management Activity
Flora Species		
Acacia grandifolia	Habitat modification through timber harvesting	Clearing Prohibition
	Inappropriate fire regimes	Fire to be Excluded
	Inappropriate grazing regimes	Grazing to be Excluded
Arthraxon hispidus (Hairy-joint grass)	Weed invasion, in particular from the Mist flower (*Ageratina riparia*), Crofton weed (*Ageratina adenophora*) and Lantana (*Lantana camara*)	Weed Control
	Competition from introduced grasses such as Paspalum (*Paspalum dilatatum*) and Kikuyu *(Pennisetum clandestinum*)	Weed Control
	Trampling by stock	Grazing to be Excluded
	Clearing for agriculture and development	Clearing Prohibition
	Slashing or mowing of habitat	Clearing Prohibition
	Inappropriate fire regimes	Fire to be Excluded
	Over-grazing by domestic stock	Grazing to be Excluded
Bertya opponens	Grazing by feral goats	Pest Animal Control
	Seedling viability	Non-manageable Threat
	Inappropriate fire regimes	Fire to be Excluded
	Clearing	Clearing Prohibition
	Drought	Non-manageable Threat
Cadellia pentastylis (Ooline)	Clearing for agriculture	Clearing Prohibition
	Localised extinction due to small and scattered populations	Non-manageable Threat
	Inbreeding which threatens genetic diversity in small populations	Non-manageable Threat
	Damage to roadside populations during roadworks	Clearing Prohibition
	Grazing and soil compaction by domestic stock including feral goats (*Capra hircus*) and pigs (*Sus scrofa*)	Pest Animal Control Grazing to be Excluded
	Invasion of habitat by weeds, such as Tiger Pear (*Opuntia aurantiaca*)	Weed Control
	Frequent fires	Fire to be Excluded
	Tunnel and sheet erosion	Clearing Prohibition
	Low seed viability which threatens breeding success	Non-manageable Threat
	High insect attack	Non-manageable Threat
Daviesia discolor	High frequency fires, including deliberate fuel reduction burns or wildlife	Fire to be Excluded
	Cattle grazing	Grazing to be Excluded
Eucalyptus beaniana (Bean's ironbark)	Destruction of trees for timber	Clearing Prohibition Access and Development to be Limited
	Road widening and maintenance activity	Clearing Prohibition
Phaius australis (Swamp orchid)	Illegal collection for horticulture or cut flowers	Access and Development to be Limited

Species	Species threats identified in relevant conservation advices and threat abatement plans	Management Activity
	Habitat loss through clearing and fragmentation and drainage for development, agriculture and road works	Clearing Prohibition
	Timber harvesting	Clearing Prohibition
	Mining	Clearing Prohibition
	Trampling and browsing by feral pigs and domestic livestock	Pest Animal Control
	Invasion by weeds, in particular Lantana (*Lantana camara*), Umbrella tree (*Schefflera actinophylla*), Groundsel (*Baccharis halmifolia*) and Brazilian cherry (*Eugenia uniflora*)	Weed Control
	Inappropriate fire regimes	Fire to be Excluded
Xerothamnella herbacea (Xerothamnella)	Competition from invasive plant species (primary species threat)	Fire to be Excluded
	Road widening and maintenance activities	Clearing Prohibition
	Surface erosion	Clearing Prohibition
	Grazing and trampling by cattle and native macropods	Grazing to be Excluded
Fauna Species		
Botaurus poiciloptilus (Australasian bittern)	Reduction in the extent and quality of habitat due to the diversion of water away from wetlands	Access and Development to be Limited
	Clearing of wetlands for urban development or agriculture	Clearing Prohibition
	Reduction of water quality	Access and Development to be Limited
	Peat mining impacts on habitat	Clearing Prohibition
	Overgrazing by livestock	Grazing to be Excluded
	Inappropriate fire regimes	Fire to be Excluded
	Predation of eggs and juveniles by foxes and cats	Pest Animal Control
Chalinolobus dwyeri (Large-eared pied bat)	Disturbance and damage at primary nursery roosts, particularly by goats	Pest Animal Control
	Potential threat - Loss of foraging habitat	Clearing Prohibition
	Potential threat - Vegetation clearance in the proximity of roosts	Clearing Prohibition
	Potential threat - Loss of genetic diversity	Non-manageable Threat
	Potential threat - Mine induced subsidence of cliff lines	Non-manageable Threat
	Potential threat - Disturbance from human recreational activities	Access and Development to be Limited
	Potential threat - Habitat disturbance by other animals, including livestock and feral animals	Pest Animal Control Grazing to be Excluded
	Potential threat - Predation by introduced predators	Pest Animal Control
	Potential threat - Fire in the proximity of roosts	Fire to be Excluded
	Lethal toxic ingestion of Cane toad toxin	Non-manageable Threat
	Feral predators	Pest Animal Control

Species	Species threats identified in relevant conservation advices and threat abatement plans	Management Activity
Dasyurus hallucatus (Northern quoll)	Weeds	Weed Control
	Disease	Non-manageable Threat
	Inappropriate fire regimes	Fire to be Excluded
	Habitat degradation	Access and Development to be Limited Clearing Prohibition
	Population isolation	Access and Development to be Limited Clearing Prohibition
	Hunting and persecution	Access and Development to be Limited Clearing Prohibition
Delma torquata (Collared delma)	Loss and modification of habitat from urban and agricultural development	Access and Development to be Limited
	Removal of surface rocks during the development process or landscaping activities	Access and Development to be Limited
	Fire	Fire to be Excluded
	Invasive weeds, particularly *Lantana montividensis*	Weed Control
Egernia rugosa (Yakka skink)	Continued legacy of past broadscale land clearing and habitat degradation	Clearing Prohibition
	Removal of wood debris and rock microhabitat features	Access and Development to be Limited
	Inappropriate roadside management	N/A
	Ripping of rabbit warrens	Pest Animal Control
	Predation by feral animals, in particular by feral cats and foxes	Pest Animal Control
Erythrotriorchis radiatus (Red goshawk)	Habitat loss and fragmentation	Access and Development to be Limited Clearing Prohibition
	Threats to nest sites ie by egg collectors, clearing of mature trees, fires	Access and Development to be Limited Clearing Prohibition Fire to be Excluded
	Threats to the prey base and prey availability ie via the degradation of rivers and wetlands utilised by potential prey species, burning, heavy grazing	All Activities
	Information and communication gaps	Non-manageable Threat
	Past legacy of broadscale land clearing and habitat modification	Non-manageable Threat

Species	Species threats identified in relevant conservation advices and threat abatement plans	Management Activity
Furina dunmalli (Dunmall's snake)	Modification of habitat due to agriculture and urban development	Access and Development to be Limited
	Overgrazing of habitat	Grazing to be Excluded
Geophaps scripta scripta (Squatter pigeon [southern])	Clearance of habitat	Clearing Prohibition
	Grazing of habitat by livestock and feral herbivores	Grazing to be Excluded Pest Animal Control
	Predation, in particular by Feral cats and foxes	Pest Animal Control
Nyctophilus corbeni (South-eastern long-eared bat)	Habitat loss and fragmentation	Clearing Prohibition
	Reduction in hollow availability	Clearing Prohibition
	Exposure to agrichemicals	Access and Development to be Limited
	Grazing	Grazing to be Excluded
	Predation by feral animals	Pest Animal Control
	Fire	Fire to be Excluded
Phascolarctos cinereus (Koala)	Loss and fragmentation of habitat	Clearing Prohibition
	Vehicle strike	Access and Development to be Limited
	Predation by dogs	Pest Animal Control
	Disease	Non-manageable Threat
Rostratula australis (Australian painted snipe)	Loss and degradation of wetlands through drainage and diversion of water	Access and Development to be Limited
	Grazing and trampling, nutrient enrichment and disturbance by livestock to species habitat	Grazing to be Excluded
	Potential threat - Climate change	Non-manageable Threat
	Potential threat – Weed invasion	Weed Control
	Potential threat – Predation by feral animals	Pest Animal Control
	Potential threat – Coastal port and infrastructure development	N/A
	Potential threat – Shale oil mining	N/A
Turnix melanogaster (Black-breasted button-quail)	Loss of habitat and habitat fragmentation due to clearing for a range of purposes (timber-harvesting and other forestry-related practices, agriculture, infrastructure construction and urban development)	Clearing Prohibition
	Habitat loss or degradation due to inappropriate fire regimes	Fire to be Excluded
	Habitat degradation as a result of domestic stock and feral pigs utilising Black-breasted button-quail habitat	Pest Animal Control
	Predation by feral animals	Pest Animal Control