Santos

Stage 3 Offset Management Plan

EPBC 2012/6615

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1.0 Introduction

1.1 The GFD Project

The Gas Field Development Project (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 gas fields across Santos GLNG petroleum tenures in the Surat and Bowen basins, and construct associated supporting infrastructure in these tenures and adjacent areas.

1.2 Purpose

The purpose of this Offset Management Plan is to outline the management objectives, actions and outcomes necessary to fulfil Santos GLNG's statutory offset requirements. Under the Santos GLNG 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 residual significant impacts to Matters of National Environmental Significance (MNES) over time. This Offset Management Plan has been prepared for Stage 3 of the GFD Project.

1.3 Scope

For the purposes of the GFD Project approval (EPBC 2012/6615), this Offset Management Plan will offset impacts associated with Stage 3 of the GFD Project. Stage 3 includes proposed development in the Arcadia and Scotia gas fields, on Petroleum Lease (PL) 90, PL 234, PL 421 and PL176 (see Figure 1-1). Impacts to MNES in PL90, PL234 and PL421 (Arcadia) are focussed on one property; Lonesome Holding (herein referred to as 'Lonesome'). Lonesome is located approximately 52 km northeast of Injune and the Scotia field is located 15 kilometres north east of Wandoan, in Central Queensland. Works in Lonesome are predominantly in PL 234, with a small section in PL 90.

1.4 Stage 3 Development

Petroleum activities proposed in Arcadia and in PL 176 (Scotia) will be typical of exploration, development, operational and decommissioning phases of a petroleum and gas project and will include:

- Petroleum production wells;
- Gas and water gathering systems / pipelines;
- Powerlines and communication lines / infrastructure (above and below ground);
- Access tracks and roads;
- Water management infrastructure;
- Temporary and permanent accommodation facilities (including sewage treatment plants); and
- Ancillary infrastructure / incidental activities.

Through the implementation of Santos GLNG's comprehensive planning and infrastructure location process, all reasonable disturbance avoidance measures will be implemented. Where unavoidable significant residual impacts do occur to any EPBC Act listed threatened species or communities, offsets will be provided.

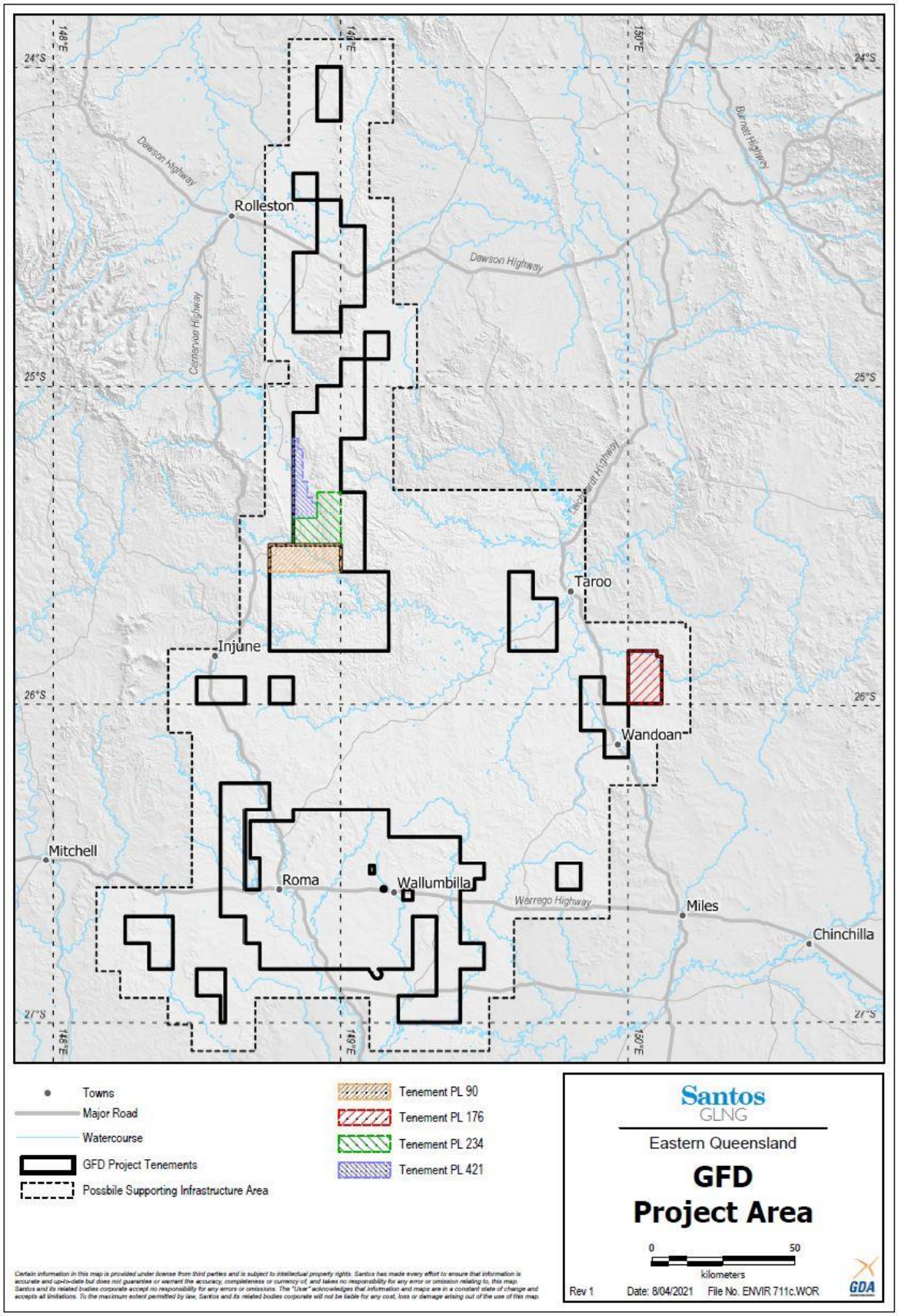


Figure 1-1 The Location of Stage 3 Development

2.0 Legal and other Requirements

2.1 The Environment 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 2012/6615. The approval conditions that relate to offsets and how they are addressed by this plan is provided in Table 2-1.

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 applied in determining the suitability of offsets are set out in the policy. These principles are listed below and an assessment against these principles for each matter potentially impacted is detailed in Section 4.6.

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.

2.2 Obligations under Other Legislation

The offsets provided for in this management plan are additional to what is already required and determined by laws other than the EPBC Act. The proposed offset does not acquit any other offset or provide a carbon credit.

2.2.1 Fire Management

An application for a 'Permit to Light Fire' is made under the *Fire and Emergency Services Act 1990*. However, there are no existing land management obligations that prescribe or exclude fire for ecological outcomes. Fire Management Guidelines exist which provide information for managing fire for ecological objectives and are designed to enhance biodiversity (Queensland Herbarium 2018). However, these are guidelines only and do not form land management obligations.

Table 2-1 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 as discussed in Section 2.1. An assessment against these principles for each of the matters potentially impacted by Stage 3 of the project is provided in Section 4.6.
12	The approval holder may carry out the action in project stages. The approval holder must deliver environmental offsets for residual significant impacts to protected matters for each project stage.	The action will be carried out in stages. This Project Offset Plan covers Stage 3 of the GFD Project as described in Section 3.1.
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 version of the Offset Management Plan must address the known and predicted impacts of the completed, current and next proposed project phases.	This plan has been submitted for the Minister's written approval. This Project Offset Plan covers Stage 3 of the GFD Project as described in Section 1.4.
14	The Offset Management Plan must include for the first project phase: 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 predicted 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. The method for assessing residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities is discussed in Section 3.2.3. b. Details of the relevant field assessments are provided in Section 3.0. c. The offset area is the Springwater Offset Area (SOA) details of the SOA are provided in Section 4.3. d. Details of the baseline surveys are provided in Section 4.0. This includes the results of the 2017 detailed monitoring assessment completed in accordance with this management plan. e. The connectivity and the landscape context of the SOA are discussed in detail in Section 4.3.3.1. f. Performance criteria, trigger levels, completion criteria and remedial actions for management activity undertaken in the SOA are discussed in Section 6.0.

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 and timing for legally securing the offset.	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 are provided in Section 7.0. h. The monitoring program for the SOA is outlined in Section 8.0**.** i. Risks to the successful implementation of this plan are outlined in Appendix D j. An implementation Schedule is provided in Section 8.6. k. Section 4.5 details how the offset for GFD Project has been legally secured.
15	The currently approved Offset Management Plan must be implemented by the approval holder..	This offsets plan complements previous offsets plans and proposals submitted for approval. Once approved, this plan will be implemented.
16	The approval holder must register and legally secure offsets for the first project phase identified in the Offset Management Plan within two years of commencement of the first project phase.	On 6 April 2018, a voluntary declaration over the SOA was certified, thereby satisfying the legal security requirement. The SOA is an area of high nature conservation value under section 19F of the *Vegetation Management Act 1999.* See Section 4.5 for details.
17	The approval holder must register and legally secure offsets for a project stage which are sufficient to acquit the predicted residual significant impacts of that project phase.	The offset for Stage 3 of the GFD Project is 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 4.5 for details.
18	If the approval holder submits the Offset Management Plan in stages, the approval holder must prepare and submit the Offset Management Plan revised to address each subsequent project stage, for written approval by the Minister. Each revised Offset Management Plan must: a. include the information required for the Offset Management Plan at condition 14 for the next project phase; b. include a reconciliation of actual and predicted but yet to actualised residual significant impacts to EPBC threatened species, EPBC migratory species and EPBC communities against offsets secured for the	A new offset plan will be submitted for all subsequent stages of the project. A reconciliation of the actual residual significant impacts associated with Stage 1 and Stage 2 of the GFD Project is provided in Section 4.1.

Condition		How the conditions are met
	commenced project phases. Secured offsets in excess of requirements arising from actual and predicted but yet to be actualised impacts of any commenced project phases may be subtracted from the obligations required for subsequent project phases. Any shortfall in secured offsets relative to the requirements arising from actual and predicted but yet to be actualised impacts of any commenced project phases must be added to the obligations required for the next project phase; and c. demonstrate how the offset builds on offsets already secured for previous project phases and will contribute to a larger strategic offset for cumulative project impacts.	
19	The approval holder must not commence the subsequent project stage until the Offset Management Plan for that project phase, has been approved by the Minister in writing.	This management plan is submitted for the approval of the Minister.

2.2.2 Pest and Weed Management

2.2.2.1 The general biosecurity obligations

Under the *Biosecurity Act 2014* (QLD), a person has a general biosecurity obligation (GBO). Under the GBO, individuals and organisations whose activities pose a biosecurity risk must:

- take all reasonable and practical steps to prevent or minimise each biosecurity risk;
- minimise the likelihood of causing a 'biosecurity event', and limit the consequences if such an event is caused;
- prevent or minimise the harmful effects a risk could have, and not do anything that might make any harmful effects worse.

A Biosecurity Risk includes a risk of any adverse effect on social amenity, the economy or the environment. Grazing beef cattle on exotic pasture grasses is a key land use in central Queensland and is a key contributor to the social amenity and the local economy. The presence of economically advantageous exotic pasture species throughout central Queensland is unlikely to be considered a biosecurity risk and therefore the voluntary control of these species is considered additional to the GBO.

In addition, reasonable steps to control a biosecurity risk are unlikely to extend to the types of weed and pest control measures proposed in this plan. The programs run as part of this offset plan, including the pest fauna control program conducted in partnership with the Queensland Murray-Darling Committee (QMDC), have been entered into optionally and are not legally required

2.2.2.2 Restricted and Prohibited Matters

The exotic pasture grass species of most concern in this plan are not Restricted Matters or Prohibited Matters under the *Biosecurity Act 2014*. Several *Opuntia* spp. known throughout the region are listed as Category 5 invasive plant. A person must not keep a Category 5 invasive plant.

Restricted invasive animals include dogs, cats, foxes and pigs. A person has the following restrictions placed upon them when dealing with these invasive animals:

- The invasive animal must not be distributed either by sale or gift; or released into the environment.
- The invasive animal must not be moved.
- The invasive animal must not be fed.
- The invasive animal must not be kept.

The proposed management actions in this plan do not include any of the above listed obligations that relate to restricted and prohibited invasive plants and animals.

3.0 Offset Assessment Methodology

3.1 Staging Plan

Environmental offsets for the Santos GFD project will be acquitted in stages. For each offset stage of the GFD Project an environmental offsets plan will be developed. The environmental offset plan for each stage will:

- Report on the methodology and results of the environmental assessments completed over the proposed disturbance area (e.g. desktop and field ecological assessment results).
- Report on the measures to be taken to avoid, mitigate and manage impacts to MNES.
- Details of the proposed infrastructure and land disturbance activities in relation to areas identified as MNES.
- Identify actual significant residual impacts on MNES for each stage.
- Reconcile the offsets obligations, post disturbance, against the advanced offsets provided.

An indicative flow diagram demonstrating the staging process is provided in Figure 3-1.

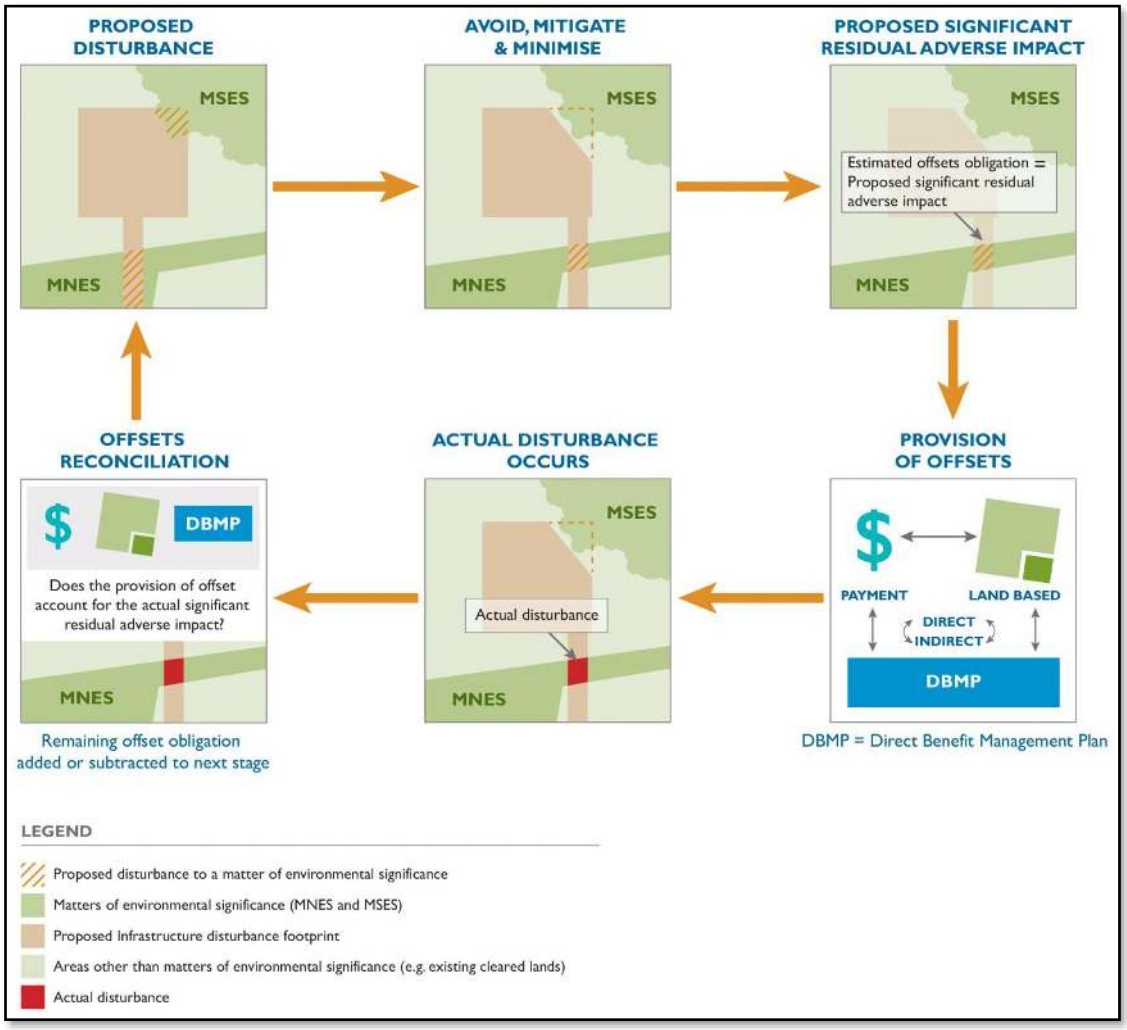


Figure 3-1 The Santos GLNG Staging Process

This offsets management plan has been written for Stage 3 of the GFD project and follows the Stage 2 Offset Plan approved by the Minister in writing on 24 October 2019. In accordance with Condition 18 of EPBC Act approval 2012/6615, Santos GLNG must prepare and submit an updated Offset Management Plan for each subsequent project stage.

3.1.1 Reconciliation of actual and predicted impacts by stage

Each Offset Management Plan must include a reconciliation of actual and predicted but yet to be actualised residual significant impacts to MNES against offsets secured for the commenced project stages. Secured offsets in excess of requirements arising from actual and predicted but yet to be actualised impacts of any commenced project phases will be subtracted from the obligations required for subsequent project phases. Any shortfall in secured offsets relative to the requirements arising from actual and predicted but yet to be actualised impacts of any commenced project phases will be added to the obligations required for the next project phase.

Actual and proposed significant residual impacts to MNES for Stages 1, 2 and 3 are provided for in Section 4.0.

3.2 Methods for Assessment of Stage 3 Impacts

A number of ecological surveys and assessments have been undertaken for the Stage 3 development area. The methodology employed in these assessments is detailed below.

3.2.1 Ecological Survey and Assessment of Arcadia (PL 90, PL 234 & PL 421)

Ecological assessments have been undertaken across the Arcadia development area, including assessment of the Lonesome property in May 2020 (Boobook 2020) and assessment of the Kaimanna property in October and November 2017 (Boobook 2017). Both assessments involved a desktop literature review and a field survey component. The purpose of these assessments was to provide baseline ecological data for the GFD Project generally and to inform future offset obligations. Specifically, these assessments involved identifying the following ecological values as follows:

<u>Lonesome property</u>

- Regional ecosystem (RE) mapping using the functional RE condition thresholds;
- Quantification of Threatened Ecological Communities (TEC);
- BioCondition survey of sites within all Assessment Units (AUs) as per the *Guide to determining terrestrial habitat quality. Methods for assessing habitat quality under the Queensland Environmental Offsets Policy* (DES 2020); and
- Threatened flora surveys targeting the following client-nominated species which had been previously recorded from the Site:
    - *Xerothamnella herbacea* – scheduled as endangered under both the Queensland (QLD) *Nature Conservation Act 1992* (NC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

<u>Kiamanna property</u>

- Regional ecosystem (RE) mapping using the functional RE condition thresholds;
- Quantification of Threatened Ecological Communities (TEC);
- Flora general habitat mapping and assessment targeting client-nominated threatened species as listed under the EPBC Act;
- Threatened flora surveys targeting the species listed as threatened under the EPBC Act and/or Nature Conservation Act 1992 (NC Act);

- Fauna general habitat mapping and assessment targeting client-nominated species for EPBC Act listed threatened species; and
- Incidental observations of EPBC Act and/or NC Act listed threatened fauna.

A desktop assessment was conducted to inform each of the field surveys. Sources of information utilised during the desktop assessment included Queensland State mapping sources for remnant regional ecosystems; the Protected Plants Flora Survey Trigger Map; and Wildlife Online flora records. Atlas of Living Australia flora records were also utilised and the EPBC Act Protected Matters Search Tool was interrogated for information on potential or known presence of listed flora, fauna and threatened ecological communities.

In-field verification of desktop findings and additional findings of significance were undertaken in general accordance with the following:

- *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (*Neldner et al. 2017; Neldner et al. 2019);
- *Guide to determining terrestrial habitat quality. Methods for assessing habitat quality under the Queensland Environmental Offsets Policy* (DES 2020);
- Santos *Methodology for Conducting Ecological Assessments* – GLNG Areas Rev 4.1 (Santos 2014); and
- Santos *Functional Thresholds for Assessing Regional Ecosystem Functionality* (Santos 2015).

3.2.1.1 Regional Ecosystem and Threatened Ecological Community Assessment

RE and Threatened Ecological Community (TEC) assessments were informed by both desktop review of earlier assessments where relevant and by ground-truthing during field assessments. Where required, in the light of new field-based information, assessment included revision of previously reported mapping for some parts of the Site. Ground-truthing (and confidence level scoring) of the regional ecosystem (RE) designation was undertaken using the quaternary level of data collection as described by Neldner et al. (2017 and 2019).

Assessments were undertaken within 50 m x 10 m plots for the purpose of typifying the vegetation community under assessment. Plots were chosen within representative areas of each vegetation type encountered.

Vegetation community polygons were verified in accordance with Queensland RE description and biodiversity status as per the Regional Ecosystem Description Database (REDD) (DSITI 2017; DES 2019) and classified as remnant RE, vegetation consistent with RE (advanced regrowth) or non-remnant vegetation (Santos 2014a; Santos 2015). For each area of potential Threatened Ecological Community (TEC) an assessment of vegetation survey data was made against published TEC threshold criteria (for example, TSSC 2013).

Vegetation community data was captured in the field and entered into Santos-specific data fields within spatial databases via Motion tablet devices. Representative photographs were taken at each vegetation survey site and at vegetation patches as supporting evidence of the identity of the subject vegetation community where full documentation was not required. Capture and delineation of RE and TEC boundaries was undertaken using a combination of mobile GIS devices, GPS and/or delineation from imagery.

For identified regrowth (i.e. vegetation floristically equivalent to an RE but not meeting structural thresholds of remnant RE) an ecosystem functionality assessment was conducted. This assessed selected vegetation characteristics against the parameters described in Santos (2015).

3.2.1.2 BioCondition Survey

To assist in the evaluation of the Site's ecological function and condition, a series of BioCondition assessments were undertaken at the Lonesome property. BioCondition assessments were completed at 15 sites which were selected within each mapped AU or RE type. BioCondition assessments were undertaken as per the methodologies described by Eyre *et al*. (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.

The following information was recorded at each BioCondition site:

- Date;
- Observers;
- Description of location (bioregion, general description, co-ordinates for plot origin and centre, plot bearing and alignment);
- General habitat description and RE type;
- Median height for canopy, emergent and sub-canopy strata;
- Slope position/slope degree and slope aspect;
- Tree species richness (within 100 m x 50 m plot);
- Native plant species richness (within 50 m x 10 m plot);
- Non-native plant cover (within 50 m x 10 m plot);
- Total length of coarse woody debris (length >10 cm diameter and >0.5 m long within 50 m x 20 m plot);
- Number and average diameter at breast height (DBH) of large eucalypt and non-eucalypt trees (within 100 m x 50 m plot);
- Recruitment of canopy species (within the 100 m x 50 m plot);
- Tree and shrub canopy cover (within 100 m transect);
- Ground cover within 1 m x 1 m plots (native perennial grass and organic litter cover in the ground layer); and
- Disturbances (severity, last event and observation type).

Large tree DBH thresholds for each RE were used where benchmark documents were available, otherwise the default ≥30 cm DBH for eucalypts and ≥20 cm DBH for non-eucalypts was applied.

Site photographs were taken using a digital camera in accordance with Eyre *et al*. (2011, 2015) (i.e. one photograph at plot origin and north, east, south and west photographs at the plot centre). Photograph numbers were recorded. Locations of BioCondition sites were determined using a handheld Global Positioning System (GPS) (Garmin GPSmap 78S) and BioCondition assessment data was captured by mobile GIS devices (Motion F5T tablet device). Permanent 0 m and 50 m markers were not established.

Scores for BioCondition sites were calculated in accordance with Eyre *et al*. (2015) which compares the values obtained at each survey site with values in the benchmark document for that particular RE (Queensland Herbarium 2019). Sub-scores are awarded to each site and landscape attribute then are added together and divided by the maximum possible score for that RE. This provides a numeric value along a continuum of biodiversity condition, where scores closer to 0 indicates that sites are 'dysfunctional' and those closer to 1 indicates that sites have 'functional' condition

3.2.1.3 Targeted Threatened Flora Survey

Targeted surveys for threat-listed flora were informed by the desktop search results and past site experience (specifically *Xerothamnella herbacea* on the Lonesome property). Searches for

X. herbacea and other threatened species were carried out during walking meanders throughout each site in all habitat types, including remnant and non-remnant vegetation.

Counts and extent of each population of *X. herbacea* and any other threatened species were made as well as structural characteristics and representative photographs taken. Data was recorded using the Santos-specific Notable Species - Flora Point or Region data capture layer.

3.2.1.4 Threatened Fauna and Flora Habitat Assessment and Mapping

Microhabitat assessments were undertaken in conjunction with the vegetation community surveys at each survey plot, or as required where significant variation in the type and abundance of habitat features occurred. The results of these assessments, combined with ecologist knowledge, were used to predict habitat suitability for the following species:

- *Chalinolobus dwyeri* (large-eared pied bat);
- *Dasyurus hallucatus* (Northern quoll);
- *Nyctophilus corbeni* (Corben's long-eared bat);
- *Petrogale penicillata* (brush-tailed rock-wallaby);
- *Phascolarctos cinereus* (koala);
- *Tachyglossus aculeatus* (echidna);
- *Botaurus poiciloptilus* (Australasian bittern);
- *Turnix melanogaster* (black-breasted buttonquail);
- *Erythrotriorchis radiatus* (red goshawk);
- *Geophaps scripta scripta* (squatter pigeon (southern));
- *Poephila cincta cincta* (black-throated finch);
- *Rostratula australis* (Australian painted snipe);
- *Neochmia ruficauda ruficauda* (star finch);
- *Polytelis swainsonii* (superb parrot);
- *Lathamus discolor* (swift parrot);
- *Ardea ibis* (cattle egret);
- *Ardea modesta* (great egret);
- *Plegadis falcinellus* (glossy ibis);
- *Pandion haliaetus* (osprey);
- *Merops ornatus* (rainbow bee-eater);
- *Pedionomus torquatus* (plains-wanderer);
- *Anomalopus mackayi* (five-clawed worm-skink);
- *Delma torquata* (collared delma);
- *Cadellia pentastylis* (ooline);
- *Dichanthium setosum* (bluegrass);
- *Swainsona murrayana* (slender darling-pea);
- *Tylophora linearis* (Slender Tylophora);
- *Xerothamnella herbacea* (Xerothamnella);
- *Eriocaulon carsonii* (salt pipewort);
- *Bertya opponens*
- *Daviesia discolor*;
- *Westringia parvifolia*;
- *Acacia curranii* (curly-bark wattle);
- *Acacia grandifolia*;
- *Calytrix gurulmundensis*;
- *Eucalyptus beaniana* (bean's ironbark);
- *Homoranthus decumbens*;
- *Phaius australis* (swamp orchid);
- *Aristida annua*;
- *Arthraxon hispidus* (hairy-joint grass);
- *Dichanthium queenslandicum* (king bluegrass);
- *Homopholis belsonii* (Belson's panic);
- *Thesium australe* (Austral toadflax); and
- *Macrozamia platyrhachis* (a cycad)

3.2.1.5 Survey Limitations

Individual mapped vegetation polygons have been assigned a confidence level (high, moderate, low) for both boundary accuracy and vegetation attributes within the polygon. Within the spatial database confidence ratings are designated as 'A' for high, 'B' for moderate and 'C' for low. The schema outlined in Table 3-1 and Table 3-2 was applied to vegetation polygons.

Table 3-1 Boundary accuracy confidence ratings applied to mapped polygons

Boundary Accuracy			
Confidence	**Range of Accuracy**	**Homogenous Patches**	**Heterogeneous Patches**
High (A)	<1 - <10 m	Ground-truthed on site, or viewed at a distance	Ground-truthed on site
Moderate (B)	>10 - <50 m	Not ground-truthed (image interpretation only)	Portion ground-truthed on site
Low (C)	>50 - >200 m	nil	No ground truthing: vegetation viewed at a distance or image interpretation only

Table 3-2 Vegetation attribute confidence ratings applied to mapped polygons

Boundary Accuracy		
Confidence	**Homogenous Patches**	**Heterogeneous Patches**
High (A)	Ground-truthed on site	Ground-truthed on site
Moderate (B)	No ground truthing: vegetation viewed at a distance	Portion ground-truthed on site
Low (C)	Image interpretation only	No ground truthing: vegetation viewed at a distance or image interpretation only

Habitat assessments were conducted at several representative sites within each ground-truthed RE present at the Site. Some assessment data was available from earlier work within the survey area e.g. BOOBOOK (2015). Though the presence and abundance of microhabitat features e.g. hollow logs likely varies within and between patches (mapping polygons) of a given RE, for the purposes of predictive fauna habitat mapping it was assumed that the results of microhabitat assessment for an RE are applicable throughout the survey area. A conservative approach was taken mapping species habitat where no ground-truthing had been undertaken. Where patches had not been ground-truthed, relevant fauna microhabitat features were assumed to be present and patches mapped as habitat until further assessments undertaken. Similarly, where predictive mapping of flora habitat was based on known associations with RE it is assumed that suitable habitat exists in all patches of the RE at the Site.

Threatened fauna searches were confined to incidental observations only (i.e. no trapping or targeted search techniques were employed). Additional survey effort would be required to provide a more comprehensive inventory of threatened fauna species present at the Site.

Timing (season) and duration of the survey period during early to mid-May was adequate for identification threatened flora, such that, although *X. herbacea* plants were beginning to desiccate they were readily detectable. The timing (season) and duration of both the 2017 and 2020 survey periods was warm (Spring – Summer) following rainfall and thus providing good conditions for plant growth. Thus, was generally favourable for identification of woody plants (trees and shrubs), grasses and forbs.

3.2.2 Ecological Survey and Assessment of Scotia (PL 176)

Ecological assessments have been undertaken across the Scotia gas field in 2015 and 2020. The 2015 assessment included a desktop literature review and a field survey. The purpose of this assessment was to provide baseline ecological data for the GFD Project generally and to inform future offset obligations. The 2020 assessment involved the collection of updated habitat quality data in

accordance with the *Guide to determining terrestrial habitat quality. Methods for assessing habitat quality under the Queensland Environmental Offsets Policy* (DES 2020).

3.2.2.1 2015 Ecological Survey and Assessment

A terrestrial ecology assessment of the Scotia gas field was undertaken by AECOM in November and December 2015 (AECOM 2017). Specifically, this assessment involved:

- Regional ecosystem (RE) mapping using the functional RE condition thresholds;
- Functionality tests on Of Concern and Endangered regrowth REs;
- Complete Habitat Mapping Assessment Tool (HMAT) assessments; and
- Incidental observations of EPBC Act or NC Act EVNT flora and fauna.

A desktop assessment was conducted to inform the field survey. The assessment analysed existing biodiversity data to identify conservation significant values including REs, flora and fauna species.

Regional Ecosystem Assessment

Ground-truthing (and confidence level scoring) of the DES RE designation was undertaken using the data collection as described by Neldner et al. (2012). Preliminary identification of the vegetation communities and target field survey locations was conducted prior to the commencement of fieldwork via interpretation of colour aerial photography and 1:100,000 RE mapping of the region.

Field surveys involved a botanical assessment at a number of representative sites within each remnant, non-remnant and regrowth vegetation community, as identified from desktop searches. The surveys employed a number of standard methods including quaternary survey sites and random meander search areas.

A number of vehicle traverses of the site were undertaken during the survey period, to identify changes in land zones and identify vegetation community boundaries. Community structural formation classes were assessed according to Neldner et al. (2012). RE classification of communities was determined as per Sattler and Williams (1999), and in accordance with the Regional Ecosystems Description Database (REDD) (DES 2019).

Quaternary surveys were undertaken at 62 survey locations across the site. Quaternary-level survey locations were used to verify vegetation units and confirm dominant characteristic species. Structural analysis included recording the height class and life form of the dominant species within the mid and canopy strata as per Neldner et al. (2012). RE classification (Sattler and Williams, 1999) was determined based on estimated structural and floristic analysis. REs and vegetation communities were also assessed against published TEC threshold criteria to confirm the presence of any TECs.

Several digital photographs were taken at each plot for future reference. The location of each quaternary survey location was recorded using a Trimble Nomad GPS.

For identified regrowth (i.e. vegetation floristically equivalent to an RE but not meeting structural thresholds of remnant RE) an ecosystem functionality assessment was conducted. This assessed selected vegetation characteristics against the parameters described in Santos (2015).

3.2.2.2 2020 Ecological Survey and Assessment

BioCondition Survey

To assist in the evaluation of the Site's ecological function and condition, a series of BioCondition assessments were undertaken by AECOM in July 2020. BioCondition assessments were completed at 17 sites in the six REs mapped for PL 176 including:

- 11.3.2 (one site)

- 11.3.25 (three sites)
- 11.9.5 (three sites)
- 11.9.5 regrowth (two sites)
- 11.10.7 (four sites)
- 11.10.9 (two sites)
- 11.10.11 (two sites)

BioCondition assessments were undertaken in accordance with the *Guide to determining terrestrial habitat quality. Methods for assessing habitat quality under the Queensland Environmental Offsets Policy* (DES 2020).

The following information was recorded at each BioCondition site:

- Date;
- Observers;
- Description of location (bioregion, general description, co-ordinates for plot origin and centre, plot bearing and alignment);
- General habitat description and RE type;
- Median height for canopy, emergent and sub-canopy strata;
- Slope position/slope degree and slope aspect;
- Tree species richness (within 100 m x 50 m plot);
- Native plant species richness (within 50 m x 10 m plot);
- Non-native plant cover (within 50 m x 10 m plot);
- Total length of coarse woody debris (length >10 cm diameter and >0.5 m long within 50 m x 20 m plot);
- Number and average diameter at breast height (DBH) of large eucalypt and non-eucalypt trees (within 100 m x 50 m plot);
- Recruitment of canopy species (within the 100 m x 50 m plot);
- Tree and shrub canopy cover (within 100 m transect);
- Ground cover within 1 m x 1 m plots (native perennial grass and organic litter cover in the ground layer);
- Disturbances (severity, last event and observation type).

Site photographs were taken in accordance with Eyre et al. (2011, 2015) (i.e. one photograph at plot origin and north, east, south and west photographs at the plot centre). Photograph numbers were recorded. Locations of BioCondition sites were determined using a handheld Global Positioning System (GPS) and BioCondition assessment data was captured by mobile GIS devices.

Field data was recorded using the BioCondition reference site sheet template (Eyre et al. 2011) to ensure data was collected consistently for all sites regardless of whether a benchmark document was available for any particular RE or not. Canopy recruit and non-native plant cover attributes are not normally recorded on this template; however this data was added to field sheets so it could be used for calculating BioCondition scores. Site data has been presented as either BioCondition assessment or reference form templates to differentiate between sites with or without published benchmarks.

Scores for BioCondition sites were calculated in accordance with Eyre et al. (2015) which compares the values obtained at each survey site with values in the benchmark document for that particular RE (DSITI 2016). Sub-scores are awarded to each site and landscape attribute then are added together and divided by the maximum possible score for that RE. This provides a numeric value along a continuum of biodiversity condition, where scores closer to 0 indicates that sites are ‘dysfunctional’ and those closer to 1 indicates that sites have ‘functional’ condition.

3.2.3 Significant Residual Impacts

In accordance with the EPBC Act Environmental Offsets Policy and the offset requirements conditioned by the Commonwealth Minister for the Environment, all residual impacts to MNES must be offset.

For the purposes of this Stage 3 Offsets Plan, all disturbances to threatened fauna habitat and threatened ecological communities are considered residual significant impacts. Minor impacts to *Xerothamnella herbacea* are proposed; however, the Stage 3 development is not expected to result in a significant residual impact to the species (see Section 4.2.2).

3.3 Methods for Assessing the Offset Site

Santos GLNG has identified the Springwater property as containing suitable environmental values to acquit offset obligations incurred by the development of Stage 3 of the GFD Project. 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.

The offset management area is located in the northeast sections of the Springwater property (Figure 3-2) and is 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.

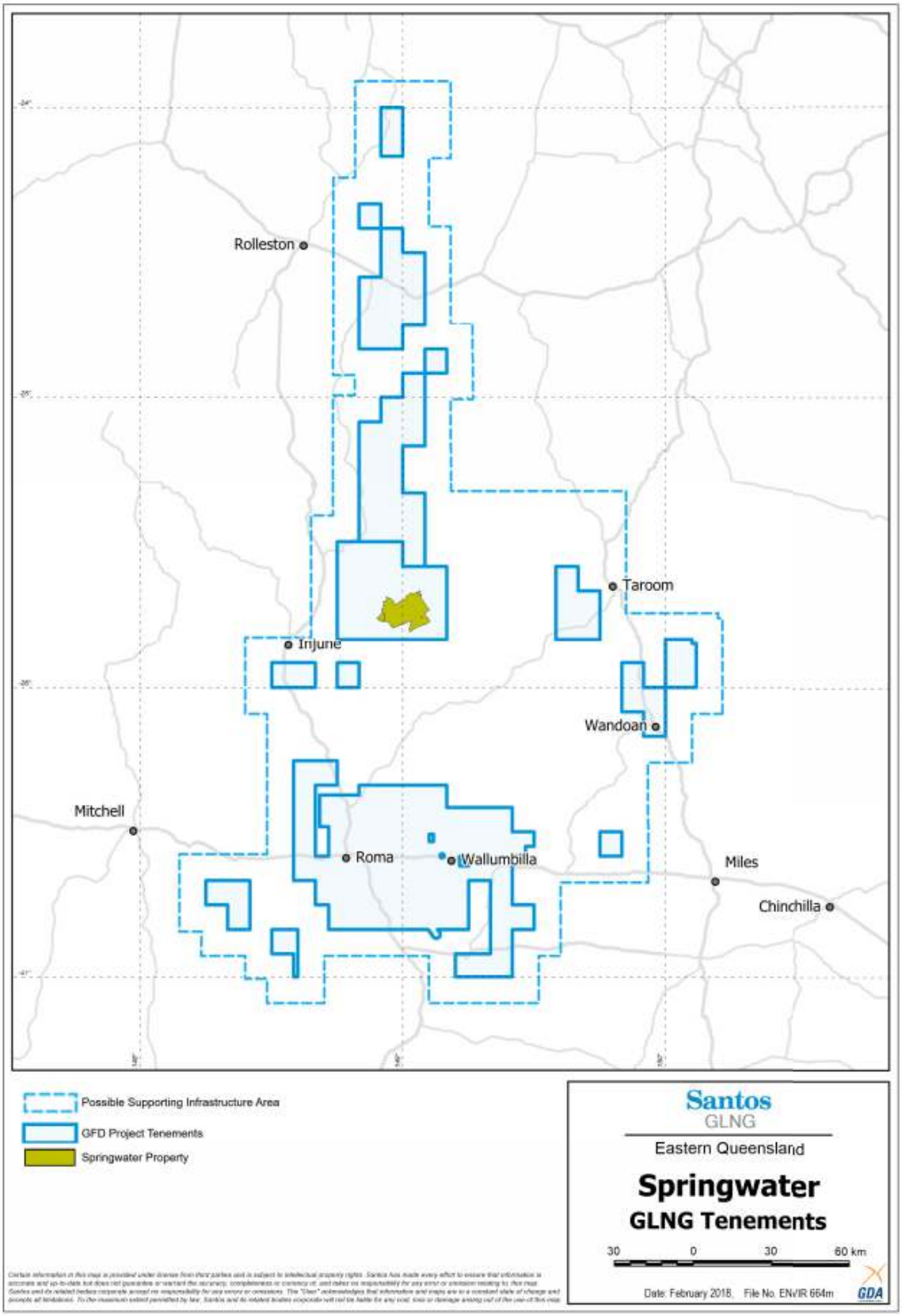


Figure 3-2 Location of Springwater Property

3.3.1 Ecological Survey and Assessment in the SOA

3.3.1.1 Detailed Assessment and Monitoring Event Spring 2017

Section 9.0 of the approved Stage 1 Offsets Plan required a detailed monitoring event to adequately assess and monitor the ecological condition of the offset. Between the 16th and 21st of October 2017, Terrestria Pty Ltd conducted a detailed monitoring event (Terrestria, 2018). The monitoring event was scheduled to coincide with the spring / early summer optimal time of year for flora and fauna surveys in the Brigalow Belt Bioregion (Eyre et. al, 2012). Details on the results of these surveys are provided in Section 5.0. The requirements for the detailed monitoring event conducted in 2017 included:

- General field assessment as outlined in Section 9.1.2 of the Stage 1 Offset Plan;
- Establishing and completing 10 BioCondition sites; one in each of the vegetation units identified in Table 4 of the Stage 1 Offset Plan as well as photo monitoring points;
- Threatened flora survey and assessment to identify the locations of any threatened flora species and to map the extent of threatened flora habitat for all EVNT species listed under either the NC Act or the EPBC Act present within the SOA. All flora species observed whilst undertaking threatened flora surveys were documented.
- Fauna surveys targeting the species listed in Table 5 of the Stage 1 Offset Plan (Note: all fauna species observed during fauna surveys were documented); and
- In addition to the BioCondition canopy cover, additional canopy cover analysis was conducted to assess the two Brigalow regrowth communities (regrowth and young regrowth). This involved an additional 2 x 50m transects to assess canopy cover. The location of the start and finish were marked with flagging tape and GPS so the same transect can be assessed in 2018. Note: This assessment replaces the Geographic Information System (GIS) canopy analysis discussed in Section 9.1.1 of the Stage 1 Offset Plan.

3.3.1.2 Rapid Assessment and Monitoring Event Spring 2018

Field assessments of the SOA were conducted during spring and early summer (12 - 16 November 2018) to coincide with the optimal time of year for flora and fauna surveys in the Brigalow Belt Bioregion (Eyre et al., 2012). The location of the field assessment was informed by the results of previous site assessments (i.e. Boobook, 2015). During flora and fauna surveys, fences, tracks and existing gas field infrastructure were inspected to ensure access and development has been excluded from the SOA and that grazing can be properly controlled.

3.3.1.3 Rapid Monitoring Event

The field assessment was informed by the results of previous assessments. During each rapid monitoring field assessment, the following will be 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.

4.0 Impacts and Offsets

4.1 Stage 1 and Stage 2 Impacts

Activities comprising Stage 1 of the GFD Project will not incur any significant residual impacts to any MNES.

Activities comprising Stage 2 of the GFD Project are yet to be completed in full, so an assessment of actual impacts to date and predicted but yet to be actualised residual significant impacts has been undertaken. Total residual significant impacts for Stage 2 of the GFD Project will exceed the estimated impacts that have been offset as per the Stage 2 Offset Plan (Table 4-1). The small shortfall in secured offsets for Stage 2 will be included in the total offset provision for Stage 3. Offset Assessment Guide calculations for the MNES identified in Table 4-1 are provided in Appendix E.

Table 4-1: Stage 2 actual and predicted project impacts

Common name	Scientific name	Stage 2 project impacts (ha)			Stage 2 project impacts that have been offset (ha)	Stage 2 project impacts to be offset as part of Stage 3 (ha)
		Actual	Predicted	Total		
Brigalow (*Acacia harpophylla* dominant and co-dominant)		5.73	1.10	6.82	6.2	0.62
South-eastern Long-eared Bat	*Nyctophilus corbeni*	51.45	4.40	55.85	49	6.85
Koala	*Phascolarctos cinereus*	39.14	2.94	42.08	37.5	4.58
Collared Delma	*Delma torquata*	51.45	4.40	55.85	49	6.85
Yakka Skink	*Egernia rugosa*	50.40	4.40	54.81	48.2	6.61
Dunmall's Snake	*Furina dunmalli*	51.45	4.40	55.85	49	6.85

4.2 Stage 3 Impacts

4.2.1 Impact Area

Scotia is a highly modified and fragmented landscape consisting of predominantly open grazing pasture and agriculture; interspersed with strips of vegetation (remnant and non-remnant). A large section of the Arcadia development area is also a highly modified and fragmented landscape used for grazing with limited areas of vegetation. Lonesome contains a large patch of remnant vegetation that extends west and east between the Expedition and Carnarvon Ranges. The Lonesome development is also adjacent to the Lonesome Section of Expedition (Limited Depth) National Park (NP).

BioCondition assessments have been completed at 30 locations within the Stage 3 impact area (17 in PL 176 and 15 in PL 90 / PL 234). Generally, the condition of the impact area is considered to be moderate, with larger and remnant areas generally attracting a higher BioCondition score.

The distribution of Assessment Units and sampling locations are illustrated in Figure 4-1 and Figure 4-2. A summary of the results for each BioCondition assessment conducted in each relevant Assessment Unit for each relevant MNES is provided in Appendix C.

4.2.2 Significant Residual Impacts

The Commonwealth Minister for the Environment requires the approval holder to ensure that environmental offsets comply with the principles of the EPBC Act Environmental Offsets Policy. In doing so, the approval holder must deliver environmental offsets for residual impacts to Matters of National Environmental Significance (MNES) for each project stage.

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 that 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' (Significant Impact Guidelines; DotE 2013).

Potential residual impacts to EPBC Act threatened species, EPBC Act migratory species and EPBC Act ecological communities as a result of Stage 3 of the GFD project was determined by assessing a conservative 'best guess' scenario – i.e. the maximum potential disturbance widths and areas were applied to the most likely field development layout. This generally results in an overestimate of impacts, as it is rare the maximum potential disturbance widths and areas are utilised during all construction. The conservative 'best guess' scenario of impacts to EPBC Act threatened species and EPBC Act communities is shown in Table 4-2. Offset Assessment Guide calculations for each MNES are provided in Appendix F.

Additionally, multiple populations of endangered *Xerothamnella herbacea* were observed in Lonesome during the targeted flora survey in May 2020. The Stage 3 development is expected to require the removal of approximately ten *X. herbacea* individuals within Lonesome.

Table 4-3 assesses the impact of the Stage 3 development to *Xerothamnella herbacea* against the significant impact criteria outlined in the Significant Impact Guidelines (DotE 2013) for listed threatened species and ecological communities. The Stage 3 development (including removal of ten individuals) is not expected to result in a significant residual impact to the species.

Table 4-2 The conservative 'best guess' scenario impacts to EPBC Act threatened species and communities

Common Name	Scientific Name	EPBC Act Status	Distribution and Known Habitat Use	Habitat Analogous REs		Disturbance Estimate Scotia(ha)	Disturbance Estimate Arcadia: (ha)	Total Stage 3 Disturbance Estimate (ha)
				Remnant	Regrowth			
Threatened Ecological Communities								
Brigalow (*Acacia harpophylla* dominant and co-dominant)		E	All remnant and regrowth of the relevant Regional Ecosystems as defined in the DAWE Species Profile and Threats Database.	11.9.5	11.9.5	4.6	19.6	24.2
Threatened Fauna								
Red Goshawk	*Erythrotriorchis radiatus*	V	Inhabits coastal and sub-coastal tall open forests and woodlands, tropical savannas and the borders of rainforests across northern and eastern Australia. The species is found in gorge and escarpment country in partly cleared areas of eastern Queensland. Requires tall trees in areas of fragmented vegetation that are within 1 km of a watercourse/wetland for breeding. Often has a large home range for hunting (up to 200 km^2) (TSSC 2015a).	11.3.2 11.3.17 11.3.25 11.3.39 11.9.5 11.9.5a 11.9.10 11.10.7 11.10.9	11.3.2 11.3.17 11.9.5	-	30.97	30.97
Squatter Pigeon (southern)	*Geophaps scripta scripta*	V	Occupies the grassy understorey of open eucalypt woodland and savannas; within close proximity to permanent water sources (natural or	11.3.2 11.3.17 11.3.25 11.3.39	11.3.2 11.3.17	-	10.76	10.76

Common Name	Scientific Name	EPBC Act Status	Distribution and Known Habitat Use	Habitat Analogous REs		Disturbance Estimate Scotia(ha)	Disturbance Estimate Arcadia: (ha)	Total Stage 3 Disturbance Estimate (ha)
				Remnant	Regrowth			
			artificial). Prefers sandy areas with short grass cover (TSSC 2015b).	11.9.10 11.10.7 11.10.9				
Black-breasted Button Quail	*Turnix melanogaster*	V	Most commonly found in vine thicket rainforest with a closed canopy, high annual rainfall and dense leaf litter. Also found in softwood scrubs in the Brigalow Belt region and vine scrub regrowth habitats (TSSC 2015c).	11.9.5a	-	-	0.61	0.61
South-eastern Long-eared Bat	*Nyctophilus corbeni*	V	The distribution and habitat preferences of this species are very poorly known; it inhabits a range of dry forest types in south central Queensland (Reardon 2012).	11.3.2 11.3.17 11.3.25 11.3.39 11.9.5 11.9.5a 11.9.10 11.10.7 11.10.9	11.3.2 11.3.17 11.9.5	12.34	30.97	43.31
Koala	*Phascolarctos cinereus*	V	This species requires eucalypt woodland and forest habitat with suitable food trees (primarily *Eucalyptus* spp.) (DoEE 2017). Woodlands containing food trees in riparian/alluvial areas are particularly favoured (Melzer et al. 2014).	11.3.2 11.3.17 11.3.25 11.3.39 11.9.10 11.10.7	11.3.2 11.3.17	7.74	10.76	18.5

Common Name	Scientific Name	EPBC Act Status	Distribution and Known Habitat Use	Habitat Analogous REs		Disturbance Estimate Scotia(ha)	Disturbance Estimate Arcadia: (ha)	Total Stage 3 Disturbance Estimate (ha)
				Remnant	Regrowth			
			Potential food trees occurring within the Site include *Eucalyptus tereticornis*, *E. camaldulensis*, *E. populnea*, *E. melanophloia*, *E. orgadophila* and *E. crebra* (Boobook 2017).	11.10.9				
Collared Delma	*Delma torquata*	V	Occupies a range of eucalypt woodlands and open forests; lives under surface rock and large woody debris (Wilson 2015). The Site is within the species' known range with several records from locations north-west of Roma (ALA 2020).	11.3.2 11.3.17 11.3.39 11.9.5 11.9.5a 11.9.10 11.10.7 11.10.9	11.3.2 11.3.17 11.9.5	10.44	30.97	41.41
Yakka Skink	*Egernia rugosa*	V	Lives in a range of woodland and open forests dominated by Eucalyptus, Acacia and *Callitris* spp.; also grassland with regrowth trees (DoEE 2017). Requires suitable soils for burrows or shelters in sinkholes, abandoned rabbit warrens or large fallen/piled woody material (Eddie 2012).	11.3.2 11.3.17 11.3.39 11.9.5 11.9.5a 11.9.10 11.10.7 11.10.9	11.3.2 11.3.17 11.9.5	10.44	30.97	41.41
Dunmall's Snake	*Furina dunmalli*	V	Occupies woodlands and open forests; may be reliant on presence of	11.3.2 11.3.17	11.3.2 11.3.17	10.44	30.97	41.41

Common Name	Scientific Name	EPBC Act Status	Distribution and Known Habitat Use	Habitat Analogous REs		Disturbance Estimate Scotia(ha)	Disturbance Estimate Arcadia: (ha)	Total Stage 3 Disturbance Estimate (ha)
				Remnant	Regrowth			
			abundant fallen woody debris (Hobson 2012a).	11.3.39 11.9.5 11.9.5a 11.9.10 11.10.7 11.10.9	11.9.5			

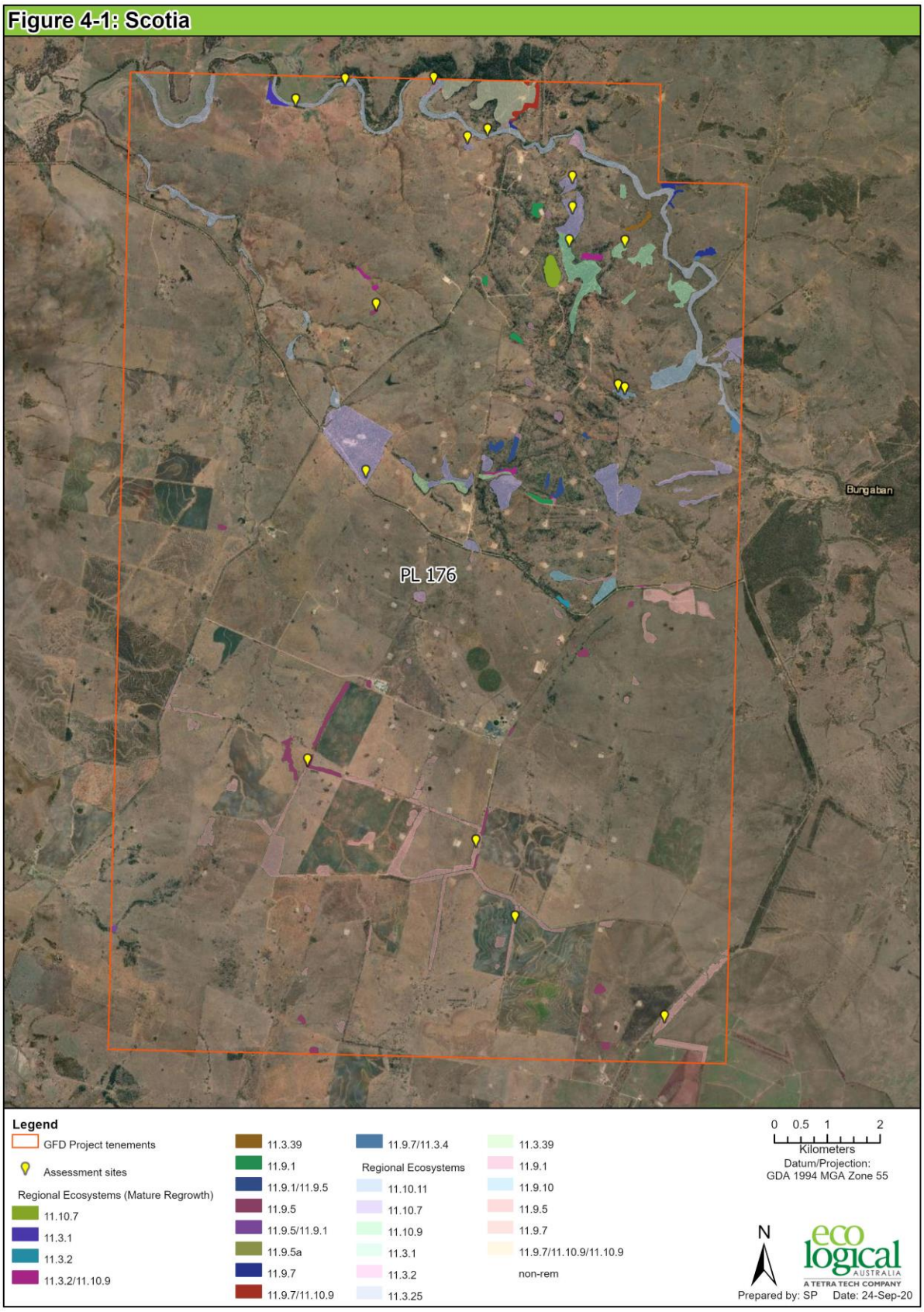


Figure 4-1 Distribution of Assessment Units and Sampling Locations – Scotia (PL176)

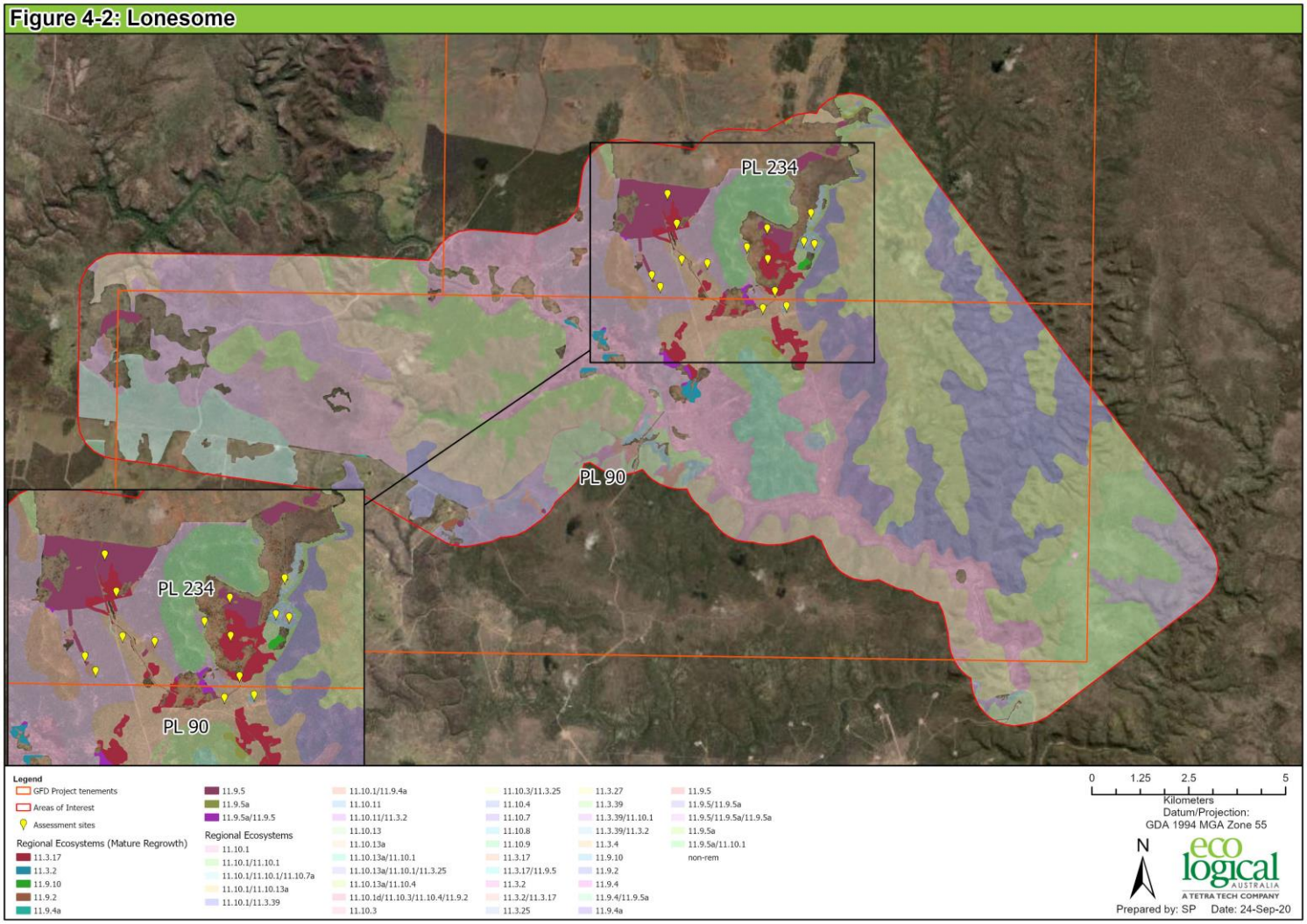


Figure 4-2 Distribution of assessment Units and Sampling Locations – Lonesome (PL90 and PL234)

Table 4-3 Significant impact assessment - *Xerothamnella herbacea*

Significant impact criteria	Significant impact?	Response to criteria
Lead to a long-term decrease in the size of a population	No	Scattered populations of *Xerothamnella herbacea* have been observed across the Lonesome property and large areas of suitable habitat are present (Boobook 2020). Suitable habitat includes all remnant and advanced regrowth of RE 11.3.17 (*Eucalyptus populnea* woodland with *Acacia harpophylla* and/or *Casuarina cristata* on alluvial plains) and RE 11.9.5 (*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks). During surveys, populations were typically observed under the shade of Brigalow (*Acacia harpophylla*) or other trees/shrubs with dense canopy such as Wilga (*Geijera parviflora*) in RE 11.3.17 or moist areas of RE 11.9.5 (clay soils near minor drainage lines, depressions or road drains with canopy cover and minimal exotic grass invasion) (Boobook 2020). The layout of infrastructure for the Stage 3 development has been pro-actively rationalised to avoid known populations of the species and is subsequently expected to result in the removal of only ten *X. herbacea* individuals. Large areas of suitable habitat will also remain in and around the Lonesome property. Therefore, it is considered unlikely that the development will lead to a long-term decrease in the size of the population within Lonesome.
Reduce the area of occupancy of the species	No	Lonesome contains large areas of suitable habitat for *Xerothamnella herbacea*, of which 28.5 ha will be impacted by the Stage 3 development. The layout of the required infrastructure has been pro-actively rationalised to avoid as many of the known populations of species within the property as possible and only 10 individuals will be removed. Although 28.5 ha of suitable habitat will still be lost due to the development, the maximum disturbance limit of 129 ha for *X. herbacea* provided under Condition 3 of the EPBC Approval (2012/6615) will not be reached. There is also opportunity to re-establish the pipeline ROW which will allow these areas to be available to any potential populations of the species. Whilst the Stage 3 development will remove suitable habitat for the species and thereby reduce the area of occupancy, in the context of the habitat still available in the development area and wider region, this is not expected to have significant impacts to the species.
Fragment an existing population into two or more populations	No	The Stage 3 Development will result in the loss of suitable habitat for *Xerothamnella herbacea*. The species is known to occur in a number of widely scattered sites across its restricted distribution; including the populations within Lonesome (ALA 2020; Boobook 2020). The Stage 3 Development is unlikely to fragment the existing *X. herbacea* population given the following: • Avoidance of known populations within Lonesome; excluding a small group of 10 individuals which will be removed; • Retention of large areas of suitable habitat within Lonesome and the wider region; • The already scattered nature of the species occurrence, with populations currently separated by large areas of non-remnant vegetation; and • The development consists of narrow, linear infrastructure which will not result in the removal of large patches of habitat.

Significant impact criteria	Significant impact?	Response to criteria
Adversely affect habitat critical to the survival of a species	No	The approved conservation advice for the species (DEWHA 2008b) does not explicitly define habitat critical to the survival of the species; however, the species is only found in Queensland and has a very restricted range. It is known to occur only within a few sites across the southern Brigalow Belt region (the Condamine, Border Rivers Maranoa–Balonne and Fitzroy Natural Resource Management Regions. Given its restricted range, any habitat where the species is known to occur could be considered habitat critical to the survival of the species. Only a small area of habitat (28.5 ha) where the species occurs will be impacted as a result of the Project, where ten individuals will be removed. All other populations have been avoided and large areas of suitable habitat will still remain in and around the Lonesome property. It is therefore considered unlikely that the development will significantly impact habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	No	*Xerothamnella herbacea* is a flowering, perennial herb that responds to rainfall (DEWHA 2008b). The targeted surveys conducted for the species were undertaken in mid-May and although this was the beginning of the dry season; a large rainfall event in January to March created good conditions for plant growth. Individuals of *X. herbacea* that were observed were often beginning to desiccate; however, they were still detectable (Boobook 2020). Although 28.5 ha of suitable habitat will be lost due to the development and 10 individuals will be removed, all other populations have been avoided and large areas of suitable habitat will still remain in and around the Lonesome property. It is therefore considered unlikely that the development will disrupt the breeding cycle of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	Lonesome contains large areas of suitable habitat for *Xerothamnella herbacea*, of which 28.5 ha will be impacted by the Stage 3 development. The layout of the required infrastructure has been pro-actively rationalised to avoid as many of the known populations of species within the property as possible and only 10 individuals will be removed. Although 28.5 ha of suitable habitat will still be lost due to the development, the maximum disturbance limit of 129 ha for *X. herbacea* provided under Condition 3 of the EPBC Approval (2012/6615) will not be reached. There is also opportunity to re-establish the pipeline ROW which will allow these areas to be available to any potential populations of the species. In addition to this, a number of good practice environmental management measures will be implemented to avoid and reduce the likelihood of impacts to the species and its habitat. This includes fire, grazing, weed and pest management measures. The Stage 3 development is therefore considered unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, particularly when large areas of suitable habitat will remain within and surrounding the development area.

Significant impact criteria	Significant impact?	Response to criteria
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	No	The main identified threat to *Xerothamnella herbacea* is competition from invasive plant species; in particular Green Panic (*Megathyrsus maximus var. pubiglumis*) and Buffel Grass (*Pennisetum ciliare*). These invasive species occur within similar microhabitats to *X. herbacea* (moist, shady areas within suitable habitat) and compete with *X. herbacea* for ground layer coverage. Invasive pant species can also increase fuel loads and alter fire regimes (DEWHA 2008b). A number of weed management measures are in place for the development which aim to avoid and reduce the impact of weeds to *X. herbacea* and its habitat. Management measures include implementation of strict weed hygiene procedures for all stages of the development; weed monitoring and control within the pipeline ROW; and ensuring that vehicles and machinery remain on approved and/or existing tracks to limit the risk of weed incursion within undisturbed areas. Additionally, an extensive weed monitoring program is in effect to ensure any increases or new incursions of invasive plant species are identified; enabling corrective management measures to be undertaken efficiently if required. Full details of the management and monitoring measures in place for weeds and invasive fauna are provided in the Project SMP. It is therefore considered unlikely that the Stage 3 development will result in the establishment invasive species that are harmful to *X. herbacea*.
Introduce disease that may cause the species to decline	No	Currently, there are no known diseases harmful to *Xerothamnella herbacea*. There is no evidence to suggest that the Stage 3 development would introduce disease that may cause the species to decline.
Interfere with the recovery of the species	No	Recovery actions outlined in the approved conservation advice for *Xerothamnella herbacea* include (DEWHA 2008b): • Monitoring known populations to identify key threats • Monitor the progress of recovery (including effectiveness of management actions) • Ensuring development activities in areas where the species occurs do not adversely impact on known populations • Minimise adverse impacts from land use at known sites. • Manage sites to prevent introduction of invasive weeds (particularly Panic and Buffel Grass), which could become a threat to *X. herbacea*, using appropriate methods. • Ensure that livestock grazing, if it occurs in the area, uses an appropriate management regime and density that does not detrimentally affect this species. • Where appropriate manage total grazing pressure at important/significant sites through exclusion fencing or other barriers. • Identify appropriate intensity and interval of fire to protect X. herbacea in its habitat

Significant impact criteria	Significant impact?	Response to criteria
		The management and monitoring measures for the Project have been developed to align with the recovery actions for various threatened species and ecological communities; including *X. herbacea.* In addition to extensive weed and pest management program, a range of good practice environmental management measures will be implemented; including those relevant to fire and grazing management which will directly benefit *X. herbacea.* Key recovery actions listed above include the monitoring of known populations and their recovery. The ongoing monitoring that will be undertaken as part of the Stage 3 development (see Project SMP) will benefit both the local and regional monitoring actions for the species; and will also help to build existing knowledge. On this basis, the Stage 3 development is considered unlikely to interfere with the recovery of the species.

4.3 Offset Area

As discussed in the Stage 1 and Stage 2 Offset Management Plans, Santos GLNG has identified the Springwater property as containing suitable environmental values to acquit offset obligations incurred by the development of GFD Project.

4.3.1 Springwater 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, Queensland.

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).

4.3.2 Springwater Offset Area

The offset area is located in the northeast sections of the Springwater property and is 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. At present, there is no immediate plans to develop the proposed pipeline and the vegetation within the pipeline corridor is being managed in the same way as the surrounding offset areas.

4.3.3 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. In October 2017, Terrestria Pty Ltd conducted a detailed offset monitoring event in the SOA in accordance with commitments made in the Stage 1 Offset Plan. The monitoring event was scheduled to coincide with spring / early summer, the optimal time of year for flora and fauna surveys in the Brigalow Belt Bioregion (Eyre et.al., 2012). The results of the 2015 and the 2017 assessments were used to identify the values and quality of the offsets in the SOA.

A summary of the BioCondition scores and other ecological input data is provided in Appendix D.

4.3.3.1 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 5 and see (Mackey et al. 2010) for original.

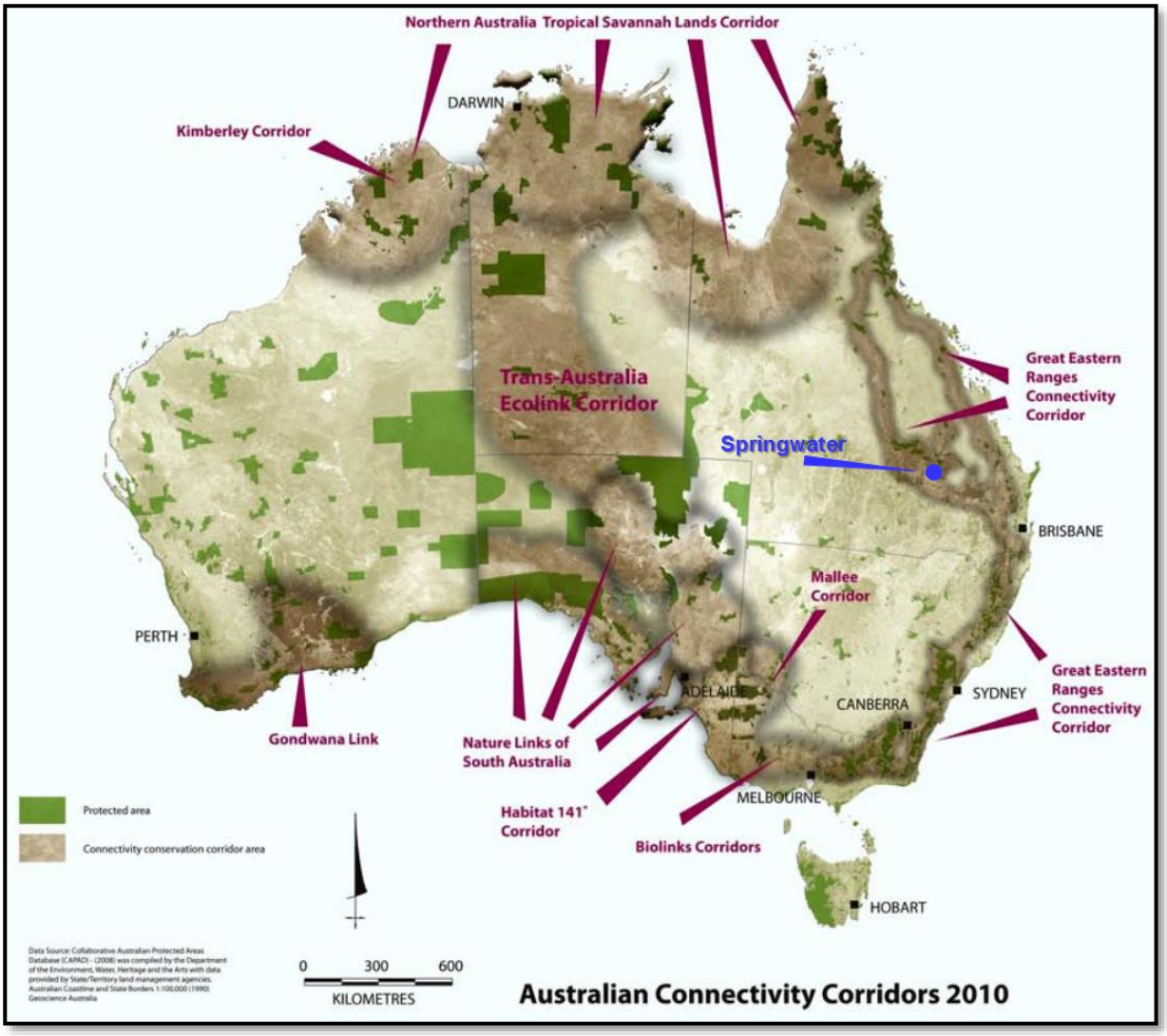


Figure 4-3 The Location of the Springwater Property within the GER

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 Biodiversity Planning Assessment (BPA) mapping. A 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 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 4-4 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.

4.3.3.2 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 was 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).

Non-Remnant

- 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.
- Cleared: 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 4-4 below and shown in Figure 4-4 Context Connection and Corridors

Figure 4-5. A detailed summary of the BioCondition scores and other calculator inputs for the offset site is provided in Appendix B.

4.3.3.3 Flora Species

Habitat for MNES flora is determined by the presence of a particular species or suitable habitat and nearby records. 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*).

Dedicated and targeted flora surveys were conducted as part of the SOA monitoring program. Targeted flora searches were conducted in all vegetation types in-line with the *Flora Survey Guidelines - Protected Plants Nature Conservation Act (1992)* (23 December 2016). The search paths and species lists for these surveys are presented in the Baseline Ecological Monitoring and Assessment Report (Terrestria 2018). No EVNT flora species were encountered during the surveys. However, habitat for *Bertya opponens* exists within REs 11.9.4, 11.9.5 and 11.10.7 and the presence of this species cannot be ruled out. Habitat for *Xerothamnella herbacea*, *Acacia calantha*, and *Sannantha brachypoda* also exists on the slopes surrounding the plateau.

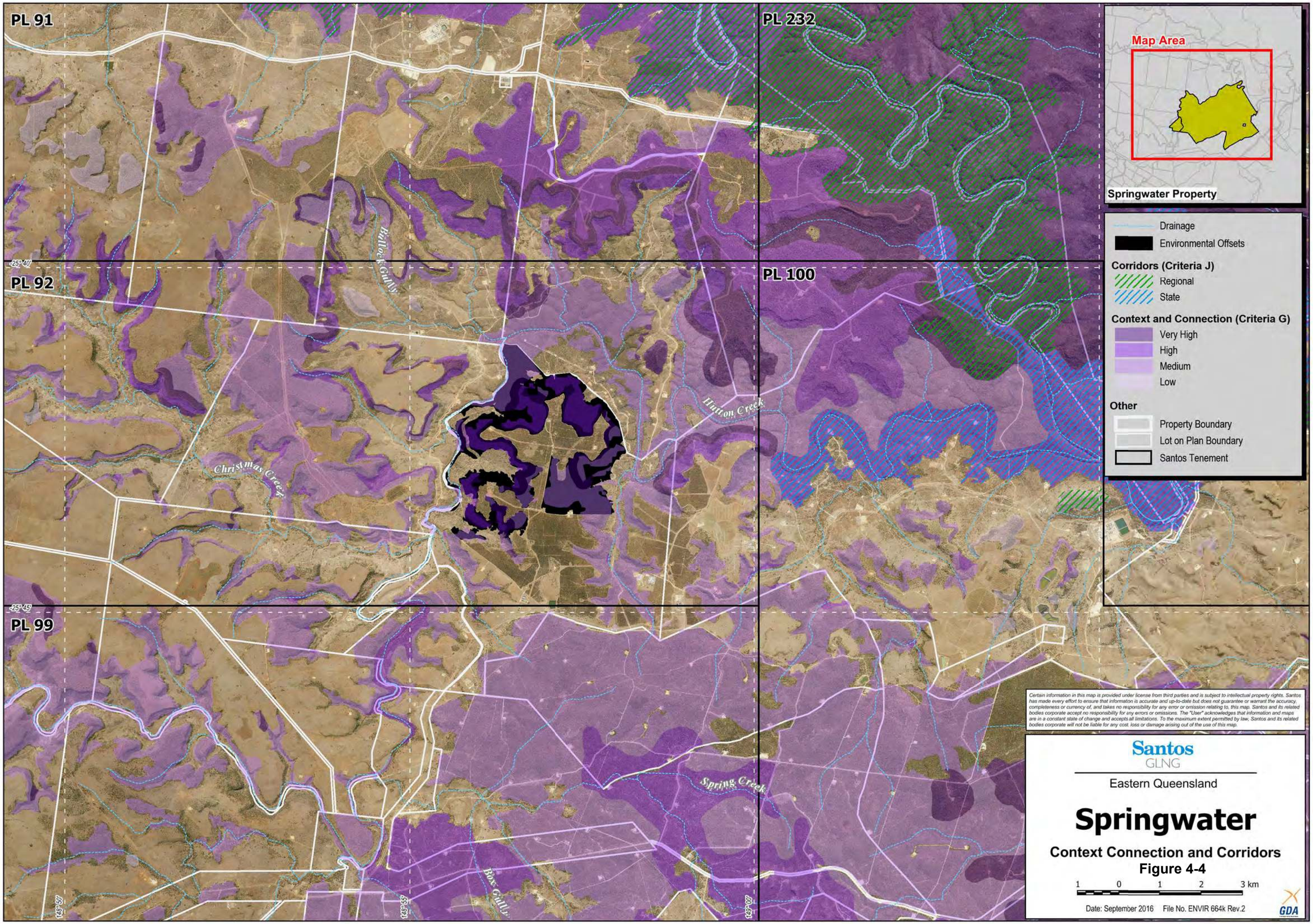
Table 4-4 Summary of Offset Values within the SOA

Veg Unit	General vegetation description	Area (ha)	Survey sites	Site Condition Score out of 80
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	BP01	45.75
			BP02	50
			BP06	51.75
			BP08	45.75
			BP15	62.5
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	BP12	56.75
VC3 11.10.7 Young Regrowth	*Eucalyptus crebra* and / or *E. melanophloia, Acacia longispicata* low open forest (young regrowth); sparse midlayer dominated by *Alphitonia excelsa* and canopy recruits; grassy ground layer dominated by *Aristida* spp. and *Eremochloa bimaculata*	9.1	Not assessed*	
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.*	312.1	BP04	56.75
			BP07	46.5
			BP09	68
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	BP13	44.75
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	BP14	51.75
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	BP03	46.5
VC8[2] 11.9.4 Remnant	Semi-evergreen vine thicket	57.5	BP05	71.75
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*.	27	BP10	43
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	BP12	56.75

*The area and shape of VC3 (11.10.7 Young Regrowth) made locating a BioCondition site impossible.

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



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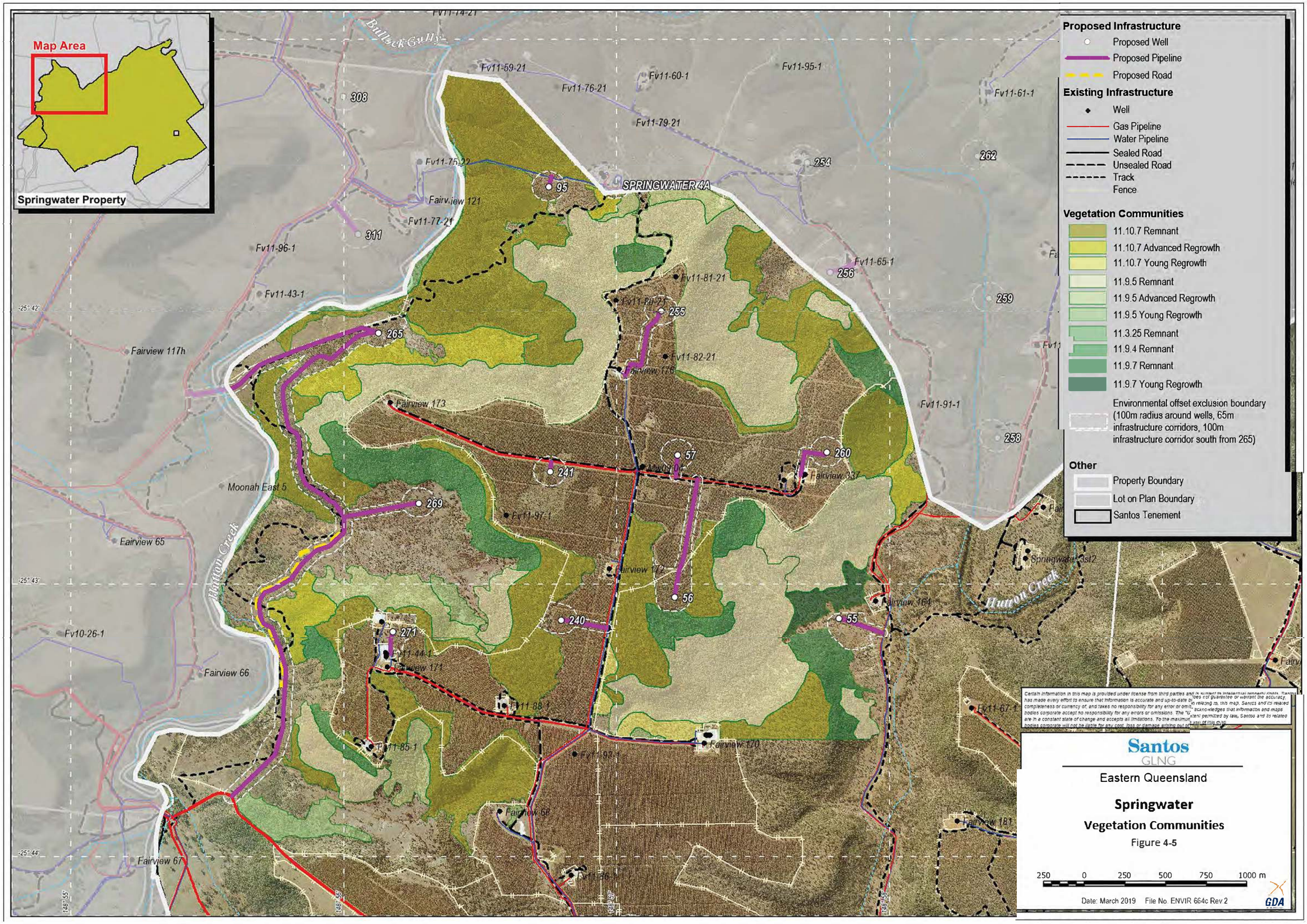
Map Area
Springwater Property
Proposed Infrastructure
Proposed Well
Proposed Pipeline
Proposed Road
Existing Infrastructure
Well
Gas Pipeline
Water Pipeline
Sealed Road
Unsealed Road
Track
Fence
Vegetation Communities
11.10.7 Remnant
11.10.7 Advanced Regrowth
11.10.7 Young Regrowth
11.9.5 Remnant
11.9.5 Advanced Regrowth
11.9.5 Young Regrowth
11.3.25 Remnant
11.9.4 Remnant
11.9.7 Remnant
11.9.7 Young Regrowth
Environmental offset exclusion boundary (100m radius around wells, 65m infrastructure corridors, 100m infrastructure corridor south from 265)
Other
Property Boundary
Lot on Plan Boundary
Santos Tenement
SPRINGWATER 4A
Bullock Gully
Hutton Creek
Fv11-14-21
Fv11-59-21
Fv11-60-1
Fv11-95-1
Fv11-76-21
Fv11-79-21
Fv11-61-1
Fv11-75-22
Fairview 121
Fv11-77-21
Fv11-96-1
Fv11-43-1
Fv11-81-21
Fv11-65-1
Fv11-82-21
Fairview 176
Fairview 117h
Fairview 173
Fv11-91-1
Fairview 337
Moonah East 5
Fv11-97-1
Fairview 65
Fairview 172
Springwater 3st2
Fairview 164
Fv10-26-1
Fairview 66
Fairview 171
Fairview 170
Fairview 68
Fairview 181
Fairview 67
Fv11-36-1
308
311
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240
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271
-25° 42'
-25° 43'
-25° 44'
148° 55'
148° 56'
148° 57'
148° 58'
Santos
GLNG
Eastern Queensland
Springwater
Vegetation Communities
Figure 4-5
250 0 250 500 750 1000 m
Date: March 2019 File No. ENVIR 664c Rev 2
GDA

4.3.3.4 Fauna Species

Fauna habitat assessments were undertaken at each of the 23 BioCondition survey sites conducted across the Springwater property in 2015 (Boobook 2015) as well as the 15 BioCondition sites conducted in 2017 (Terrestria 2018). Additional assessments have been conducted in the SOA annually since 2017 in accordance with the approved Stage 2 Plan. 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 4-6 to Figure 4-9 and the total area of offset for each MNES fauna species provided in Table 4-5.

Table 4-5 Area (ha) of MNES Fauna Habitat within the SOA

Species	Habitat Preferences	Habitat Mapping Assumptions and Criteria (Boobook 2020)	Area (ha) of Habitat Remaining in the SOA
Black-breasted button-quail *(Turnix melanogaster)*	SEVT and other closed forest types with dense leaf litter and low shrubs (DoTE 2015b, Mathieson and Smith 2009). Habitat for this species is provided by RE 11.9.4	Mapped General Habitat includes all remnant and advanced regrowth RE 11.9.4 that have linkages to other woody vegetation. Young regrowth of RE 11.9.4 represents Potential Future Habitat with appropriate rehabilitation.	57.5
Red goshawk *(Erythrotriorchis radiatus)*	Woodlands and open forests, especially near permanent water bodies; high prey bird populations; tall trees for nest site (Marchant and Higgins 1993). Habitat for this species is provided by REs Remnant and Regrowth (ie excluding Young Regrowth): 11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7, 11.10.7a	Mapped General Habitat includes all remnant and advanced regrowth of potentially suitable REs. Young regrowth of all REs represents Potential Future Habitat with appropriate rehabilitation. This species may also forage within sub-optimal and non-remnant vegetation throughout the Site.	837.3
Squatter pigeon (southern) *(Geophaps scripta scripta)*	Grassy woodlands with open areas for foraging habitat; usually nearby water source (Higgins and Davies 1996). Habitat for this species is provided by Remnant and Regrowth (ie excluding Young Regrowth) REs: 11.3.25, 11.9.7, 11.10.7, 11.10.7a	Mapped General Habitat includes remnant and advanced regrowth of potentially suitable REs. Advanced regrowth of all REs represents Potential Future Habitat with appropriate rehabilitation. This species may also forage within non-remnant vegetation.	429.6

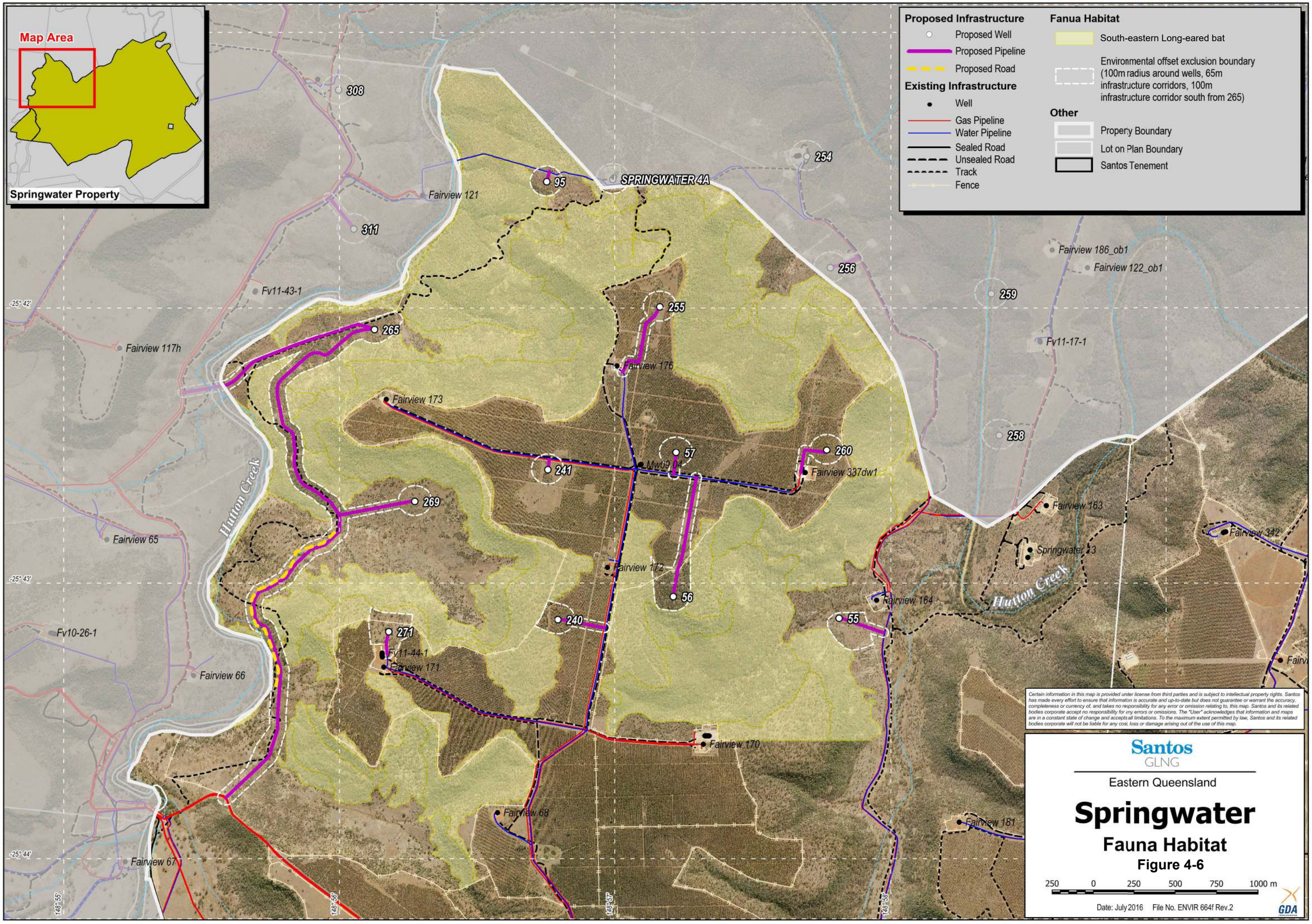
Species	Habitat Preferences	Habitat Mapping Assumptions and Criteria (Boobook 2020)	Area (ha) of Habitat Remaining in the SOA
South-eastern long-eared bat *(Nyctophilus corbent)*	Forages in open forests and woodlands and roosts in adjacent caves and overhangs of cliffs and rocky hills; occasionally shelters in disused Fairy Martin nests (Hoye and Schultz 2008). Habitat for this species is provided by Remnant and Regrowth (ie excluding Young Regrowth) REs: 11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7, 11.10.7a,	Mapped General Habitat includes all areas of remnant vegetation and advanced regrowth that may be suitable for foraging or shelter. Young regrowth of all REs represents Potential Future Habitat.	497.5 (340 ha used in Stage 2)
Koala *(Phascolarctos cinereus* (combined populations of Qld, NSW and the ACT))	This species requires eucalypt woodland and forest habitat with suitable food trees (primarily *Eucalyptus* spp.) (DoEE 2017). Woodlands containing food trees in riparian/alluvial areas are particularly favoured (Melzer et al. 2014). Potential food trees occurring within the Site include *Eucalyptus tereticornis*, *E. camaldulensis*, *E. populnea*, *E. melanophloia*, *E. orgadophila* and *E. crebra*. (Boobook 2017). Habitat for this species is provided by Remnant and Regrowth (ie excluding Young Regrowth) REs: 11.3.25, 11.9.7, 11.10.7, 11.10.7a,	Mapped General Habitat includes all areas of remnant vegetation and advanced regrowth that may be suitable for foraging or shelter. Young regrowth of all REs containing eucalypts and corymbias represents Potential Future Habitat.	212.6 (217 ha used in Stage 2)
Large-eared pied bat (*Chalinolobus dwyeri)*	Eucalyptus and Callitris woodlands and roosts in tree hollows and crevices and under loose bark (DoTE 2015b). Habitat for this species is provided by Remnant and Regrowth (ie excluding Young Regrowth) REs: 11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7, 11.10.7a,	Mapped General Habitat includes all areas of remnant vegetation and advanced regrowth that may be suitable for foraging or shelter. Young regrowth of all REs represents Potential Future Habitat. RE 11.9.4 is included on the basis that this RE may contain potentially suitable shelter sites.	837.3

Species	Habitat Preferences	Habitat Mapping Assumptions and Criteria (Boobook 2020)	Area (ha) of Habitat Remaining in the SOA
Northern quoll *(Dasyurus hallucatus)*	Shelter in crevices in rocky hills and escarpments; forage in associated woodland and forest habitats (DoTE 2015b). Habitat for this species is provided by Remnant and Regrowth (ie excluding Young Regrowth) REs: 11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7, 11.10.7a,	Mapped General Habitat includes all remnant and advanced regrowth vegetation (includes foraging habitat and vegetation containing potentially suitable densites). Young regrowth of all REs represents Potential Future Habitat	837.3
Collared delma *(Delma torquata)*	Occupies eucalypt woodlands and open forests; lives under surface rock and large woody debris (Wilson 2005). Habitat for this species is provided by Remnant and Regrowth (ie excluding Young Regrowth) REs: 11.3.25, 11.9.5, 11.9.7, 11.10.7, 11.10.7a	Mapped General Habitat includes all areas of remnant and advanced regrowth of all REs except RE 11.9.4. Young regrowth of potentially suitable REs has been mapped as Potential Future Habitat.	484.4 (284 ha used in Stage 2)
Dunmall's snake *(Furina dunmalli)*	Eucalyptus, Acacia and Callitris woodlands and open forests; may be reliant on presence of abundant fallen woody debris (Hobson 2012). Habitat for this species is provided by Remnant and Regrowth (ie excluding Young Regrowth) REs: 11.9.5, 11.9.7, 11.10.7, 11.10.7a,	Mapped General Habitat includes all remnant vegetation and advanced regrowth of the nominated REs. Young regrowth of potentially suitable REs has been mapped as Potential Future Habitat.	484.4 (284 ha used in Stage 2)
Yakka skink (*Egernia rugosa)*	Woodland and open forests, also derived grassland with regrowth trees; requires suitable soils for burrows, sinkholes, abandoned rabbit warrens or large fallen woody material for shelter (Eddie 2012). Habitat for this species is provided by Remnant and Regrowth (ie excluding Young Regrowth) REs: 11.9.5, 11.9.7, 11.10.7, 11.10.7a	Mapped General Habitat includes all remnant vegetation and advanced regrowth of the nominated REs. Young regrowth of potentially suitable REs has been mapped as Potential Future Habitat.	489.4 (279 ha used in Stage 2)

Targeted fauna surveys were conducted to assess EVNT fauna species richness of the SOA as part of the 2017 detailed monitoring assessment. Targeted fauna survey methods focused on the relevant species that are unlikely to be detected effectively during 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 included the following survey techniques:

- Camera traps focused on bait stations;
- Elliot B trapping;
- Funnel trapping;
- Ultrasonic bat call detection;
- Harp trapping;
- Active daytime habitat searching;
- Spotlighting habitat searches; and
- Active Koala searches and scat analysis.

A single species listed under both State and Commonwealth legislation was recorded during the surveys. Greater Glider (Vulnerable under the NC Act and EPBC Act) was recorded in a mature Forest Red Gum adjacent to Hutton Creek. Although no other EVNT species have been recorded on site the same precautionary principles applied to the impact sites are provided to the offset site and where suitable habitat and species-specific microhabitat features are present it is assumed the species is present.



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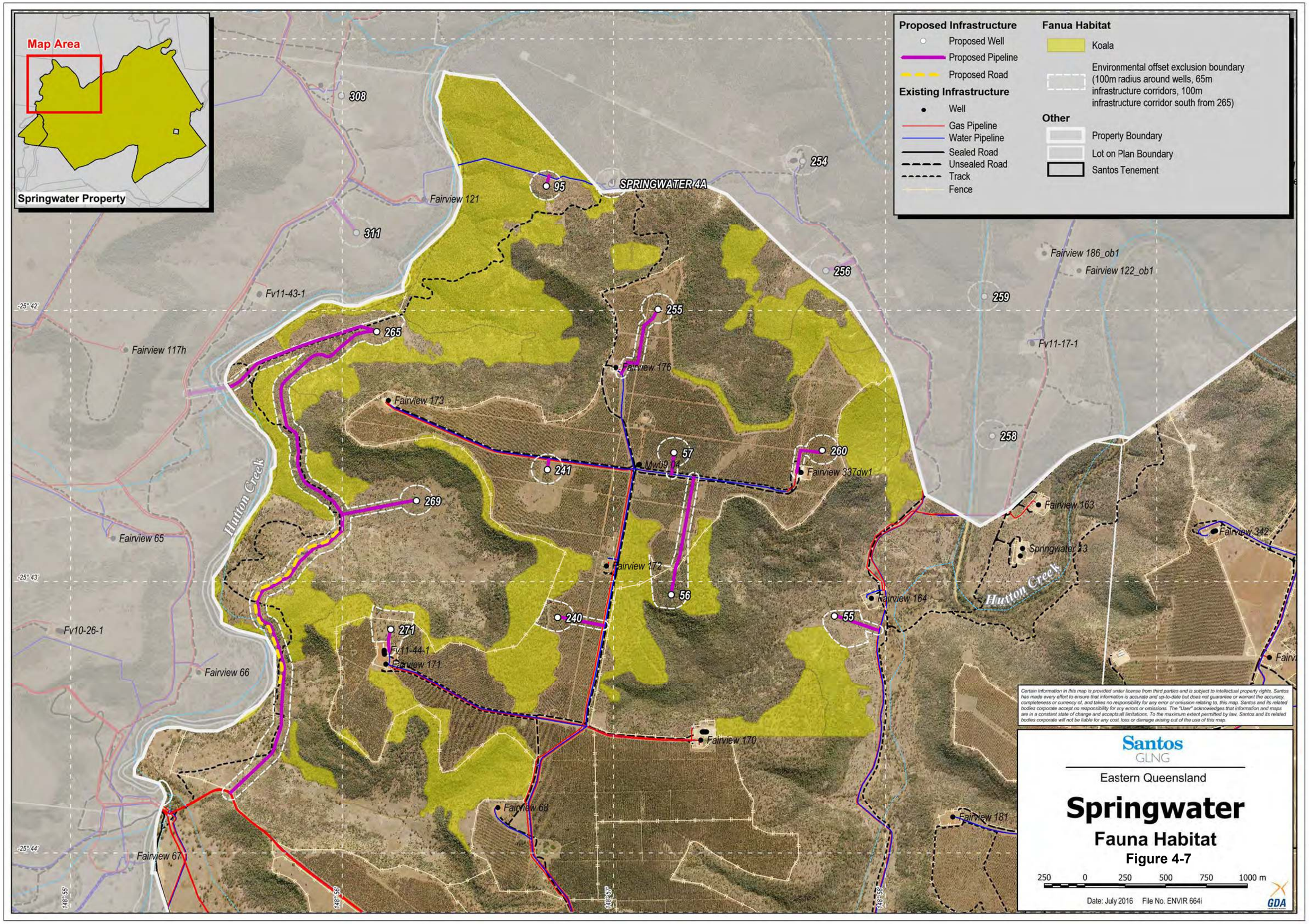
Map Area
Springwater Property
Proposed Infrastructure
Proposed Well
Proposed Pipeline
Proposed Road
Existing Infrastructure
Well
Gas Pipeline
Water Pipeline
Sealed Road
Unsealed Road
Track
Fence
Fauna Habitat
Koala
Environmental offset exclusion boundary (100m radius around wells, 65m infrastructure corridors, 100m infrastructure corridor south from 265)
Other
Property Boundary
Lot on Plan Boundary
Santos Tenement
SPRINGWATER 4A
Fairview 121
Fairview 186_ob1
Fairview 122_ob1
Fv11-43-1
Fairview 117h
Fv11-17-1
Fairview 176
Fairview 173
Mw09 04
Fairview 337dw1
Fairview 163
Fairview 342
Springwater 23
Hutton Creek
Fairview 65
Fairview 172
Fairview 164
Fv10-26-1
Fv11-44-1
Fairview 171
Fairview 66
Fairview 170
Fairview 68
Fairview 181
Fairview 67
-25° 42'
-25° 43'
-25° 44'
148° 55'
148° 56'
148° 57'
148° 58'
308
311
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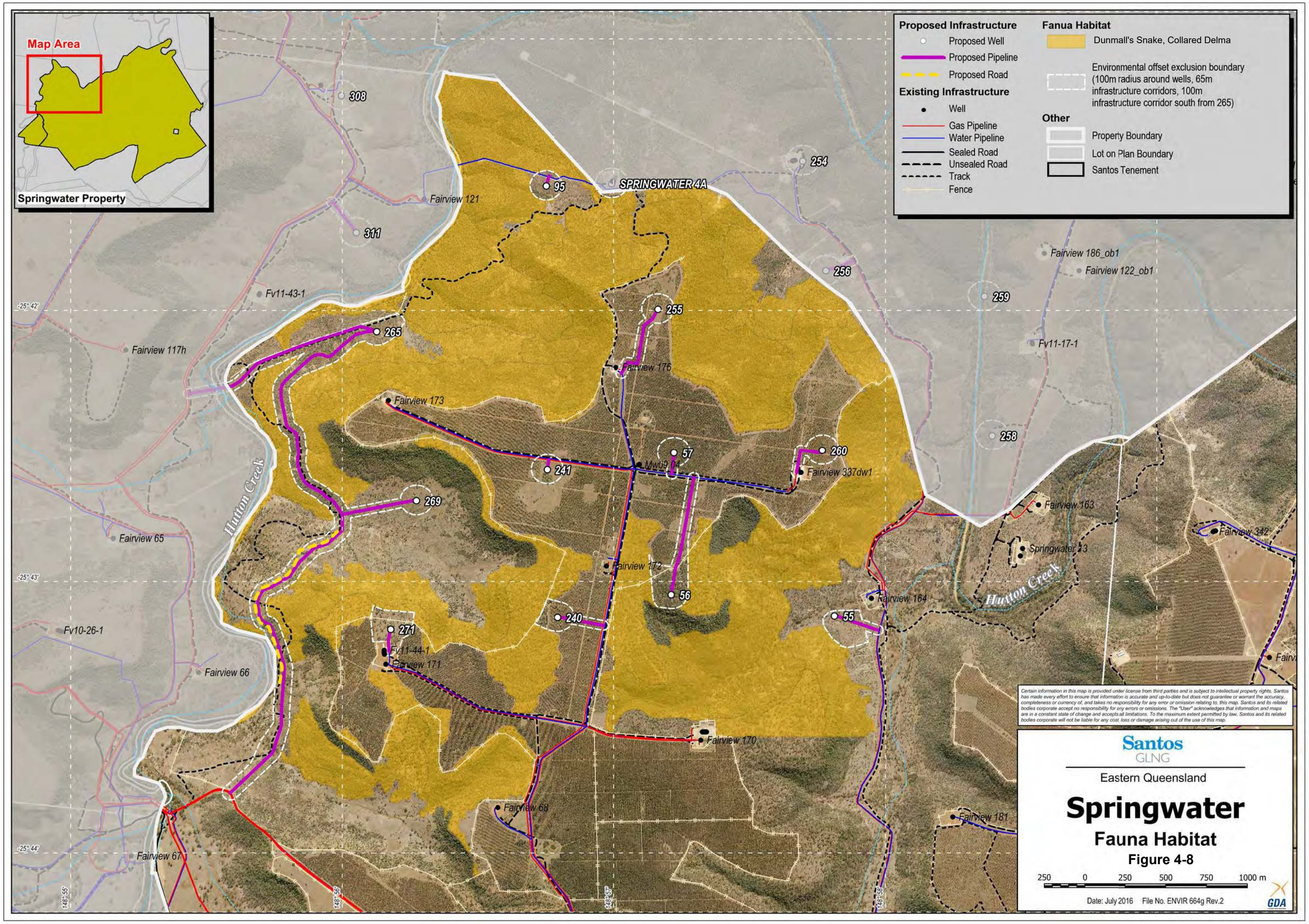
Santos
GLNG
Eastern Queensland
Springwater
Fauna Habitat
Figure 4-7
250 0 250 500 750 1000 m
Date: July 2016 File No. ENVIR 664i
GDA


Map Area
Springwater Property
Proposed Infrastructure
Proposed Well
Proposed Pipeline
Proposed Road
Existing Infrastructure
Well
Gas Pipeline
Water Pipeline
Sealed Road
Unsealed Road
Track
Fence
Fanua Habitat
Dunmall's Snake, Collared Delma
Environmental offset exclusion boundary (100m radius around wells, 65m infrastructure corridors, 100m infrastructure corridor south from 265)
Other
Property Boundary
Lot on Plan Boundary
Santos Tenement
SPRINGWATER 4A
Fairview 121
Fairview 186_ob1
Fairview 122_ob1
Fv11-43-1
Fairview 117h
Fv11-17-1
Fairview 176
Fairview 173
Mw09 04
Fairview 337dw1
Fairview 163
Springwater 13
Fairview 342
Hutton Creek
Fairview 65
Fairview 172
Fairview 164
Fv10-26-1
Fv11-44-1
Fairview 171
Fairview 66
Fairview 170
Fairview 68
Fairview 181
Fairview 67
308
311
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-25° 42'
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148° 57'
148° 58'
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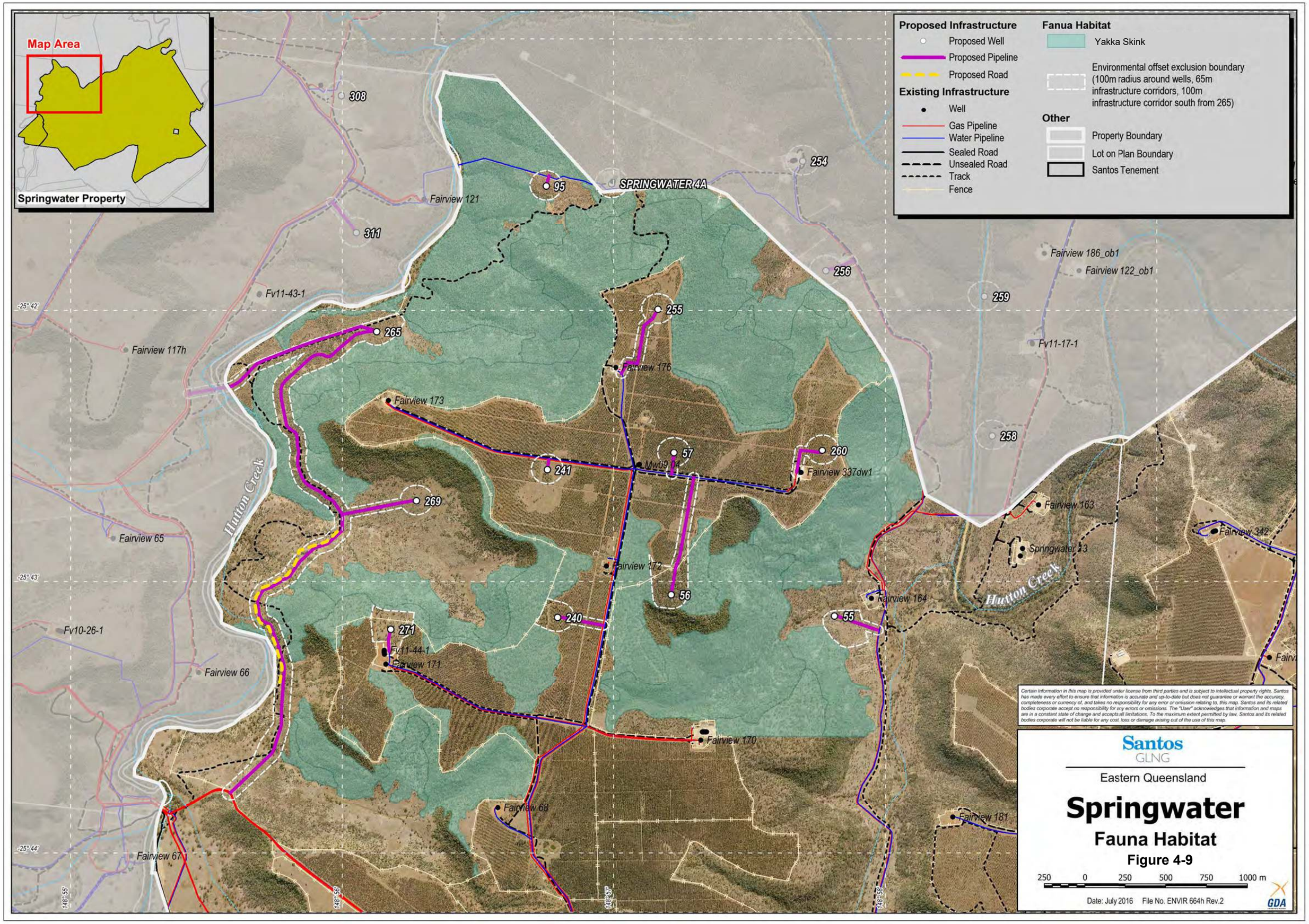
Santos
GLNG
Eastern Queensland
Springwater
Fauna Habitat
Figure 4-8
250 0 250 500 750 1000 m
Date: July 2016 File No. ENVIR 664g Rev.2
GDA


Map Area
Springwater Property
Proposed Infrastructure
Proposed Well
Proposed Pipeline
Proposed Road
Existing Infrastructure
Well
Gas Pipeline
Water Pipeline
Sealed Road
Unsealed Road
Track
Fence
Fanua Habitat
Yakka Skink
Environmental offset exclusion boundary (100m radius around wells, 65m infrastructure corridors, 100m infrastructure corridor south from 265)
Other
Property Boundary
Lot on Plan Boundary
Santos Tenement
SPRINGWATER 4A
Fairview 121
Fairview 186_ob1
Fairview 122_ob1
Fv11-43-1
Fairview 117h
Fv11-17-1
Fairview 176
Fairview 173
Mw09_04
Fairview 337dw1
Fairview 163
Springwater 23
Fairview 342
Hutton Creek
Fairview 65
Fairview 172
Fairview 164
Fv10-26-1
Fv11-44-1
Fairview 171
Fairview 66
Fairview 170
Fairview 68
Fairview 181
Fairview 67
-25° 42'
-25° 43'
-25° 44'
148° 55'
148° 56'
148° 57'
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Santos
GLNG
Eastern Queensland
Springwater
Fauna Habitat
Figure 4-9
250 0 250 500 750 1000 m
Date: July 2016 File No. ENVIR 664h Rev.2
GDA

4.4 Threats to the Offset Values

Table 4-6 details the key threats to the offset values identified in relevant recovery plans and threat abatement plans that will be addressed through the implementation of this Offset Plan.

Table 4-6 Summary of main threats to offset values

TEC / Species	EPBC Act Status	Threats identified in relevant conservation advices and threat abatement plans
Brigalow TEC (DEE 2019a)	Endangered	Habitat loss, clearing, fragmentation and/or modification [A]
		Fire
		Invasive weeds, particularly introduced grasses
		Pest animals, particularly feral pigs
		Inappropriate grazing regimes
Delma torquata (Collared delma) (DEWHA 2008a)	Vulnerable	Habitat loss, clearing, fragmentation and/or modification [A]
		Fire
		Invasive weeds, particularly *Lantana montevidensis*
Egernia rugosa (Yakka skink) (DoE 2014a)	Vulnerable	Habitat loss, clearing, fragmentation and/or modification [A]
		Pest animals, in particular predation by feral cats and foxes
Erythrotriorchis radiatus (Red goshawk) (TSSC 2015a)	Vulnerable	Habitat loss, clearing, fragmentation and/or modification [A]
		Reduced fire frequencies (thickening/reduction of hunting habitat)
		Declines in abundance of key prey species
Furina dunmalli (Dunmall's snake) (DoE 2014b)	Vulnerable	Habitat loss, clearing, fragmentation and/or modification [A]
		Pest animals
		Inappropriate grazing regimes
Geophaps scripta scripta (Squatter pigeon [southern]) (TSSC 2015b)	Vulnerable	Habitat loss, clearing, fragmentation and/or modification [A]
		Inappropriate fire regimes (thickening/reduction of understorey)
		Inappropriate grazing regimes
		Invasive weeds
		Pest animals, in particularly predation by feral cats and foxes
Nyctophilus corbeni (South-eastern long-eared bat) (TSSC 2015)	Vulnerable	Habitat loss, clearing, fragmentation and/or modification [A]
		Fire
		Inappropriate grazing regimes
		Invasive weeds
		Exposure to agrochemicals and nutrient enrichment [B]
Phascolarctos cinereus (Koala) (DEE 2019b)	Vulnerable	Habitat loss, clearing, fragmentation and/or modification [A]
		Pest animals
		Mortality due to vehicle strike
	Vulnerable	Habitat loss, clearing, fragmentation and/or modification [A]

TEC / Species	EPBC Act Status	Threats identified in relevant conservation advices and threat abatement plans
Turnix melanogaster (Black-breasted button quail) (TSSC 2015c)		Pest animals including feral pigs and predation by feral cats and foxes

[A] *Including loss of feeding, breeding/nesting habitat and drinking sites, hydrological and salinity changes associated with clearing, drainage of swamps, loss of microhabitat features (e.g. hollows, wood debris and rocks) and damage to roadside plant populations associated with road/track widening*

[B] *Associated with spread of inorganic fertilisers, drift from adjacent farmland or accumulation of manure from livestock.*

4.5 Legal Security Mechanism

Under Queensland legislation, one option of a legal securing mechanism for an offset area is declaring the area of high nature conservation value under section 19F of the *Vegetation Management Act 1999*, where it is secured in perpetuity for the purposes of an environmental offset.

In October 2017 Santos GLNG wrote to the Queensland Department of Natural Resources Mines and Energy (DNRME) requesting that the SOA be declared as an area of high nature conservation value under section 19F of the *Vegetation Management Act 1999* (a voluntary declaration). On 26 February 2018 the DNRME wrote to the Santos GLNG informing that the SOA meets the requirements of a Voluntary Declaration under the *Vegetation Management Act 1999* and on 1 April 2018 Santos GLNG agreed to the offer. On 6 April 2018, the voluntary declaration was certified, thereby satisfying the legal security requirement of Condition 16.

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 notices, offsets and voluntary declarations".

4.6 Assessment against the Principles of the Offset Policy

Condition 11 of the EPBC Act Approval 2012/6615 states that the approval holder must ensure that environmental offsets comply with the principles of the EPBC Act Environmental Offsets Policy. An assessment of the suitability of the proposed offset against the principles of the Offset Policy for each matter potentially impacted by Stage 3 of the project is provided in Table 5.

Table 4-7 Assessment against Principles of the Offset Policy

Principle	How the principle is met in this offset proposal
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	Section 4.3.3 summarises the area of potential offsets available on the SOA, including the offset area allocated to offset Stage 3 impacts. A positive conservation outcome for all MNES will be achieved by protecting and enhancing a suitable area of Brigalow and/or MNES species habitat within the SOA because, in the absence of the project there will be continued decline in condition the SOA principally due to agricultural grazing and poor fire management practice. The offset site was formally secured on 1 April 2018. Since then the viability of MNES within the SOA has been maintained or improved and will continue to improve/be maintained throughout the project EPBC approval period.
2. be built around direct offsets but may include other compensatory measures	The offset for all MNES is provided as a 100% direct offset, located within the SOA. Key threats to be addressed by the offset proposal include threats specified in conservation/listing advice and recovery plans, e.g. prevention of clearing, fire protection, pest animal control, weed control and removal of grazing pressure.
3. be in proportion to the level of statutory protection that applies to the protected matter	In consultation with Santos, the DAWE has identified a suitable offset area within the SOA for each MNES. The DAWE's offset assessment guide determines a suitable offset area based on a series of factors, including the level of statutory protection (i.e. whether listed as Vulnerable or Endangered)

Principle	How the principle is met in this offset proposal
4. be of a size and scale proportionate to the residual impacts on the protected matter	In consultation with Santos, the DAWE has identified a suitable offset area within the SOA for each MNES. The DAWE's offset assessment guide determines a suitable offset area based on a series of factors, including: • the site attributes of importance to the TEC/MNES habitat, and the quality/importance of that habitat or TEC; • the relative risks to the SOA without the property being under a voluntary declaration; • time to ecological benefit, that is the time to achieve future quality; • uncertainty associated with changes in habitat/TEC quality with and without offset.
5. effectively account for and manage the risks of the offset not succeeding	Threats to the offset site are managed by through the implementation of the management measures discussed in Section 5.0, Section 6.0 and Section 7.0, including: • Fire prevention and management • Weed monitoring and control • Clearing protection • Management of grazing • Restricted access Section 4.0 demonstrates that on conservative assumptions there is likely to be more than adequate offsets available on the SOA for each MNES, for acquittal of Stage 3 impacts. If the offset cannot attain and maintain the completion criteria, then additional offsets will be provided to compensate for the impact and the failed offset.
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)	The SOA is additional to what is already required and determined by laws other than the EPBC Act. The SOA does not acquit any other offset or provide a carbon credit. In Queensland there are no existing land management obligations that prescribe or exclude fire. Under the *Biosecurity Act 2014* a person has a general biosecurity obligation to: take all reasonable and practical steps to prevent or minimise each biosecurity risk. The steps proposed in this plan are above reasonable and practical steps required to control feral animals and weeds in central Queensland (See Section 2.2).

Principle	How the principle is met in this offset proposal
7. be efficient, effective, timely, transparent, scientifically robust and reasonable	**Efficient/effective/reasonable**. The offset proposal is a cost-effective approach to providing a direct offset, achieved through implementing widely applied and verified management strategies (DoE 2013; Ponce-Reyes *et al.* 2016). **Timely**. The offset outcomes will be delivered progressively over 20 years, and maintained for at least the period of effective approval (ie. 31 March 2066). Legal security of the SOA occurred in advance of the impacts associated with Stage 3. On 6 April 2018, the voluntary declaration was certified, thereby satisfying the legal security requirement. All clearing, even that considered insignificant and non-referred, is not permissible without specific Queensland government approval. **Transparent/scientifically robust.** Implementation of the offset proposal will be monitored and reported in annual compliance reports and on the Santos website. There is strong evidence to demonstrate the likelihood of the offset achieving improvement in TEC and MNES habitat condition (DoE 2013; Ponce-Reyes *et al.* 2016). Fauna surveys have been conducted in accordance with best-practice guidelines, habitat/EC defined using SPRAT profile and/or peer-reviewed articles.
8. have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.	The SOA is monitored every year (See Section 8.0). Monitoring in the field will occur on at least an annual basis and audit of monitoring results against approval conditions and following the production of the annual monitoring report. All annual monitoring reports will be made available to **DAWE** upon request.

5.0 Approach to Management

5.1 Adaptive management

This Offset Plan is based on an adaptive management approach which involves 'flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood' (National Research Council 2004).

Adaptive management includes two key phases:

- establishment of the key components of a management framework including engaging stakeholders, developing clear and measurable objectives and performance criteria, identification and selection of potential management actions and the development of monitoring protocols which enable the evaluation of progress towards achieving objectives, and which will effectively contribute to the adaptive management decision making process.
- an iterative learning phase which involves utilisation of the management framework to learn about the natural resource system and iteratively adapt management strategies and approaches based on what is learned (Williams 2011)

The implementation of this Offset Plan will use the adaptive management framework, as illustrated in Figure 5-1, to detect changes in the condition of offset values, incorporate learnings from other similar management activities/conservation advice and inform decisions on corrective actions to ensure that interim performance targets and completion criteria are attained and maintained for the life of the approval. The offset site will be managed and monitored, as a minimum for the life of the approval and until the completion criteria have been achieved.

Section 6.0 details the overall environmental outcome of this Offset Plan, interim performance targets and completion criteria for each offset value and management objectives to be achieved as part of this Offset Plan. Attainment and maintenance of the completion criteria will be assessed based on the results of ongoing management and monitoring events and will be presented as part of compliance reporting commitments to DAWE (see Section 8.2).

If an interim performance target has not been achieved, or a completion criterion (once attained) has not been maintained, or an adaptive management trigger is identified, corrective actions will be implemented. Where there is uncertainty as to the cause of the management trigger (e.g. failure to achieve the interim performance target), the event or circumstance triggering corrective action will be reviewed, and management actions in this Offset Plan may be revised accordingly.

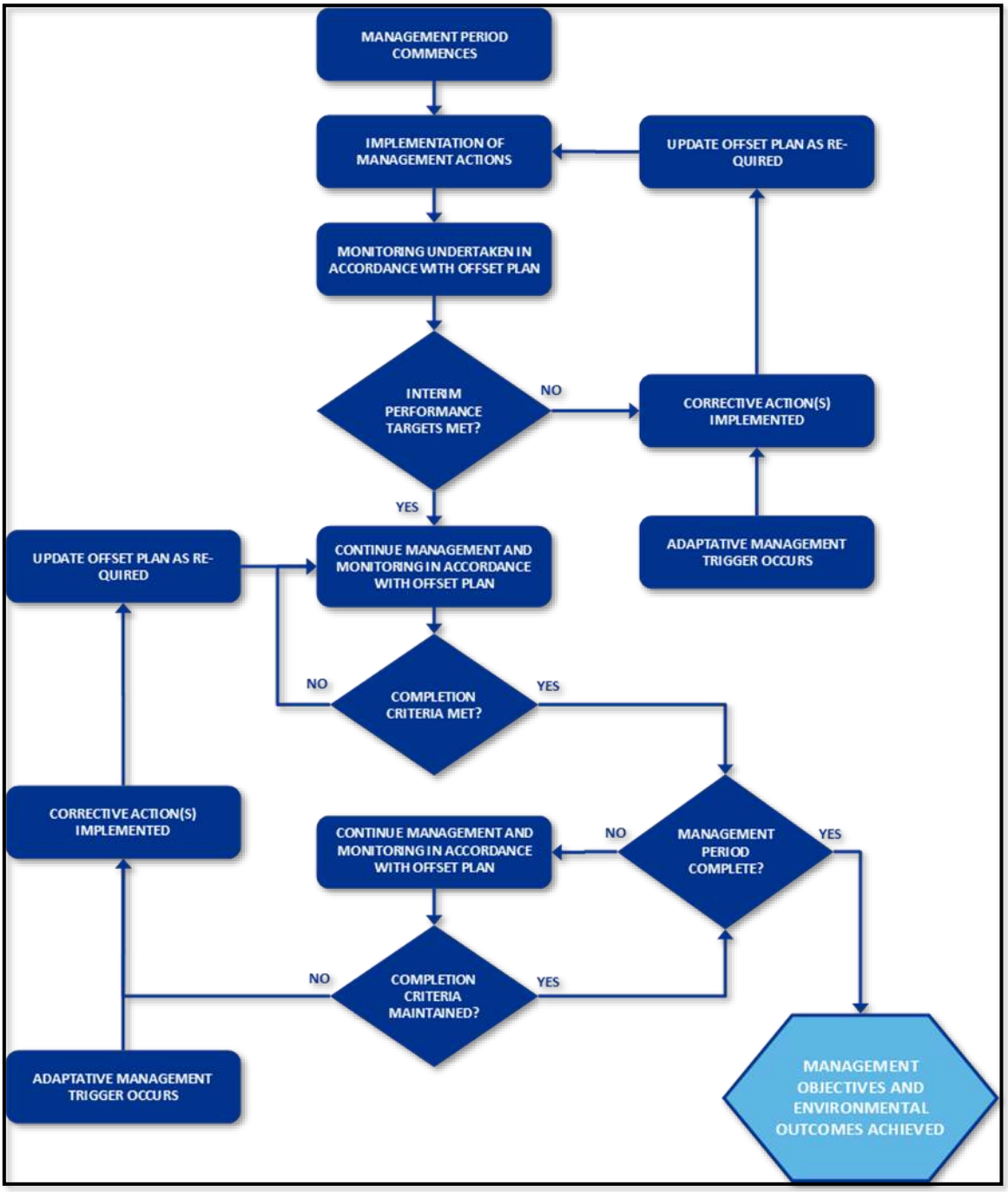

Figure 5-1 Adaptive management process for implementation of the Offset Plan

5.2 Managing uncertainty

The management of natural systems involves uncertainty which can affect the success of the management measures in achieving the objectives and performance criteria. Williams (2011) and Williams and Brown (2016) identify four kinds of uncertainty, outlined in Table 5-1, with how they have been addressed through the development of this Offset Plan.

Table 5-1 Four kinds of uncertainty (Williams and Brown 2016)

Uncertainty	Description	Addressed How
Environmental variation	**C**aused by external factors that act upon natural systems, but which are not influenced by the resource conditions and dynamics, for example variation in rainfall or temperature.	Largely outside of the control of the manager (Williams 2011). Influence is considered in the analysis of the effectiveness of the adaptive management approach, the analysis of the ability to achieve and maintain performance criteria and when considering the need for corrective actions.
Partial observability	Includes potential uncertainty arising from variation in the collection of data during monitoring events, and from being unable to completely observe the natural system in its entirety (Williams & Brown 2016).	Addressed in this OAMP through the development of a monitoring program based on scientifically tested and repeatable methods.
Partial controllability	Relates to the difference between the intended effect of the management measures to be implemented through this OAMP and the actual effect of their implementation on the ground (Williams & Brown 2016).	Address through adherence to an adaptive management approach including regular monitoring of conformance with performance criteria, assessment of adaptive management triggers, the implementation of corrective actions, review and amendments to the OAMP, and reporting to ensure that management measures are being effectively implemented on the ground.
Structural and process uncertainty	concerns a lack of knowledge or understanding regarding biological and ecological processes and relationships, and differing views regarding how natural systems respond to management (Williams & Brown 2016).	Addressed through the adaptive management approach. Following the results of ongoing management, monitoring and reporting, the OAMP will be reviewed and updated as required to incorporate learnings, updated conservation advice and best practice management techniques.

5.3 Timing for implementation of the Offset Plan

The offset area will be managed and monitored until the interim performance targets and completion criteria are achieved. It is anticipated that through the adaptive management approach, interim performance targets and completion criteria will be achieved within the proposed 20-year management period. However, if the interim performance targets and/or completion criteria for offset values have not been achieved within the anticipated timeframes, management and monitoring will continue beyond the 20-year management period in accordance with this Offset Plan until the completion criteria have been achieved. Once attained, completion criteria will be maintained for at least the life of the EPBC Act Approval.

5.4 Risk of offset failure

Appendix G presents an assessment of the risk of failure to achieve the Offset Plan objectives for the offset values.

Based on the adaptive approach to management and the proposed management and monitoring program, it is considered that the management objectives, interim performance targets and completion criteria (see Table 6-1) will be successfully achieved.

If interim performance targets are not achieved for one or more offset values by year 5, 10 or 15 for those offset values, Santos will obtain advice from suitably qualified people / groups with the aim of identifying appropriate additional management interventions.

It should be noted that unavoidable temporary perturbations such as severe drought, or insect/fungal pest invasion that may cause a temporary decrease in metrics such as canopy or shrub cover from which the community still may recover within the next 5 year period should not preclude assessment of a satisfactory increase in ecological condition by the completion date.

If it is considered that the completion criteria cannot be achieved, Santos will update this Offset Plan proposing alternative offset areas in order to acquit the required Stage 3 offset requirements in accordance with the offsets assessment guide. The revised Offset Plan will be submitted to the Commonwealth Government.

6.0 Management Outcomes

The environmental outcome sought through this Offset Plan is to improve the condition of vegetation in the SOA according to the interim performance targets and completion criteria detailed in Table 6-1, such that the habitat quality score for each MNES is improved from the baseline, as summarised in Table 7-1.

6.1 Interim performance targets and completion criteria

Table 8 details the interim performance targets and completion criteria for improving vegetation condition, and therefore MNES habitat quality, in the SOA, to demonstrate the success of the Offset Plan in achieving the overall environmental outcome.

The completion criteria align with the future habitat quality score included in the offsets assessment guides in Appendix C. Through the implementation of management and monitoring activities outlined in Section 7.0, the condition of the vegetation and offset values within the offset area will be improved from the baseline habitat quality to achieve the completion criteria within 20 years of commencement of the OAMP and be maintained for the life of the approval (i.e. until 31 March 2066).

All determinations of habitat quality will be made in accordance with the *Guide to assessing terrestrial habitat quality: Methods for assessing habitat quality under the Queensland Environmental Offsets Policy (Version 1.3, 2020)*, and converted to scores out of 10 via the spreadsheets included at Appendices A and B to the plan, unless agreed otherwise in writing by the Commonwealth Department of the Agriculture, Water and the Environment. The completion criteria for this plan are the offset site future state quality scores shown at Appendix B, for each metric included therein.

Table 6-1 Interim Performance Targets and Completion Criteria

Metric	Interim performance targets			Completion criteria*
	Year 5	Year 10	Year 15	Year 20
Assessment Units - Advanced regrowth REs: 11.9.5, 11.9.7 and Young regrowth REs: 11.9.5, 11.9.7, 11.10.7				
Tree canopy height	• Increased	• Increased to within 50% of remnant height	• Increased to within 75% of remnant height	• Remnant (VMA) Structure and floristics
Canopy recruitment	• Increased, or 100%	• Increased, or 100%	• Increased, or 100%	• Increased, or 100%
Tree canopy cover	• Increased	• Increased to within 50% of remnant cover	• Increased to within 75% of remnant cover	• Remnant (VMA) Structure and floristics
Shrub layer cover	• Increased	• Increased	• Increased	• Increased
Coarse woody debris	• Increased, or remains constant	• Increased, or remains constant	• Increased, or remains constant	• Increased, or remains constant
Native plant species richness	• Increased for four life forms	• Increased for four life forms	• Increased for four life forms	• Increased for four life forms
Non-native plant cover	• Decreased, or is below 5%	• Decreased, or is below 5%	• Decreased, or is below 5%	• Decreased, or is below 5%
Native perennial grass cover	• Increased	• Increased	• Increased	• Increased
Litter cover	• Increased, or remains constant	• Increased, or remains constant	• Increased, or remains constant	• Increased, or remains constant
Access and development	• Limited	• Limited	• Limited	• Limited

Metric	Interim performance targets			Completion criteria*
	Year 5	Year 10	Year 15	Year 20
BioCondition metric scores	• Have not declined as a result of fire or grazing	• Have not declined as a result of fire or grazing	• Have not declined as a result of fire or grazing	• Have not declined as a result of fire or grazing
Clearing	• No clearing has occurred	• No clearing has occurred	• No clearing has occurred	• No clearing has occurred
Weeds	• Weed control activities have prevented an increased in weed cover	• Weed control activities have prevented an increased in weed cover	• Weed control activities have prevented an increased in weed cover	• Weed control activities have prevented an increased in weed cover
Pest animals	• Decrease in Pest fauna trapped during trapping events.	• Decrease in Pest fauna trapped during trapping events.	• Decrease in Pest fauna trapped during trapping events.	• Decrease in Pest fauna trapped during trapping events.
Assessment Unit - Remnant REs: 11.3.25, 11.9.4, 11.9.5, 11.9.7, 11.10.7				
Tree canopy height	• Has not decreased	• Has not decreased	• Has not decreased	• Has not decreased
Canopy recruitment	• Increased, or 100%	• Increased, or 100%	• Increased, or 100%	• Increased, or 100%
Tree canopy cover	• Has not decreased	• Has not decreased	• Has not decreased	• Has not decreased
Shrub layer cover	• Increased	• Increased	• Increased	• Remnant (VMA) Structure and floristics
Coarse woody debris	• Increased, or remains constant	• Increased, or remains constant	• Increased, or remains constant	• Increased, or remains constant
Native plant species richness	• Increased for four life forms	• Increased for four life forms	• Increased for four life forms	• Increased for four life forms
Non-native plant cover	• Decreased, or is below 5%	• Decreased, or is below 5%	• Decreased, or is below 5%	• Decreased, or is below 5%

Metric	Interim performance targets			Completion criteria*
	Year 5	Year 10	Year 15	Year 20
Native perennial grass cover	• Increased	• Increased	• Increased	• Increased
Litter cover	• Increased, or remains constant	• Increased, or remains constant	• Increased, or remains constant	• Increased, or remains constant
Access and development	• Limited	• Limited	• Limited	• Limited
BioCondition metric scores	• Have not declined as a result of fire or grazing	• Have not declined as a result of fire or grazing	• Have not declined as a result of fire or grazing	• Have not declined as a result of fire or grazing
Clearing	• No clearing has occurred	• No clearing has occurred	• No clearing has occurred	• No clearing has occurred
Weeds	• Weed control activities have prevented an increased in weed cover	• Weed control activities have prevented an increased in weed cover	• Weed control activities have prevented an increased in weed cover	• Weed control activities have prevented an increased in weed cover
Pest animals	• Decrease in Pest fauna trapped during trapping events.	• Decrease in Pest fauna trapped during trapping events.	• Decrease in Pest fauna trapped during trapping events.	• Decrease in Pest fauna trapped during trapping events.

** For the purposes of the Completion Criteria, remnant height is 70% of benchmark community height and remnant canopy cover is 50% of benchmark community cover*

6.2 MNES habitat quality – baseline scores, interim targets and completion scores

Table 6-2 summarises habitat quality scores for each offset value in the SOA:

- Baseline habitat quality scores (calculated in accordance with the Guide to Determining Terrestrial Habitat Quality)
- Habitat quality score required at completion

Table 6-2 SOA Baseline Habitat Quality Scores

Offset Value	Baseline habitat quality score (area-weighted)	Rounded baseline quality score	Completion habitat quality score (Year 20)
Brigalow (*Acacia harpophylla* dominant and co-dominant)	6.84	7	8
Red Goshawk	6.15	6	7
Squatter Pigeon	7.71	8	9
Black-breasted Button Quail	6.40	6	9
South-eastern Long-eared Bat	6.15	6	7
Koala	5.66	6	7
Collared Delma	5.60	6	7
Yakka Skink	5.60	6	7
Dunmall's Snake	5.66	6	7

7.0 Offset Area Management

7.1 Overview

Figure 13 shows the three management areas in the SOA. Table 7-1 summarises management actions in each area.

Table 7-1 Summary of Management Actions in Each Management Area

Management activity	Management area(s)
Access and Development to be limited	All management areas
Fire to be Excluded	All management areas
Livestock exclusion	All management areas (with the exception of strategic grazing events)
Strategic Grazing	Management Area 1 and potentially Management Area 2 if needed.
Clearing Prohibition	All management areas
Weed Control	All management areas
Feral Animal Control	All management areas
Regrowth Thinning of Brigalow TEC	Regrowth Brigalow where thickening has occurred to >10,000 stems per hectare (Brigalow TEC only, parts of Management Area 3)

The management measures to be implemented within the SOA have been developed considering the relevant conservation advice for each MNES value and are consistent with the measures in relevant recovery plans and threat abatement plans. Table 7-2 details the species threats and relevant management measures for each MNES being offset.

Table 7-2 Relevant conservation priorities and management measures to be implemented within the SOA

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

Species	Species threats identified in relevant conservation advices and threat abatement plans	Management Activity
	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

Species	Species threats identified in relevant conservation advices and threat abatement plans	Management Activity
	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
Dasyurus hallucatus (Northern quoll)	Lethal toxic ingestion of Cane toad toxin	Non-manageable Threat
	Feral predators	Pest Animal Control
	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

Species	Species threats identified in relevant conservation advices and threat abatement plans	Management Activity
	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
Furina dunmalli (Dunmall's snake)	Past legacy of broadscale land clearing and habitat modification	Non-manageable Threat
	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

Species	Species threats identified in relevant conservation advices and threat abatement plans	Management Activity
	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

7.2 General restrictions

The general restrictions presented in Table 7-3 will be implemented to ensure the completion criteria and management objectives are achieved.

Table 7-3 Offset Area Restrictions

Restriction	Details
Access	• Access into the offset area will be restricted to authorised personnel only. • The SOA will be demarcated as an exclusion zone in the Santos GIS • Existing and new fences will be used to restrict access into offset area. Fences will be installed along southern perimeter of Hutton Creek providing a natural access barrier to the north, west and east • Signs will be installed in prominent locations (i.e. at access points into the offset area) which recognise that the areas are protected for conservation purposes. The signs will advise that access into the offset area is restricted to authorised personnel only
Weed hygiene	• Weed hygiene measures will be implemented to prevent the movement of weed material into the offset area. • All persons entering the offset area will be required to ensure vehicles and equipment are weed free. • All contractors entering the offset area must hold a current weed hygiene certificate or equivalent for all vehicles and equipment. • Evidence is to be provided on request to the landowner and Santos environmental advisors that vehicles, slashers or any machinery implementing management actions are clean prior to entry to minimise potential weed spread.
Vehicles	• Vehicle movement will be limited to designated access tracks in the offset area and access will be restricted to authorised personnel only. • Vehicles will travel to track conditions to minimise the risk of vehicle strike to fauna.

Vegetation clearing	• 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.
	• Clearing of native vegetation will not be permitted within the SOA as part of any management and monitoring activities associated with the Offset Plan, except for clearing that is required for:
	  ○ maintenance of access tracks and/or fire breaks
	  ○ fence construction and maintenance and
	  ○ ensure public safety or as directed by emergency management response personnel in the event of unplanned fire or other emergency or associated procedure.
	• If vegetation clearing is required for fencing, access, firebreaks or public safety, all activities will be appropriately planned, recorded and monitored.
	• Machinery will not be allowed on site after heavy or prolonged rainfall events until after the site has dried to allow for safe movement of traffic.

7.2.1 Access tracks

Existing access tracks will be utilised to facilitate necessary management, maintenance and monitoring activities as part of this Offset Plan. If existing access tracks become impassable (through erosion or vegetation regrowth), maintenance activities of these tracks (e.g. grading) will be prioritised

over alternative track alignments. Gully crossings are likely to be subject to periodic, ongoing maintenance because of erosion following rain events.

Existing and new access tracks will be no wider than 5 m and vegetation disturbance will be minimised.

7.2.2 Fencing

To support strategic grazing and the exclusion of livestock at other times, fences in the SOA will be assessed and, where required to assist with livestock control for weed and fuel load management, additional fencing will be installed. To minimise impacts to birds and bats all new fences will use a single strand of high tensile steel wire on the top strand (barbed wire will not be used).

Any vegetation disturbance associated with new fence construction will be minimised in accordance with Table 7-3.

Regular inspections of all fencing will be undertaken in accordance with Section 8.1, and repairs to the fences will be made as required.

7.3 Fire management

Fire will be excluded from the SOA. Unplanned fire risk will be managed through:

- establishment and regular maintenance (grading) of a firebreak around the SOA
- carefully monitored and managed fuel loads

The firebreak will be maintained by grading along:

- all existing/proposed fence lines
- all existing access tracks bordering or traversing offset area
- Strategic grazing will be used to control fuel loads, where appropriate/necessary (see Section 7.4). As increasing grazing intensity is correlated with an increase in weedy cover (Franks 2002), and a decrease in native grass species richness, grazing will be permitted in the offset area on a managed and limited basis to control weeds and reduce fuel loads. Best management practices will be employed as follows:
- a minimum of 1,500 kg/ha of dry matter will be retained at the end of the dry season
- stock will only be permitted in the offset area to reduce fuel loads and reduce exotic pasture grass cover.

The suitability of conditions for undertaking a grazing event will be informed by biomass monitoring events (see Section 8.2). Following a wet season spell and prior to a strategic grazing event in pasture areas of the offset area, a feed budgeting assessment will be undertaken. The feed budgeting assessment will determine the stocking rate based on the amount of feed available within pasture areas and the amount of feed desired in these areas at the end of the grazing event.

7.4 Grazing

Livestock grazing will be excluded from all offset management areas except during strategic grazing events, which will play an important role in reducing fuel loads. As increasing grazing intensity is correlated with an increase in weedy cover (Franks 2002), and a decrease in native grass species richness (ELA 2017). Best management practices will be employed as follows:

- minimum of 1,500 kg/ha of dry matter will be retained at the end of the dry season
- stock will only be permitted in the offset area to reduce fuel loads, avoid weed seed set and reduce weed cover

To minimise erosion and subsequent impacts on water quality, strategic grazing will be excluded where rainfall causes inundated or waterlogged soils. The location and extent of grazing exclusion areas will be reviewed annually based on the results of management and monitoring events.

The suitability of conditions for undertaking a grazing event will be informed by biomass monitoring events as described in Section 8.2. Regular inspections of all fencing will be undertaken in accordance with Section 8.1 and repairs to the fences will be made as required.

7.5 Weed management

Weed management in the SOA will aim to minimise the introduction, establishment and spread of restricted and prohibited pest plants under the Biosecurity Act 2014 (Qld) and other invasive species, not regulated under the *Biosecurity Act 2014*, that present a threat to vegetation communities and species habitat in the offset area. Weed management will focus on reducing the extent of existing weeds as well as minimising the risk of introduction of additional weed species to the offset areas.

The presence of buffel grass and parthenium as well as other exotic weed and pasture species poses the greatest threat to vegetation communities in the offset area, with areas supporting buffel grass

contributing to a groundcover biomass up to 20 times that of similar, intact vegetation communities (Walker et al. 1981). Elevated biomass increases the risk of uncontrolled fires, particularly in Brigalow TEC (Butler & Fairfax 2003).

Reductions in the extent of buffel grass and parthenium are most effectively achieved by maximising the competitive advantage of native ground cover species. This requires native species richness and abundance to be maximised. In historically grazed environments the most effective way to ensure high species richness is through conservatively managed cattle grazing (Fensham 1998). Conservative cattle grazing requires maintenance of enough biomass to maximise grass growth and appropriate spelling to allow for native species to set seed.

Accordingly, a strategic grazing regime will be implemented to reduce the presence and biomass of exotic pasture grasses in the offset areas (refer to Section 7.4). To supplement this, weeds will be managed using chemical and/or mechanical control in accordance with the control measures outlined in the Biosecurity Queensland Fact Sheets, for the relevant weed species.

7.6 Pest Animal Management

Pest animals are present or have the potential to be present within or in the immediate vicinity of the SOA, and pose the following threats:

- predation of fauna (including South-Eastern Long-eared Bat, Koala, Dunmall's snake and yakka skink) by wild dogs, foxes and cats, and
- erosion and degradation of habitat and competition by feral pigs and rabbits.

Pest animal control activities will be conducted generally in accordance with the Biosecurity Act 2014 (Qld). Table 7-4 provides examples of approved species-specific pest animal control measures recommended by the Queensland and Commonwealth governments. Results of pest animal assessments will be reviewed following each reporting event to inform the need for, location and timing of species-specific control measures in subsequent years.

Table 7-4 Examples of Species-Specific Control Methods for Pest Animal Species

Species	Status[a]	Example control method	Reference
Wild dog (*Canis familiaris*)	Category 3,4,6	Ground baiting Foot hold traps Shooting	(DAF 2017)
Fox (*Vulpes vulpes*)	Category 3,4,5,6	Ground baiting Trapping Shooting	(DAF 2016a)
Feral cat (*Felis catus*)	Category 3,4,6	Night shooting Poisoning Trapping	(DAF 2016b)
Pig (*Sus scrofa*)	Category 3,4,6	Trapping Shooting Poisoning	(DAF 2016c)
Rabbit (*Oryctolagus cuniculus*)	Category 3,4,5,6	Baiting Fumigation Trapping Shooting	(DAF 2016d)

[a] Status under the Biosecurity Act 2014 (Qld)

7.7 Brigalow Vegetation Management

Selective regrowth thinning of Brigalow TEC may be required where regrowth of Brigalow vegetation (RE 11.9.5) occurs at >10,000 stems per hectare. Restoration thinning using mechanical methods can accelerate structural development.

The requirement for management by mechanical thinning will be informed by monitoring events (see Section 8.5).

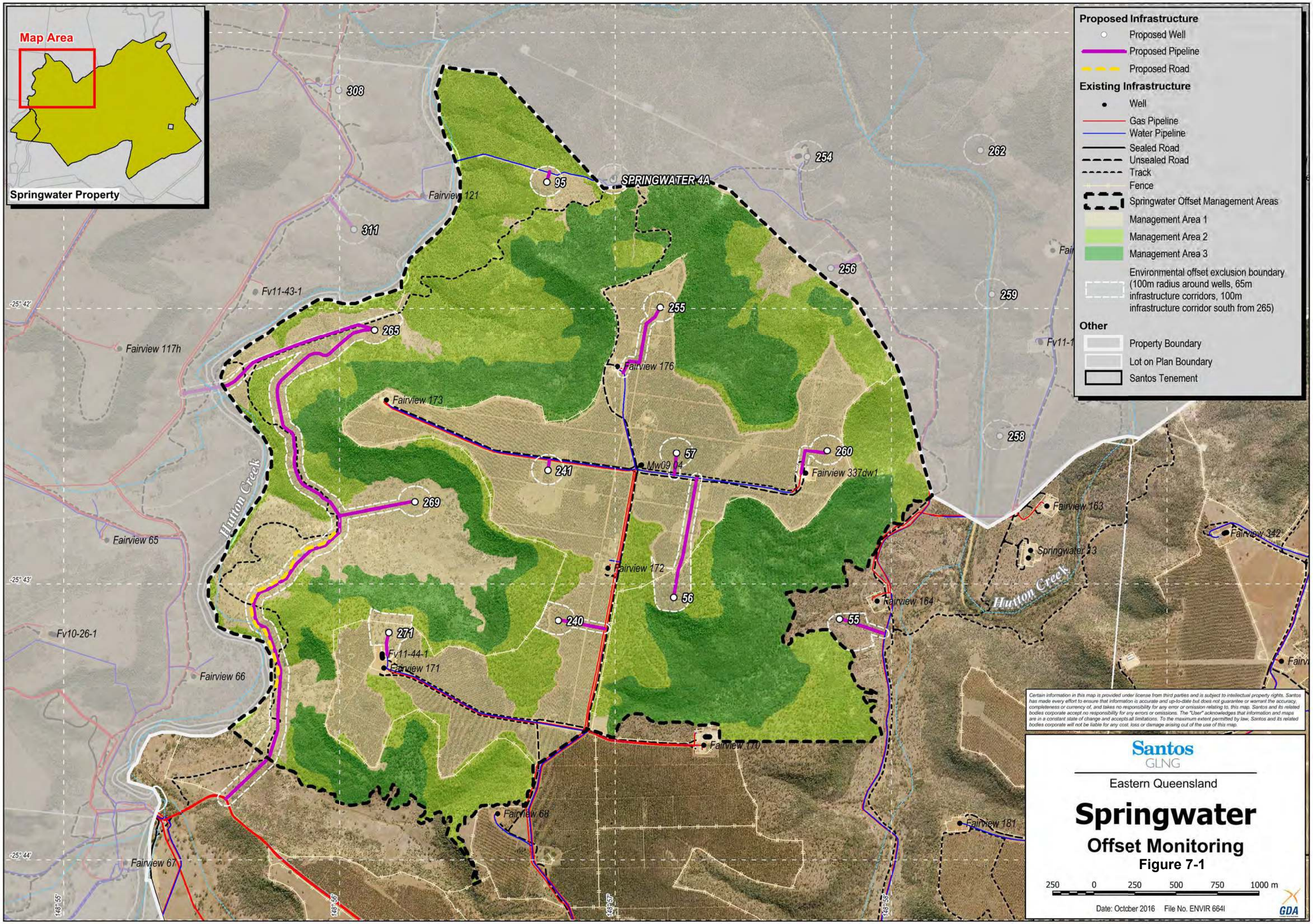
Map Area
Springwater Property
Proposed Infrastructure
Proposed Well
Proposed Pipeline
Proposed Road
Existing Infrastructure
Well
Gas Pipeline
Water Pipeline
Sealed Road
Unsealed Road
Track
Fence
Springwater Offset Management Areas
Management Area 1
Management Area 2
Management Area 3
Environmental offset exclusion boundary (100m radius around wells, 65m infrastructure corridors, 100m infrastructure corridor south from 265)
Other
Property Boundary
Lot on Plan Boundary
Santos Tenement
SPRINGWATER 4A
Hutton Creek
Fairview 121
Fairview 117h
Fairview 176
Fairview 173
Fairview 337dw1
Fairview 163
Springwater 13
Fairview 342
Fairview 65
Fairview 172
Fairview 164
Fairview 66
Fairview 171
Fairview 170
Fairview 68
Fairview 181
Fairview 67
Fv11-43-1
Fv10-26-1
Fv11-44-1
Mw09 04
308
311
95
254
262
256
259
255
265
258
57
260
241
269
56
55
240
271
-25° 42'
-25° 43'
-25° 44'
148° 55'
148° 56'
148° 57'
148° 58'
Santos
GLNG
Eastern Queensland
Springwater
Offset Monitoring
Figure 7-1
250 0 250 500 750 1000 m
Date: October 2016 File No. ENVIR 664I
GDA

Table 7-5 Springwater Offset Area Management Actions

Threat to offset values	Management objective	Performance criteria	Management action	Monitoring	Trigger for adaptive management and corrective action(s)	Corrective action
Degradation of habitat	Achieve the completion criteria and habitat quality improvements for offset values, which include the habitat quality scores in this Offset Plan	Increase the habitat quality scores for each offset value at each habitat quality assessment site based on the results of baseline and subsequent monitoring events to achieve the scores in the completion criteria	Implementation of the management actions and adaptive management framework as outlined in this Offset Plan	Monitoring of offset value habitat quality scores will be undertaken in accordance with Section 8.0. Including: Offset area inspections (Section 8.1). Habitat quality assessments to determine habitat quality scores (Section 8.5). The results of monitoring events will be compared against the habitat quality scores in the interim performance targets and completion criteria to determine the progress of the offset area and recorded as part of reporting (Section 8.7)	Habitat quality scores for interim performance targets are not achieved for one or more offset values by: • Year 5 • Year 10. • Year 15 or • Year 20	Step 1: Investigate cause of trigger: • Investigate reasons why the interim performance targets or the completion criteria were not achieved within the specified timeframes. • Re-evaluate the suitability of the relevant management measures in the Offset Plan. • Identify appropriate corrective actions. Step 2: Implementation of corrective action/s The appropriate corrective actions will be implemented and may include: • Third party review of the OAMP to provide input on the effectiveness of the management actions. • Increasing the frequency and intensity of pest animal and weed control measures or revising the type of measures to be implemented. • For offset values that have not achieved interim performance targets by year 15, for those offset values, Santos will obtain advice from scientific advisory groups with the aim of identifying appropriate additional management interventions. • In the very unlikely event that it is considered that the completion criteria will not be achieved, Santos will discuss the provision of additional offset options with the Commonwealth Government
Habitat or vegetation loss through land clearing	Maintain the extent of offset value habitat within the SOA	No unapproved and/or intentional clearing of habitat within the offset area, except for clearing that is required for fencing, access, firebreaks and public safety.	Protection of the SOA offset area via a Voluntary Declaration under section 19E and 19F of the VMA, as described in Section 4.5	Reporting to the Commonwealth Government consistent with any EPBC approval	Any activities in contravention of the Voluntary Declaration	Step 1: Investigate cause of trigger e.g. unauthorised access Identify appropriate corrective actions. Step 2: Implementation of corrective action/s The appropriate corrective actions will be implemented and may include additional fencing and/or signage and security for the SOA
			Comply with the restrictions outlined in Section 7.2. Construction and maintenance of access tracks, fencing and firebreaks will be undertaken in accordance with Sections 7.2 and 7.3. If vegetation clearing is required for fencing, access, firebreaks or public safety, all activities will be planned, recorded and monitored.	Compliance with restrictions for vegetation clearing associated with maintenance and establishment of access tracks, fencing and firebreaks will also be assessed as part of offset area inspections	Clearing for access, fencing, firebreaks or public safety is not undertaken in accordance with the restrictions outlined in Sections 7.2 and 7.3.	Step 1: Investigate cause of trigger • If restrictions for clearing associated with fencing, access, firebreaks or public safety are not adhered to, Santos will ensure that all clearing activities cease immediately. • Investigate the reason for unapproved or unintentional clearing. • Following clearing, the area is to be assessed by a suitably qualified ecologist/expert to determine the total clearing extent of offset value habitat. a. Identify appropriate corrective actions. Step 2: Implementation of corrective action/s The appropriate corrective actions will be implemented and may include: • Reviewing and modifying protocols for the establishment of fences, access tracks, and firebreaks. • Prior to the establishment of fences, access tracks, and firebreaks, the area to be cleared will be clearly marked out with flagging tape and checked prior to clearing. • Rehabilitation of the impacted area.

Threat to offset values	Management objective	Performance criteria	Management action	Monitoring	Trigger for adaptive management and corrective action(s)	Corrective action
Degradation of habitat by overgrazing	Ensure that any livestock grazing for fire management and weed control maintains and enhances the ground cover attributes for MNES and does not result in the degradation of habitat and vegetation	Increase the richness and average % cover of native perennial grasses at each habitat quality assessment site based on the results of baseline and subsequent monitoring events	Implementation of strategic grazing to reduce fuel loads and control exotic pasture grasses in accordance with Section 7.4. Implementation of strategic grazing to promote the establishment of preferred foraging grass species including modifying the frequency, intensity and/or duration of grazing events. Excluding livestock grazing during wet periods (approximately December to March), which is typically the peak growing and flowering season for native grasses. Construct additional fencing should the current fencing be considered insufficient to manage the strategic grazing regime	Habitat quality assessments will be undertaken in accordance with Section 8.5.2. These will include assessment of % cover of native perennial grasses	Decrease in the richness and average ground layer cover at one or more habitat quality assessment sites based on the results of baseline and subsequent monitoring events	Step 1: Investigate cause of trigger • Investigate the reason for the decrease in richness and average % cover of native perennial grasses. • Identify appropriate corrective actions. Step 2: Implementation of corrective action(s) The appropriate corrective actions will be implemented and may include: • Modifying the strategic grazing regime, including modifying the frequency, intensity and/or duration of grazing events. • Constructing additional fencing should the current fencing be considered insufficient to manage livestock in accordance with the grazing regime. • Installing additional watering points for livestock to manage livestock in accordance with the grazing regime.
		Biomass levels of at least 1,500 kg/ha are retained at each of the monitoring sites at the end of the dry season.	Implementation of the strategic grazing regime to protect and maintain environmental values in accordance with Section 7.4.	Biomass monitoring will be undertaken in accordance with Section 8.1	Biomass monitoring results indicate less than 1,500 kg/ha of biomass is present at any of the monitoring sites at the end of the dry season.	Step 1: Investigate cause of trigger • Investigate the reason for the decrease in biomass at the end of the dry season • Identify appropriate corrective actions Step 2: Implementation of corrective action(s) Corrective actions will be implemented and may include the following: • Re-evaluating the strategic grazing regime to assess the suitability of grazing to ensure no less than 1,500 kg/ha of biomass is retained at the end of the dry season. • Removal of stock or spelling grazing from the offset management area in which less than 1,500kg/ha of biomass was identified. • Amending livestock management practices in the Offset Plan, including amending stocking rates, and/or duration and/or frequency of strategic grazing. • Evaluating the location of existing fencing to ensure it is enough to control livestock as part of strategic grazing and investigate if additional fencing is required to be constructed. • Constructing additional fencing to control livestock movements.
		Livestock are only observed to be in the offset management areas undertaking strategic grazing.	Existing fencing is always maintained as outlined in Section 7.2.2. Construction of additional fencing as required.	Offset area inspections will be undertaken at least twice a year (Section 8.1) and will include monitoring to assess the: • condition of fencing to identify any necessary maintenance requirements. • presence of livestock within the offset management area.	Livestock are observed within an offset management area when not permitted within that area. Damaged fencing is observed.	Step 1: Investigate cause of trigger • Investigate the reason why livestock have entered the offset area • Identify appropriate corrective actions Step 2: Implementation of corrective action(s) Corrective actions will be implemented and may include the following: • If livestock are identified in the offset management areas, notify the onsite Environmental Supervisor or relevant responsible person and remove stock immediately. • Repair fencing to ensure its condition is satisfactory to exclude livestock. • Construct additional fencing should the current fencing be considered insufficient to exclude livestock.

Threat to offset values	Management objective	Performance criteria	Management action	Monitoring	Trigger for adaptive management and corrective action(s)	Corrective action
Degradation of Brigalow TEC habitat	Manage regrowth of Brigalow TEC vegetation (RE 11.9.5) to accelerate structural development	Maintenance of Brigalow TEC regrowth in accordance with interim performance targets and completion criteria.	Selective regrowth thinning of Brigalow TEC where regrowth of Brigalow vegetation (RE 11.9.5) occurs at >10,000 stems per hectare, using mechanical methods	Habitat quality assessment in accordance with Section 8.5	Brigalow TEC regrowth exceeds 10,000 stems per hectare based on previous monitoring events.	Step 1: Investigate cause of trigger Identify whether mechanical thinning is appropriate Step 2: Implementation of corrective action(s) Corrective actions including mechanical thinning of regrowth Brigalow TEC may be carried out.
Invasion of habitat by weed species, including exotic grasses	Manage invasive weed species to reduce degradation of MNES habitat	Decrease in relative abundance of weed species at 80% of monitoring sites from subsequent monitoring events. No new weed species are identified at any monitoring site (based On subsequent monitoring events	Implement weed control actions in accordance with Section 7.5 Adhere to weed hygiene restrictions.	Undertake weed monitoring in accordance with Section 8.3.	An increase in relative abundance of weed species at more than 15% of monitoring sites from subsequent monitoring events. A new weed species is identified at one or more monitoring sites.	Step 1: Investigate cause of trigger Investigate the increase in relative weed abundance Identify appropriate corrective actions Step 2: Implementation of corrective action(s) Corrective actions will be implemented and may include the following: • Reviewing adherence to weed management control measures as outlined in Section 7.5. • Amending weed hygiene restrictions. • Providing additional weed awareness training for all staff and contractors to ensure weed hygiene restrictions are adhered to. • Revising weed control methods. • Increasing the frequency and intensity of weed control. • Updating weed control methods in the Offset Plan and targeted weed control programs.
Predation by pest animals (feral foxes, cats and wild dogs)	Minimise predation risk by pest animals to threatened fauna species	Reduction in Catling* Index for the relevant pest animal from the first year of offset management	Implement control actions for pest animals in accordance with Section 7.6.	Undertake monitoring for pest animals in accordance with Section 8.4.	An increase in Catling* Index for the relevant pest animal from the first year of offset management and subsequent monitoring events.	Step 1: Investigate cause of trigger • Investigate the reason for the increase in Catling index (or relative abundance, or change in rabbit impact category) from year 1/subsequent monitoring events • Identify appropriate corrective actions Step 2: Implementation of corrective action(s) Corrective actions will be implemented and may include the following: • Reviewing adherence to pest management control measures. • Increasing the frequency and intensity of pest animal control. • Revising methods of pest animal control in accordance with Queensland Department of Agriculture and Fisheries (DAF) guidelines, and coordinate with neighbouring landowners to ensure a consistent approach. • Updating pest animal control methods in the Offset Plan and targeted pest animal control programs.
Degradation of habitat by rabbits	Minimise degradation of MNES habitat by rabbits.	Maintain rabbit impact category as 'acceptable'.	Implement control actions for rabbits in accordance with Section 7.6.	Undertake monitoring for rabbits in accordance with Section 8.4.	Rabbit impact category measured as 'monitor closely', or 'unacceptable'.	
Degradation of habitat by feral pigs	Minimise degradation of MNES habitat by feral pigs.	Reduction in mean feral pig abundance score from the first year of management	Implement control actions for feral pigs in accordance with Section 7.6	Undertake monitoring for feral pigs in accordance with Section 8.4.	An increase in mean feral pig abundance score from first year and subsequent monitoring events.	

Threat to offset values	Management objective	Performance criteria	Management action	Monitoring	Trigger for adaptive management and corrective action(s)	Corrective action
Fire	Reduce the risk of adverse impacts on MNES habitat associated with unplanned fire	No unplanned fire within the SOA Increase in habitat quality scores as a result of implementation of any fire management measures.	Implement fire management according to Section 7.3.	Habitat quality assessments to determine habitat quality scores will be undertaken in accordance with Section 8.5.	As a result of fire management measures, or an unplanned fire, there is a decrease in the habitat quality score for any offset value from baseline and subsequent monitoring events.	Step 1: Investigate cause of trigger • Investigate reasons why the fire management measures have resulted in a decrease in habitat quality scores. • Review adherence to the fire management measures. • Identify appropriate corrective actions. Step 2: Implementation of corrective action/s The appropriate corrective actions will be implemented and may include: • Increasing the frequency of biomass monitoring. • Increasing the frequency of weed control measures. • Reviewing effectiveness of firebreaks, and establishment of additional fire breaks.
Offset fails to achieve the interim performance targets and completion criteria within the anticipated 5, 10-, 15- and 20-year timeframes, respectively	Achieve the interim performance targets and completion criteria for each offset value within 5, 10, 15 and 20 years, respectively.	The interim performance targets are achieved for all offset values by year 5,10 and 15. The completion criteria are achieved for all offset values by year 20.	All management actions outlined in Section 7.0 will be implemented to ensure that the interim performance targets and completion criteria are achieved.	Monitoring of the offset area will be undertaken in accordance with Section 8.0 including: Offset area inspections (Section 8.1). Habitat quality assessments to determine habitat quality scores (Section 8.5.) The results of monitoring events will be compared against the interim performance targets and completion criteria to determine the progress of offset area and recorded as part of reporting (Section 8.7).	Interim performance targets are not achieved for one or more offset values by year 5, 10 or 15 Completion criteria are not achieved for one or more offset values by year 20.	Step 1: Investigate cause of trigger • Investigate reasons why the interim performance targets or the completion criteria were not achieved within the specified timeframes. • Re-evaluate the suitability of the relevant management measures in the OAMP. • Identify appropriate corrective actions. Step 2: Implementation of Corrective Action/s The appropriate corrective actions will be implemented and may include: • Third party review of the Offset Plan to provide input on the effectiveness of the management actions. • Increasing the frequency and intensity of pest animal and weed control measures or revising the type of measures to be implemented. • Modifying the fire management measures, to better support enhancement of offset values.

8.0 Monitoring

Ongoing monitoring is required to ensure the Offset Plan meets the performance criteria and management objectives, and ultimately attains the completion criteria. A monitoring programme has been developed, detailed in the following sections and in Table 16

The results of the monitoring program will be used to inform operational management decisions, including adaptive implementation of this Offset Plan to ensure the performance criteria and management objectives, and ultimately interim performance targets and completion criteria are met.

The monitoring results will also be used to assess adherence to performance criteria, and to determine when corrective actions are required to be implemented. The results will also be compared to those from previous monitoring events to assess change over time and to inform the ongoing implementation of the OAMP

8.1 Offset Area Inspections

The aim of offset area inspections is to enable a general assessment of the offset area to identify any potential issues that may require remedial action to be undertaken. Inspections will be undertaken at twice per year for the duration of the management period to assess the following:

- condition of fencing, gates and signs and existing gas field infrastructure
- condition of access tracks
- condition of firebreaks
- compliance with restrictions for vegetation clearing associated with maintenance and establishment of access tracks, fencing and firebreaks
- incidence of erosion within offset area, particularly around permanent and semi-permanent water bodies or areas subject to inundation or waterlogging
- damage/degradation resulting from pest animal activity within the offset area
- signs of land degradation and over-grazing
- presence of weed/invasive species
- exclusion of livestock
- incidental fauna observations and any additional risks to offset values (i.e. evidence of vehicle strike)

8.2 Biomass monitoring

Biomass monitoring for fire management will be undertaken twice a year, at the end of the wet season and end of the dry season, to:

- determine the risk of fire to the offset site and
- inform fire management strategies.

Biomass is at its greatest at the end of the wet season (around April) with fire risk greatest towards the end of the dry season (September/October). Biomass will be monitored within the offset areas using appropriate photo standards which will be used to determine dry matter yields and subsequently fuel loads. Biomass monitoring will be undertaken at the same permanent weed monitoring sites established as part of the baseline surveying.

Fuel loads will be managed through strategic grazing events (see Section 7.4) if the biomass assessment at the end of the wet season shows that biomass is greater than 1,500 kg/ha.

The stocking rate of these strategic grazing events will be determined through a feed budgeting assessment (see Section 8.2.1) undertaken prior to a grazing event in the offset area. A feed budgeting assessment is a recognised method of determining the stocking rate based on the amount of feed available and the amount of feed desired at the end of the grazing event (i.e. >1,500 kg/ha).

8.2.1 Feed Budgeting Assessment

The process for undertaking a feed budget assessment will include the following sequence of activities:

- determine the current amount of feed present (kg/ha) using appropriate photo standards available on the Future Beef website[1].
- determine the amount of feed desired (kg/ha) at the end of the grazing event.
- calculate the total useable feed (kg/ha) by subtracting the feed desired from the feed present.
- determine utilisation (i.e. the proportion of useable feed that livestock can use).
- determine the feed available for the grazing animal (kg/ha) by multiplying the total useable feed by the utilisation rate.
- calculate the safe stocking rate by:
    - determining the feed consumption per day (kg/day)
    - determining the number of days feed is required (days)
    - calculating the feed requirement per head (kg/hd) by multiplying the feed consumption per day by the number of days
    - calculating the stocking rate (ha/hd) by dividing the feed requirement per head by feed available
    - calculate the number of stock (head) by dividing the area of the paddock by the stocking rate.

The amount of feed available prior to the grazing event will be estimated using the appropriate photo standards available on the Future Beef website. The “Dry Season Feed Budget” worksheet will then be used to calculate the required stocking rate for the grazing event.

At the completion of the grazing event, photo standards will be used to assess ground cover and ecosystem biomass. Should the grazing event be required to be extended (e.g. as a result of additional rainfall and resultant grass growth and potential weed flowering), the feed budget assessment will be recalculated using the “Dry Season Feed Budget” worksheet.

8.3 Weed monitoring

Weed monitoring sites will be randomly stratified, fixed monitoring sites representative of offset values and incorporating natural variability such as aspect (e.g. a mix of north-, east-, south- and west-facing monitoring sites), community type – (e.g. woodland, riparian). There will also be fixed monitoring sites

at strategic trafficable areas (e.g. entry gates, creek crossings, stock watering points) to monitor potential introduction and/or irruptions of prohibited and restricted weed species.

The offset area will be monitored for weeds every two years (post wet season) to determine the species richness and abundance, for the duration of the management period. The results of this monitoring will inform the methods for weed treatment and control (see Section 7.5).

[1] https://futurebeef.com.au/knowledge-centre/pastures-forage-crops/pasture-photo-standards/

Non-native plant cover is also assessed as part of the habitat quality assessments detailed in Section 8.5, and the presence of weed species will also be recorded as part of the general offset area inspections (see Section 8.1), where noted.

Weed 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 martini*).

8.4 Pest Animal Monitoring

In partnership with the Queensland Murray-Darling Committee (QMDC), Santos GLNG conduct a feral animal research, monitoring and control project across the Fairview gas field. This includes the Springwater property. The methodology employed in this program included wild dog and feral cat trapping at known hot spots and feral pig trapping and control. This will continue for the period of offset area management.

Pest animal control will occur twice annually. Each trapping program is over a two week period with the first trapping program occurring during March to April and the second trapping program occurring during October to December. This timing aligns with increased dog activity during the breeding season and avoids the colder months where cat activity and breeding is limited.

In addition to the above program, evidence of pest fauna species is documented during the offset area inspections (see Section 8.1).

8.5 Habitat Quality Assessments

The first detailed monitoring event of the SOA was completed in spring/summer 2017, including BioCondition sites established in all major vegetation assessment units.

All determinations of habitat quality will be made in accordance with the *Guide to assessing terrestrial habitat quality: Methods for assessing habitat quality under the Queensland Environmental Offsets Policy (Version 1.3, 2020)*, and converted to scores out of 10 via the spreadsheets included at Appendices A and B to the plan, unless agreed otherwise in writing by the Commonwealth Department of Agriculture, Water and the Environment. The completion criteria for this plan are the offset site future state quality scores shown at Appendix B, for each metric included therein.

8.5.1 Rapid Monitoring Event

Rapid monitoring events will be carried out each year there is not full monitoring of habitat quality (BioCondition, Section 8.5.2, targeted fauna survey, Section 8.5.4 and flora surveys, Section 8.5.5).

These will be aligned with the offset area inspections (see Section 8.1), and carried out by suitably qualified ecologists during spring and early summer (September – mid December) to coincide with the optimal time of year for flora and fauna surveys in the Brigalow Belt Bioregion (Eyre et al. 2014).

During each rapid monitoring field assessment, the following will conducted:

- An unbounded timed meander flora 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.
- Fauna surveys will be conducted throughout the rapid monitoring events. Early morning and late evening bird surveys will be conducted during floristic surveys and surveys for the presence of all fauna species will be conducted throughout the day by the ecologists.

8.5.2 Habitat quality assessment (BioCondition)

Vegetation condition and habitat quality for each MNES will be assessed in accordance with the Guide to Determining Terrestrial Habitat Quality, developed by the Queensland Government to measure the habitat quality of a land-based offset. The guide is based on the methodology set out in the BioCondition Assessment Manual (Eyre et al. 2015) and compared to control sites (BioCondition benchmarks), as developed by the Queensland Herbarium.

Fixed transects were established in 2017 and these will be repeated every two years for the first six years following the 2017 baseline, and then every three years thereafter.

All ecological surveys and assessments will be undertaken by suitably qualified ecologists.

8.5.3 Photo monitoring

For each BioCondition site, photo-monitoring points have been established.

Photo monitoring is a qualitative analysis technique that provides the opportunity for visual time series analysis of changes in vegetation composition, structure and integrity. In areas where active management is being undertaken, photo monitoring offers a simple and effective visual means by which to capture the response of the vegetation to management actions. Photo monitoring will be conducted at all fixed habitat quality assessment monitoring sites, in accordance with the Guide to Determining Terrestrial Habitat Quality. Timing of photo monitoring will therefore align with habitat quality assessment monitoring.

8.5.4 Targeted Fauna Surveys

Targeted fauna surveys are 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. Methodology, search effort and timing is provided in Table 8-1.

Targeted fauna surveys will be carried out in conjunction with BioCondition surveys, every two years for the first six years following the 2017 baseline, and then every three years thereafter.

Table 8-1 Fauna Species Survey Methods

Technique	Regime	Target and method
Elliot B (Box Trap) or Cage Trap	Four per site over four consecutive nights, checked early morning, reopened late afternoon.	Baited with a mixture of oats, peanut butter, vegetable oil and sardines. Placed within suitable micro-habitat for Northern Quoll.
Funnel Trap	Six at each of five trap sites over four consecutive nights, checked early morning and afternoon.	Placed in pairs either side along a 30m drift-fence. Targeting Dunmall's Snake and Collared Delma.
Anabat	Three units overnight for four consecutive nights	Left overnight on site near entrances to possible roost sites for Large Pied Bat, if considered present, and/or along flyways and near waterbodies.

Technique	Regime	Target and method
Harp Trap	Two per night for four consecutive nights, locations chosen based on presence of suitable flyways	Targeting South-eastern Long-eared Bat, which is not identifiable by ultrasonic calls. Also Large-eared Pied Bat.
Camera Trap	10 over at least 14 consecutive nights	Focused on stations baited with a mixture of oats, peanut butter, vegetable oil and sardines. Targeting Northern Quoll and possibly Yakka Skink. (Fleming et al., 2014).
Spotlighting	Meander along watercourses.	Targeting Koala. This will also target Dunmall's Snake.
Spotlighting	Rocky areas.	Targeting Northern Quoll and Collared Delma.
Spotlighting	By vehicle along tracks.	Targeting Dunmall's Snake.
Scat Search	Conducted in habitat considered suitable for target species.	Targeting Koala and Northern Quoll. The Spot Assessment Technique (SAT), or a variation, were used to survey for Koalas within suitable habitat within the site.
Bird Survey	At waterbodies.	Targeting Australian Painted Snipe, Australasian Bittern and Squatter Pigeon.
Bird Survey	Meander along watercourses during the day.	Targeting nest sites for Red Goshawk. Includes diurnal Koala Search.
Track Traverse	By vehicle and on foot.	Targeting Squatter Pigeon.
Diurnal Herpetofauna Search	Late morning/early afternoon.	Conducted by two searchers, duration is determined by site-specific habitat quality and presence of suitable micro-habitat. Targeting Collared Delma, Dunmall's Snake and Yakka Skink.
Platelet Search	In suitable habitat.	Targeting Black-breasted Button-quail.

8.5.5 Flora Surveys and Habitat Mapping

Threatened flora surveys will be conducted throughout the SOA. Timed meander surveys are conducted in each of the vegetation units listed in Table 3 to identify and locate EVNT plants. The timed meander survey are 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

Flora surveys and habitat mapping will be carried out in conjunction with BioCondition surveys and targeted fauna surveys, every two years for the first six years following the 2017 baseline, and then every three years thereafter.

8.6 Implementation Schedule

Table 8-2 and Table 8-3 Table 8-2summarise the implementation schedule for the management, monitoring and reporting activities presented in this OAMP.

Table 8-2 Implementation of management actions

Activity		Management years ✓ Activity required ■ Activity to be carried out as required																				Timing	Related monitoring
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
General restrictions (Section 7.2)	Access, vehicles, vegetation clearing, weed hygiene	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	At all times	General offset inspections (see Section 8.1).
Access tracks (Section 7.2.1)	Maintenance/new tracks	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	As required	
Fencing (Section 7.2.2)	Construction of additional fencing to support livestock exclusion and strategic grazing	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	As required	
	Maintenance	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■		
Fire management (Section 7.3)	Fire excluded	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	At all times	Biomass monitoring (Section 8.2.1).
Grazing (Section 7.4)	Strategic grazing	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	As required based on the results of biomass monitoring, and informed by weed monitoring	Biomass monitoring (Section 8.2.1). Weed monitoring (Section 8.3).
Weed management (Section 7.5)	Buffel grass and other weeds	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	Control activities in addition to stratetic grazing to be undertaken as required	Weed monitoring (Section 8.3).
Pest animal management (Section 7.6)	Wild dog (*Canis familiaris*); Feral cat (*Felis catus*); Fox (*Vulpes vulpes*); Rabbit (*Oryctolagus cuniculus*); Pig (*Sus scrofa*)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	Control acfitivites to be undertaken as required	Pest animal monitoring (Section 8.4)
Brigalow vegetation management (Section 7.7).	Restoration/regrowth Brigalow vegetation (RE 11.9.5)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	Thinning to be undertaken as required, according to habitat quality assessments	Habitat quality assessment (Section 8.5)
Reporting (Section 8.7)	Annual reporting	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Offset Plan audit every 5 years	Reporting (Section 8.7)
	Update Offset Plan					■					■					■					■		

Table 8-3 Offset Plan Monitoring Events

Survey or monitoring objective	Monitoring activity	Management years ✓ Activity required ■ Activity to be carried out as required																				Timing	Survey/monitoring guidelines	Reliability
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Offset area inspections (Section 8.1)	Twice yearly inspections of: • fencing, gates, signs and existing • access tracks • firebreaks • compliance with restrictions for vegetation clearing associated with • incidence of erosion • damage/ degradation resulting from pest animal activity within the offset area • signs of land degradation and over-grazing • weed/invasive species • exclusion of livestock • incidental fauna observations and any additional risks to offset values (i.e. evidence of vehicle strike	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Inspections will be undertaken at least twice a year, Usually at the end of the wet season and the end of the dry season, with one of the inspections occurring prior to the submission of the annual report		General assessment of the offset management areas to identify any potential issues that may require remedial action to be undertaken within the subsequent year of management.
Biomass monitoring (Section 8.2.1)	Biomass monitoring for fire management and to inform strategic grazing regime	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Twice every year at the end of the wet season (March/April) and towards the end of the dry season (October)	Assessment against Future Beef photo standards (Section 8.2.1)	Methodology developed by the Queensland Government Department of Nation Resources.
Weed monitoring (Section 8.3)	Ongoing weed surveys to assess the effectiveness of weed control		✓		✓		✓		✓		✓		✓		✓		✓		✓		✓	Every two years including a survey in the dry season and a survey post wet season	NSW Guidelines for Monitoring eed Control and recovery of native vegetation (Auld 2009) Photo monitoring of selected sites to assess visual changes in weed species and infestations over time.	Assessment undertaken generally in accordance with guidelines developed by Bruce Auld from the NSW Department of Primary Industries.

Survey or monitoring objective	Monitoring activity	Management years ✓ Activity required ■ Activity to be carried out as required																				Timing	Survey/monitoring guidelines	Reliability
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
																							The use of precision unmanned aerial vehicles (drone) technology, aerial imagery and/or remote sensing.	
Pest animal monitoring (Section 8.4)	Ongoing pest animal surveys to assess the effectiveness of pest animal control	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Twice annually, according to Section 8.4	Methods as detailed in Santos partnership with Queensland Murray-Darling Committee (QMDC	
Habitat quality assessment (baseline surveys completed in 2017) (Section 8.5)	Rapid monitoring events		✓		✓		✓	✓		✓	✓		✓	✓		✓	✓		✓	✓		Every year there is no full BioCondition assessment	See Section	
	Targeted fauna and flora surveys	✓		✓		✓			✓			✓			✓			✓			✓	Every two years from the 2017 baseline, and then every three years thereafter.	Guide to Determining Terrestrial Habitat Quality (DEHP 2017) Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al. 2018) Survey Guidelines for Australia's Threatened Birds (DEWHA 2010) Survey guidelines for Australia's threatened reptiles (DSEWPaC 2011).	Assessment undertaken in accordance with method developed by the Queensland Government and aligns with the EPBC Act Environmental Offsets Policy measure of 'habitat quality' and is intended to provide a consistent framework for environmental offsets in Queensland.
	BioCondition transects	✓		✓		✓			✓			✓			✓			✓			✓			
	Photo monitoring	✓		✓		✓			✓			✓			✓			✓			✓		Photos at each photo monitoring point will be taken in a north, east, south and westerly direction. A record of the photographs will be maintained, including GPS co-ordinates, date and time of each photograph and the direction in which the photograph was taken.	Based on best practice photo monitoring techniques, see Appendix 4 of BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.2. (Eyre *et al.* 2015)

8.7 Reporting

Reports detailing the progress against the management outcomes detailed in Section 6 will be prepared by the suitably qualified ecologist responsible for conducting the monitoring, within two weeks following each monitoring event. The report will contain, at a minimum:

- A description of the monitoring conducted, when it was conducted, and by whom;
- A discussion of the weather in the lead up to and during the monitoring;
- Results of photo monitoring;
- Site data including site description and location and results for all site based condition attributes listed in Section 5.5.
- Rapid assessment site data including site description and location and results (if relevant that year);
- An overview of the management actions that were implemented since the last report (i.e. if thinning of Brigalow occurred, or pest animal and weed control);
- Details of any triggers that have been exceeded and the remedial actions that were implemented;
- An overview of the progress of the management area in achieving the performance criteria and how any risks or threats have impacted on the area; and
- An indication of any risks or potential threats that have become apparent to the management area since the development of this management plan, and activities to be undertaken to manage these threats and/or risks.
- This plan will be reviewed and audited every 5 years and/or if the risks to the offsets success identified in Section 5.4 have been identified.
- Annual reports discussing compliance with the commitments within this plan will be published on the Santos website.

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Appendix A: Lonesome Ecology Report

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Field Survey Report

Ecological survey of selected proposed infrastructure within Lonesome Holding (Lot 2 on Plan SP313789).

Compiled by BOOBOOK for Santos

Revision	Date	Description	Author	Verifier	Approved
A	22/6/2020	Draft issued to client for review	C. Eddie, L. Hardwick	C. Eddie	C. Eddie
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Executive Summary

This report provides the results of an ecological assessment undertaken by BOOBOOK Ecological Consulting (BOOBOOK) on the property "Lonesome" (Lot 2 on Plan SP313789) (the Site) located northeast of Injune, south central Queensland. A field survey was undertaken in May 2020 within proposed coal seam gas (CSG) infrastructure within client-nominated parts of the Site.

The field assessment included identification of remnant and regrowth regional ecosystems (RE), using the BioCondition methodology at each Assessment Unit (AU) as defined by DEHP (2020a) and undertaking targeted searches for the herb *Xerothamnella herbacea* which is listed under the Queensland (QLD) *Nature Conservation Act 1992* (NC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) as endangered. A total of 15 BioCondition sites were completed within eight assessment units.

The field survey identified the following ecological values within the Site:

- Approximately 26.0 ha of Brigalow (*Acacia harpophylla* dominant and dominant) Threatened Ecological Community (TEC).
- Presence of four Endangered (biodiversity status) REs, these being 31.6 ha of RE 11.3.17, 70.0 ha of RE 11.9.5, 2.6 ha of RE 11.9.5a and 6.3 ha of RE 11.9.10.
- Multiple populations of the endangered herb *Xerothamnella herbacea*.

List of Abbreviations

AU	Assessment Unit
DAWE	Department of Agriculture, Water and the Environment (Commonwealth)
DEHP	Department of Environment and Heritage Protection (State)
DES	Department of Environment and Science (State)
DoEE	Department of the Environment and Energy (Commonwealth)
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (Commonwealth)
E	Endangered
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
GLNG	Gladstone Liquefied Natural Gas (project)
GPS	Global Positioning System
ha	hectare (s)
km	Kilometre (s)
LC	Least Concern
m	metre (s)
MNES	Matter(s) of National Environmental Significance
NC Act	*Nature Conservation Act 1992*
NCAP	No Concern At Present
NP	National Park
OC	Of Concern
PMST	Protected Matters Search Tool
QLD	Queensland
RE	Regional Ecosystem (s)
REDD	Regional Ecosystem Description Database
TEC	Threatened Ecological Community (ies)
TSSC	Threatened Species Scientific Committee

Conclusions drawn in this report are based on available information at the time of writing. Any additional information may alter such conclusions and the author reserves the right to do so if such information becomes available. This report has been made as at the date of the report and is not to be used after six (6) months and not if there are any material changes meanwhile. In either event it should be referred back for review. To the extent permitted by law BOOBOOK does not accept liability for any loss or damage which any person may suffer arising from any negligence or breach of contract on its part. This report was prepared for the benefit of the party to whom it is directed only and for the purpose identified within. BOOBOOK does not accept responsibility to any other person for the contents of the report.

1. Introduction

1.1. Site Description

This report provides a description of an ecological assessment undertaken within part of the property 'Lonesome' described as Lot 2 on Plan SP313789 (hereafter 2SP313789). The assessment covered proposed coal seam gas (CSG) infrastructure (including assessment buffers) as provided in spatial data supplied by Santos (the Client). The assessment area is hereafter referred to as 'the Site' (Appendix A).

The Site is located approximately 52 km northeast of Injune, south central Queensland. The Site is situated within the boundary of the Maranoa Regional Council and is accessed via the Arcadia Valley Road.

The Site lies at the southern end of Subregion 20 (Arcadia) of the Brigalow Belt bioregion (Sattler and Williams 1999). The topography of the Site was characterised by areas of alluvium (land zone 3) adjoined by undulating low hills with fine grained sediments (land zone 9) and dissected plateaux and scarps formed from exposed Clematis Sandstone (land zone 10). A series of minor drainage lines were present (e.g. Gratz Gully) which drained southwards into the Dawson River, a major watercourse within the Fitzroy drainage basin.

Soils at the Site were predominantly clay and clay loams on alluvium and undulating low hills. These supported Poplar Box (*Eucalyptus populnea*) and Brigalow (*Acacia harpophylla*) communities. Small areas of woodland were dominated by Silver-leaved Ironbark (*E. melanophloia*) on sandy alluvium, and shallow sandy soils on hill crests supported Narrow-leaved Ironbark (*E. crebra*) woodlands. Vegetation clearing at the Site was patchy within the Site, having targeted areas of RE 11.3.17 and 11.9.5 (i.e. Brigalow and Poplar Box communities). Evidence of historical wildfire and selective thinning were present within almost all vegetation types within the Site.

In a regional context, the Site is part of a very large tract of remnant vegetation extending west and east between the Expedition and Carnarvon Ranges. The Site partly adjoins the Lonesome Section of Expedition (Limited Depth) National Park (NP). Lonesome Holding is state land currently managed primarily for nature conservation purposes. Other observed land uses included CSG activities. Some older gas wells and pipelines were present, with the more recently constructed Gladstone Liquefied Gas Project (GLNG) pipeline traversing the Site in a roughly south-north alignment.

1.2. Purpose and Scope

Santos required the following services within the Site:

- Ground-truthed Regional Ecosystem (RE) mapping.
- Completion of BioCondition sites within all Assessment Units (AUs) as per *DEHP (2020a) Guide to determining terrestrial habitat quality. A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy. Version 1.3*.
- Threatened flora surveys targeting the following client-nominated species which had been previously recorded from the Site:
    - *Xerothamnella herbacea* – scheduled as endangered under both the Queensland (QLD) *Nature Conservation Act 1992* (NC Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.3. Survey Team

A field survey of the Site was conducted by Craig Eddie (Principal Ecologist), Michael Cunningham (Senior Ecologist) and Courtney Andrew (Field Technician) from 11-15th May 2020.

The project supervisor (Craig Eddie) was approved by the Department of Agriculture, Water and the Environment (DAWE), formerly the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC), in writing on the 28th of January 2011 for the purpose of undertaking ecological assessment works for the Gladstone Liquefied Natural Gas (GLNG) project. All aspects of the project including field survey and reporting were conducted under the supervision of Craig Eddie.

2. Methodology

2.1. Desktop Assessment

Earlier surveys of part of Lonesome Holding by BOOBOOK provided background information for the present study (e.g. BOOBOOK 2017). These sources were supported by updated searches of datasets including:

- EPBC Act Protected Matters Search Tool (PMST) (DAWE 2020);
- Wildlife Online flora records within 5km of the approximate centre of the Site (DES 2020b);
- Protected Plants Flora Survey Trigger Map (DES 2020c); and
- Atlas of Living Australia flora records within 10km of the approximate centre of the Site (ALA 2020).

Data searches were performed using the property lot/plan number or using a 5km buffer around the coordinates -25.4843°S, 148.8732°E (these approximated the centre point of the Site).

2.2. Field Survey

In-field verification of desktop findings and additional findings of significance were undertaken in general accordance with the following:

- *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner *et al*. 2019);
- *Guide to determining terrestrial habitat quality. A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy* (DES 2020a);
- *Methodology for Conducting Ecological Assessments* – GLNG Areas Rev 4.1 (Santos 2014); and
- *Functional Thresholds for Assessing Regional Ecosystem Functionality* (Santos 2015).

BioCondition survey sites were established in all AUs, based on identifiable vegetation characteristics i.e. structure, floristics and condition. Methodologies that were employed for each element of the field survey are further described in the following sections.

2.2.1. RE and TEC Assessment

RE and Threatened Ecological Community (TEC) assessment was informed by both desktop review of earlier assessments where relevant (see Section 2.1) and by ground-truthing during field assessment. Where required, in the light of new field-based information, assessment included revision of previously reported mapping for some parts of the Site. Ground-truthing (and confidence level scoring) of the RE designation was undertaken using data collection methods as described by Neldner *et al*. (2019).

Assessments were undertaken within 50 m x 10 m plots (at BioCondition sites) for the purpose of typifying the vegetation community under assessment. Plots were chosen within representative areas of each vegetation type encountered. Locations of assessment sites are mapped in Appendix A.

Vegetation community polygons were verified in accordance with Queensland RE description and biodiversity status as per the Regional Ecosystem Description Database (REDD) (DES 2019) and classified as remnant RE, vegetation consistent with RE (regrowth) or non-remnant vegetation (Santos 2014). For each area of potential TEC an assessment of vegetation survey data was made against TEC threshold criteria (e.g. TSSC 2013).

Vegetation community data was captured in the field and entered into Santos-specific data fields within spatial databases via Motion tablet devices. Representative photographs were taken at each vegetation survey site and at vegetation patches as supporting evidence of the identity of the subject vegetation community where full documentation was not required. Capture and delineation of RE and TEC boundaries was undertaken using a combination of mobile GIS devices, GPS and/or delineation from imagery.

For identified regrowth (i.e. vegetation floristically equivalent to a RE but not meeting structural thresholds of remnant RE) an ecosystem functionality assessment was conducted. This assessed selected vegetation characteristics against the parameters described in Santos (2015).

Plant names used within this document conform to those given in Brown and Bostock (2019).

2.2.2. BioCondition Survey

To assist in the evaluation of the Site's ecological function and condition a series of BioCondition assessments were undertaken. BioCondition assessments were completed at 15 sites which were selected within each mapped AU or RE type. 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.

The following information was recorded at each BioCondition site:

- Date;
- Observers;
- Description of location (bioregion, general description, co-ordinates for plot origin and centre, plot bearing and alignment);
- General habitat description and RE type;
- Median height for canopy, emergent and sub-canopy strata;
- Slope position/slope degree and slope aspect;
- Tree species richness (within 100 m x 50 m plot);
- Native plant species richness (within 50 m x 10 m plot);
- Non-native plant cover (within 50 m x 10 m plot);
- Total length of coarse woody debris (length >10 cm diameter and >0.5 m long within 50 m x 20 m plot);
- Number and average diameter at breast height (DBH) of large eucalypt and non-eucalypt trees (within 100 m x 50 m plot);
- Recruitment of canopy species (within the 100 m x 50 m plot);
- Tree and shrub canopy cover (within 100 m transect);
- Ground cover within 1 m x 1 m plots (native perennial grass and organic litter cover in the ground layer);
- Disturbances (severity, last event and observation type).

Large tree DBH thresholds for each RE were used where benchmark documents were available, otherwise the default ≥30 cm DBH for eucalypts and ≥20 cm DBH for non-eucalypts was applied.

Site photographs were taken using a digital camera in accordance with Eyre *et al*. (2011, 2015) (i.e. one photograph at plot origin and north, east, south and west photographs at the plot centre). Photograph numbers were recorded. Locations of BioCondition sites were determined using a handheld Global Positioning System (GPS) (Garmin GPSmap 78S) and BioCondition assessment data was captured by mobile GIS devices (Motion F5T tablet device). Permanent 0 m and 50 m markers were not established.

Scores for BioCondition sites were calculated in accordance with Eyre *et al*. (2015) which compares the values obtained at each survey site with values in the benchmark document for that particular RE (Queensland Herbarium 2019). Sub-scores are awarded to each site and landscape attribute then are added together and divided by the maximum possible score for that RE. This provides a numeric value along a continuum of biodiversity condition, where scores closer to 0 indicates that sites are 'dysfunctional' and those closer to 1 indicates that sites have 'functional' condition.

2.2.3. Targeted Threatened Flora Survey

Targeted surveys for client-nominated threat-listed flora (i.e. *Xerothamnella herbacea*) were informed by the desktop search results and past site experience. Searches for *X. herbacea* were conducted during walking meanders throughout the Site in all habitat types, including remnant and non-remnant vegetation.

Where detected, counts and extent of each population of *X. herbacea* were made as well as structural characteristics and representative photographs taken. Data were recorded using the Santos-specific Notable Species - Flora Point or Region data capture layer.

2.2.4. Survey Limitations

Individual mapped vegetation polygons have been assigned a confidence level (high, moderate, low) for both boundary accuracy and vegetation attributes within the polygon as per Neldner *et al*. (2019). Within the spatial database confidence ratings are designated as 'A' for high, 'B' for moderate and 'C' for low. The schema outlined in Tables 1 and 2 was applied to vegetation polygons.

Table 1: Boundary accuracy confidence ratings applied to mapped polygons.

Boundary Accuracy			
Confidence	**Range of Accuracy**	**Homogenous Patches**	**Heterogeneous Patches**
High (A)	<1 - <10 m	Ground-truthed on site, or viewed at a distance	Ground-truthed on site
Moderate (B)	>10 - <50 m	Not ground-truthed (image interpretation only)	Portion ground-truthed on site
Low (C)	>50 - >200 m	nil	No ground truthing: vegetation viewed at a distance or image interpretation only

Table 2: Vegetation attribute confidence ratings applied to mapped polygons.

Vegetation Attributes		
Confidence	Homogenous Patches	Heterogeneous Patches
High (A)	Ground-truthed on site	Ground-truthed on site
Moderate (B)	No ground truthing: vegetation viewed at a distance	Portion ground-truthed on site
Low (C)	Image interpretation only	Viewed at a distance or image interpretation only

The timing (season) and duration of the survey period during early to mid-May was adequate to detect target flora species (i.e. *Xerothamnella herbacea*). Although *X. herbacea* plants were beginning to desiccate they were readily detectable. A significant rainfall event from end of January – March 2020 promoted good conditions for plant growth such that the survey period was ideal for BioCondition assessments.

3. Results & Discussion

3.1. Desktop Assessment

State government mapped regional ecosystems are presented in Appendix B.

3.2. Ground-truthed Vegetation Mapping

Ground-truthing identified six RE types within the Site. Two of these RE were only represented by regrowth. Mapping of remnant and regrowth RE based on field analysis is presented in Appendix C.

The extent (total area) of each mapped remnant and regrowth RE within the Site is summarised in Table 3. In total, approximately 113.9 ha of vegetation (47.9 ha of remnant and 66.0 ha of regrowth) was mapped within the Site.

Table 3: Summary of extent of ground-truthed REs within the proposed infrastructure footprint at the Site.

RE Code	*VM Act* Class	Biodiversity Status	Short Description (DES 2019)	Extent – remnant (ha)	Extent – regrowth (ha)
11.3.17	OC	E	*Eucalyptus populnea* woodland with *Acacia harpophylla* and/or *Casuarina cristata* on alluvial plains	18.3	13.3

RE Code	*VM Act* Class	Biodiversity Status	Short Description (DES 2019)	Extent – remnant (ha)	Extent – regrowth (ha)
11.3.39	LC	NCAP	*Eucalyptus melanophloia* +/- *E. chloroclada* open woodland on undulating plains and valleys with sandy soils	0.4	N/A
11.9.5	E	E	*Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks.	17.3	52.7
11.9.5a	E	E	*Acacia harpophylla* with a semi-evergreen vine thicket understorey	2.6	N/A
11.9.10	OC	E	*Eucalyptus populnea* open forest with a secondary tree layer of *Acacia harpophylla* and sometimes *Casuarina cristata* on fine-grained sedimentary rocks	6.3	N/A
11.10.7	LC	NCAP	*Eucalyptus crebra* woodland on coarse-grained sedimentary rocks	3.0	N/A

E = Endangered; OC = Of Concern; LC = Least Concern; NCAP = No Concern at Present

3.3. TEC Assessment

The field survey confirmed the presence of one TEC this being Brigalow (*Acacia harpophylla* dominant and co-dominant) (hereafter Brigalow TEC).

For the purposes of this assessment all remnant RE 11.9.5 (a listed component of the Brigalow TEC) was mapped as TEC (TSSC 2013) provided that *Acacia harpophylla* was dominant in the canopy and that the vegetation otherwise met condition criteria (TSSC 2013).

The mapped extent of TEC at the Site is shown within Appendix D. Table 4 shows the total area of TEC mapped within the Site.

Table 4: Description and ground-truthed extent of TEC within the Site.

TEC Description	RE Code	Extent of TEC (ha)
Brigalow (*Acacia harpophylla* dominant and co-dominant)	11.9.5	26.0

3.4. BioCondition Assessment

Vegetation condition was assessed using the BioCondition methodology of Eyre *et al*. (2015). Assessments were completed at 15 locations within the Site (Appendix A), these being representative samples of the eight AU (i.e. remnant and regrowth RE) described above. BioCondition site characteristics and scores are summarised in Table 5. Raw data for BioCondition assessment sheets are attached separately to this report.

Table 5: Summary of BioCondition assessment sites and results within the Site based on intact subregion assessment (DEHP 2017).

AU	RE	Structural condition	Assessment sites	BioCondition score	Averaged BioCondition score
1	11.3.17	remnant	LHB05	0.74	0.75
			LHB15	0.76	
2	11.3.17	regrowth	LHB04	0.48	0.52
			LHB13	0.56	
3	11.3.39	remnant	LHB14	0.69	0.69
4	11.9.5	remnant	LHB06	0.85	0.87
			LHB09	0.92	
			LHB11	0.84	
5	11.9.5	regrowth	LHB03	0.43	0.55
			LHB10	0.66	
6	11.9.5a	remnant	LHB08	0.85	0.8
			LHB12	0.75	
7	11.9.10	remnant	LHB02	0.74	0.85
			LHB07	0.96	
8	11.10.7	remnant	LHB01	0.92	0.92

3.5. Targeted Threatened Flora Survey

The endangered herb *Xerothamnella herbacea* was detected at multiple locations within the Site. *X. herbacea* was most frequently encountered within RE 11.3.17 where it occurred under the shade of Brigalow (*Acacia harpophylla*) or other small trees/tall shrubs that had a dense canopy such as Wilga (*Geijera parviflora*). *X. herbacea* was also detected in RE 11.9.5 wherever there was sufficient soil moisture (e.g. clay soils close to minor drainage lines, depressions or road drains), sufficient canopy cover, little to no invasion by exotic grasses and dense leaflitter. *X. herbacea* was not detected at any gilgais within the Site. Locations of *X. herbacea* detected within the Site are shown within Appendix D.

4. Conclusions

The field survey identified the following ecological values within the Site:

- Approximately 26.0 ha of Brigalow (*Acacia harpophylla* dominant and dominant) TEC.
- Presence of four Endangered (biodiversity status) RE, these being 31.6 ha of RE 11.3.17, 70.0 ha of RE 11.9.5, 2.6 ha of RE 11.9.5a and 6.3 ha of RE 11.9.10.
- Multiple populations of the endangered herb *Xerothamnella herbacea*.

5. References

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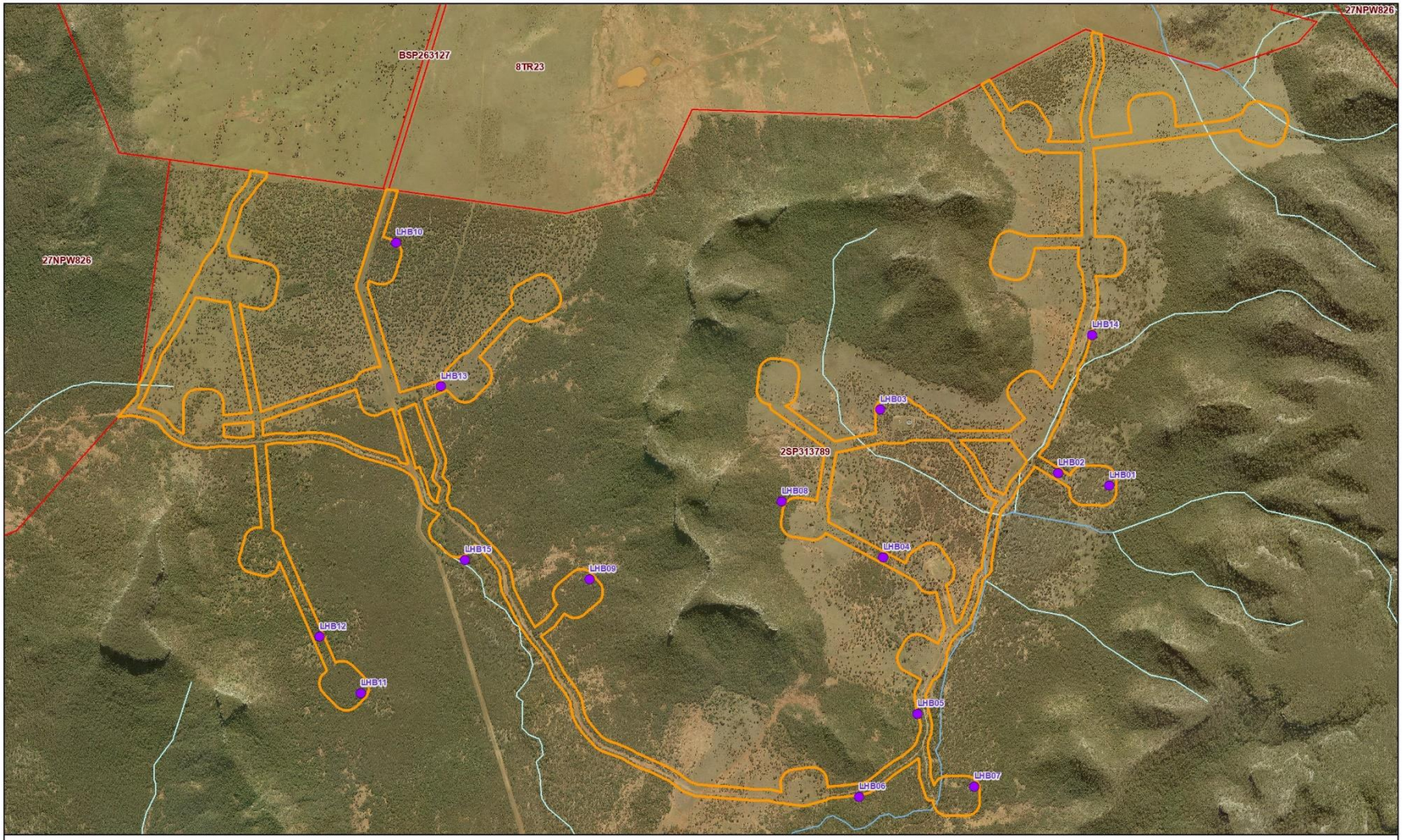
Appendix A. Location of the Site & assessment sites.



Appendix A: Location of The Site and Assessment Sites

Legend

- Biocondition Site
- Survey Area
- Cadastre

Ordered Streams

- 1
- 2 - 3

N W E S

0 100 200 400m

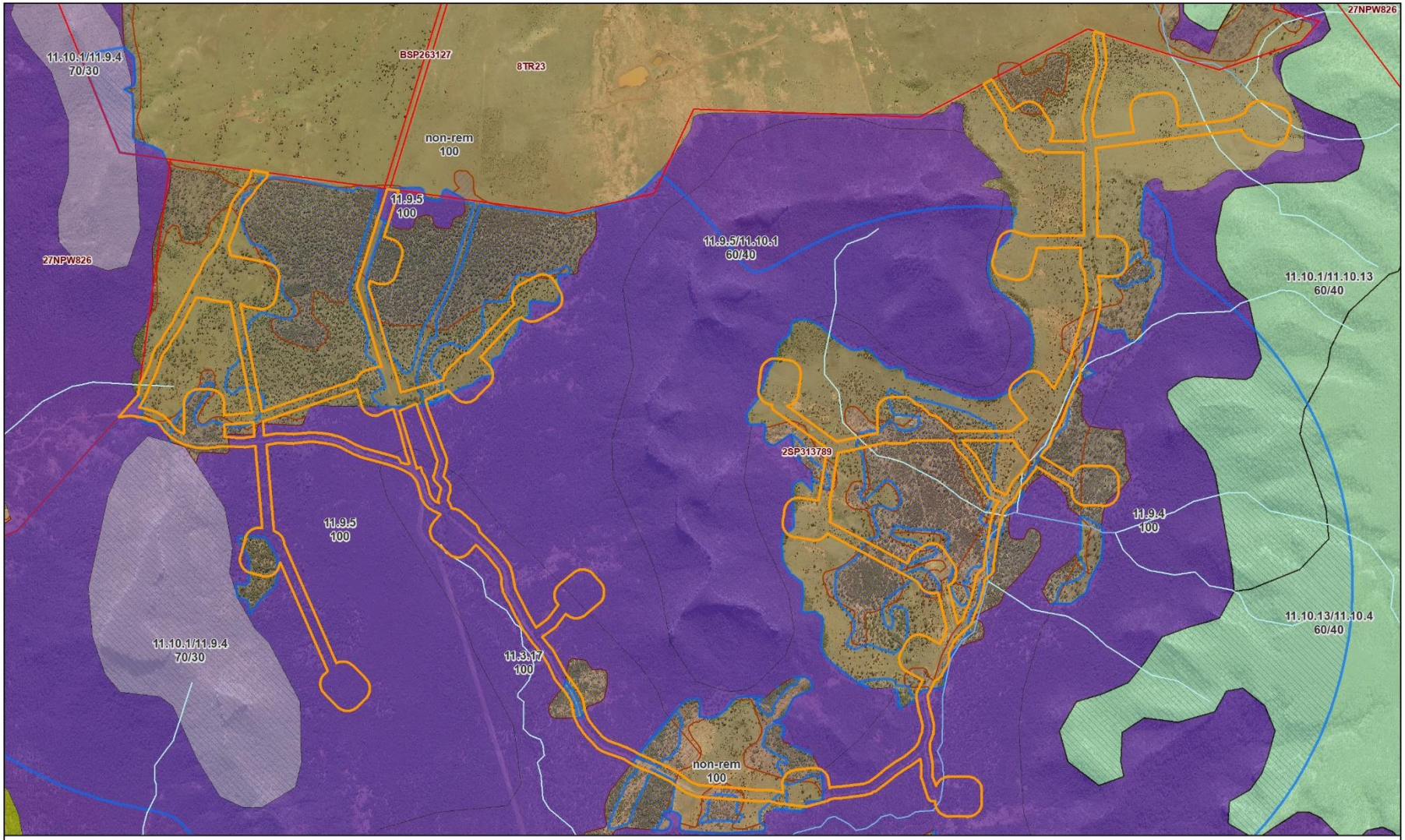
Project:	Lonesome Protected Plant Survey
Map No:	PC756_AppA
Date:	29/05/2020 RevA
Drawn:	L. Hardwick
Approved:	C. Eddie
Scale:	1: 18,000 @ A3
Datum:	GDA94

Boobook

Roma Site Brisbane

BOOBOOK gives no warranty in relation to the data in this map (including accuracy, reliability, completeness or suitability) and accepts no liability for any loss, damage or costs (including consequential damage) relating to any use of this data.

Appendix B. State Government mapped remnant and Mature Regrowth RE within the Site.



Appendix B: State Government mapping of Remnant & Regrowth RE.

Survey Area
Cadastre

Remnant Regional Ecosystems (Biodiversity Status)
- Endangered, Dominant
- Endangered, Sub-dominant
- Of Concern, Dominant
- No concern At Present

Mature Regrowth (Biodiversity Status)
- Endangered, Dominant
- Endangered, Sub-dominant
- Of Concern, Dominant
- No concern At Present

Protected Plants Flora Trigger
- High Risk Area

Ordered Streams
- 1
- 2 - 3

N W E S

0 100 200 400m

Project:	Lonesome Protected Plant Survey
Map No:	PC756_AppB
Date:	29/05/2020 RevA
Drawn:	L. Hardwick
Approved:	C. Eddie
Scale:	1: 18,000 @ A3
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Roma Site Brisbane

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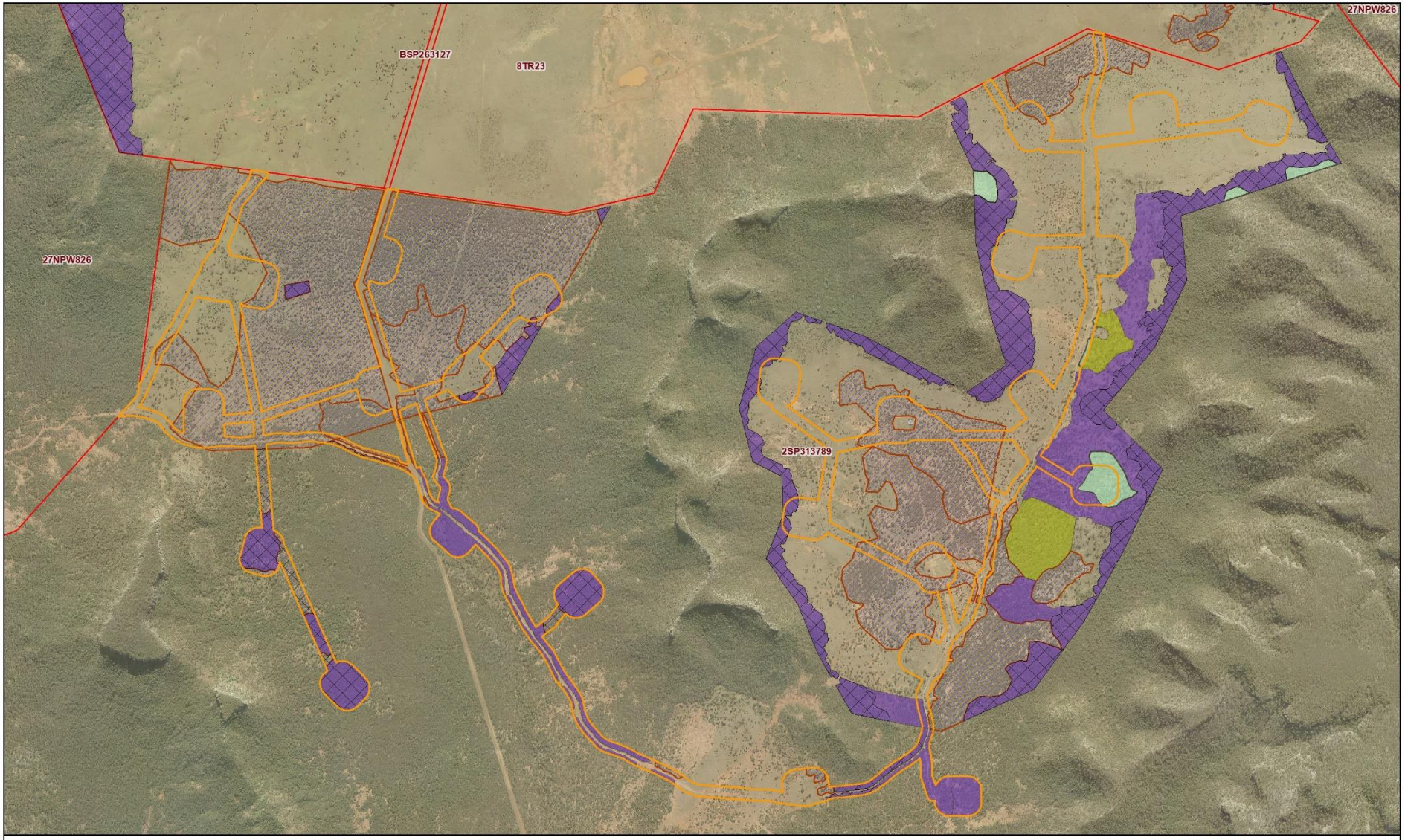
Appendix C. Ground-truthed remnant and regrowth RE and TEC.



Appendix C: Ground-truthed RE and TEC Recorded on the Site.

Survey Area
Cadastre

Ground-truthed Remnant RE (Biodiversity Status)
Endangered, Dominant
Of Concern, Dominant
No concern At Present

Advanced Regrowth (Biodiversity Status)
Endangered, Dominant

Threatened Ecological Communities
Brigalow

N
W E
S

0 100 200 400m

Project:	Lonesome Protected Plant Survey
Map No:	PC756_AppC
Date:	29/05/2020 RevA
Drawn:	L. Hardwick
Approved:	C. Eddie
Scale:	1: 18,000 @ A3
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Boobook

Roma
Site
Brisbane

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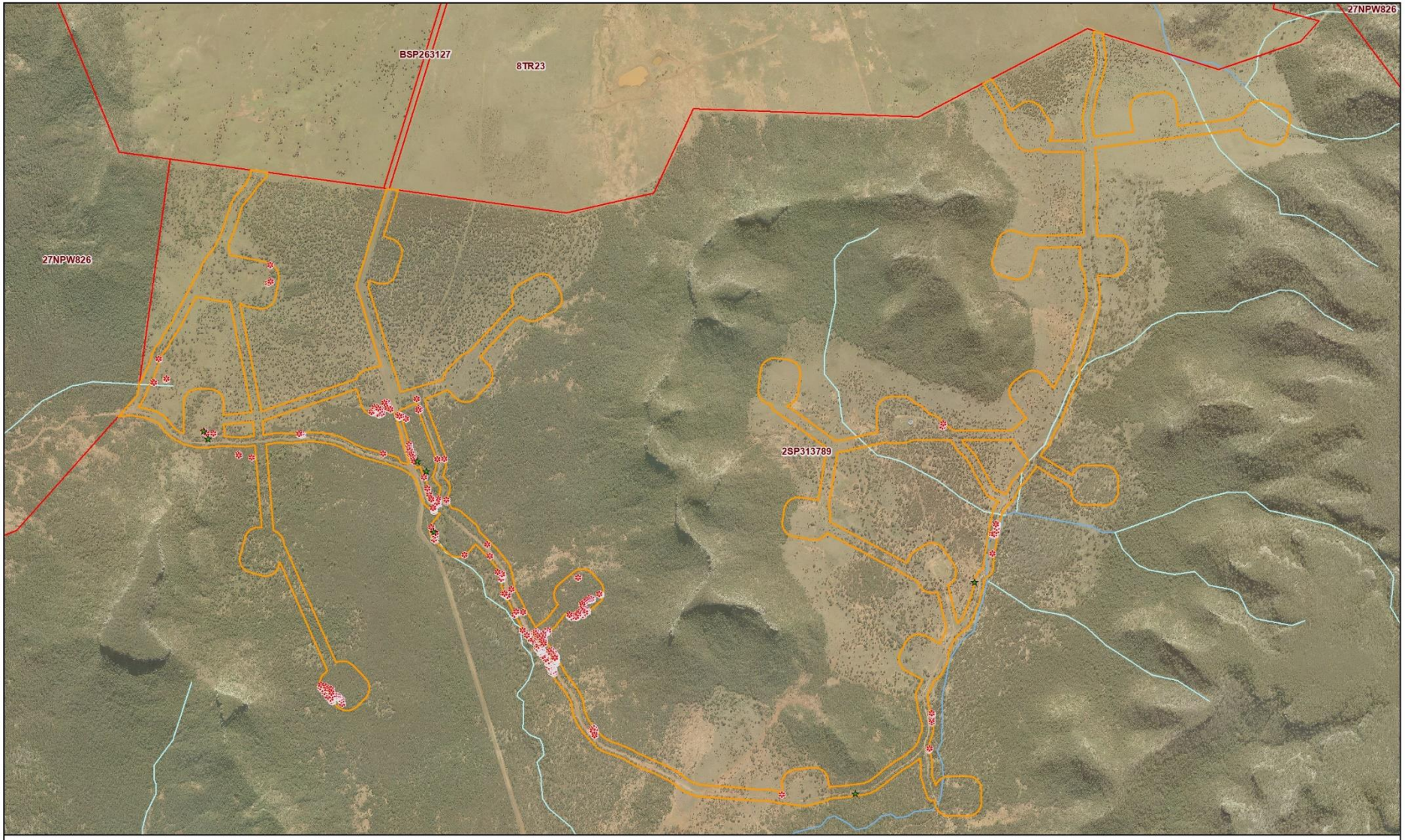
Appendix D. Locations of *Xerothamnella herbacea* detected within the Site.



Appendix D: Protected Plant (*Xerothamnella herbacea*) records at the Site.

- *Xerothamnella herbacea* (Surveyed)
- *Xerothamnella herbacea* (ALA records)
- Survey Area
- Cadastre

Ordered Streams

- 1
- 2 - 3

N W E S

0 100 200 400m

Project:	Lonesome Protected Plant Survey
Map No:	PC756_AppC
Date:	29/05/2020 RevA
Drawn:	L. Hardwick
Approved:	C. Eddie
Scale:	1: 18,000 @ A3
Datum:	GDA94

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Roma Site Brisbane

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Atlas of Living Australia occurrence download at https://biocache.ala.org.au/occurrence/search?q=Xerothamnella%20herbacea accessed on 29 May 2020.

Appendix B: Scotia Ecology Report

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Santos Limited
12-Nov-2020

Santos Scotia Ecology Report

Santos Scotia Ecology Report

Client: Santos Limited

ABN: 80007550923

Prepared by

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			Name/Position	Signature
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1.0 Introduction

1.1 Background

Santos Limited (Santos) engaged AECOM Australia Pty Ltd (AECOM) to undertake a BioCondition ecology survey for a portion of the Scotia gas field. Terrestrial habitat quality assessments were required within Phases 3 and 4 of the Scotia gas field to determine habitat quality scores for the relevant Matters of National Environmental Significance (MNES) as outlined in Section 1.3.

1.2 Project Area

The Santos Scotia Gas Field (Project Area) is located within the southern Brigalow Belt bioregion in the Bowen Basin. The Project Area is approximately 15 kilometres north east of Wandoan and 140 km north east of Roma, in Central Queensland. Within the Project Area, the continued development of Scotia gas field will occur in areas designated as Phases 3 and 4 (Figure 1).

The Project Area and surrounding region is predominantly open grazing pasture and agriculture, interspersed with tracts of remnant vegetation. The landscape within the Project Area is highly fragmented, however small areas of remnant *Eucalyptus* or *Acacia* woodland are mapped along drainage lines and a larger area of remnant vegetation is present adjacent to Nathan Road. Topography of the Project Area includes undulating hills with a sedimentary geologic origin. The main watercourses that occur within the Project Area include Bungaban Creek, Bullock Creek and Stakeyard Creek.

Pastoral allotments which were surveyed within the Project Area include:

- 3 FT845130; 28 FT313 ('The Rock')
- 19 FT1028 ('Kelsall')
- 6 FT801; 2 SP247967 ('Daldowie')
- 4 FT835681 ('Collingwood').

As identified in Figure 1, the Project Area is bounded by Petroleum Lease 176.

1.3 MNES Target Values

The development of Phase 3 and 4 of the Project Area may result in potential impacts on MNES. Potential impacts were considered for five MNES species as outlined in Table 1. Suitable potential habitat for these species was delineated by vegetation community, patch size and vegetation condition within the Project Area that were previously assessed (AECOM, 2016) as containing sufficient habitat resources to support the species (Table 1). Potential habitat REs are derived from ground-truthed vegetation within the Project Area and are based on habitat requirements for each MNES target value.

Table 1 MNES target values

Scientific name	Common name	Potential habitat REs	Potential habitat vegetation condition
Delma torquata	Collared delma	11.3.2, 11.3.39, 11.9.1, 11.9.5, 11.9.10, 11.10.7, 11.10.9 and 11.10.11.	Remnant and high-value regrowth (HVR)
Furina dunmalli	Dunmall's snake	11.3.1, 11.3.2, 11.3.39, 11.9.1, 11.9.5, 11.9.10, 11.10.7, 11.10.9 and 11.10.11.	Remnant and high-value regrowth (HVR)
Phascolarctos cinereus	Koala	11.3.2, 11.3.25, 11.3.39, 11.9.1, 11.9.10, 11.10.7 and 11.10.11	Remnant and high-value regrowth (HVR)
Nyctophilus corbeni	South eastern long-eared bat	11.3.1, 11.3.2, 11.3.25, 11.3.39, 11.9.1, 11.9.5, 11.9.10, 11.10.7, 11.10.9 and 11.10.11.	Remnant and high-value regrowth (HVR)

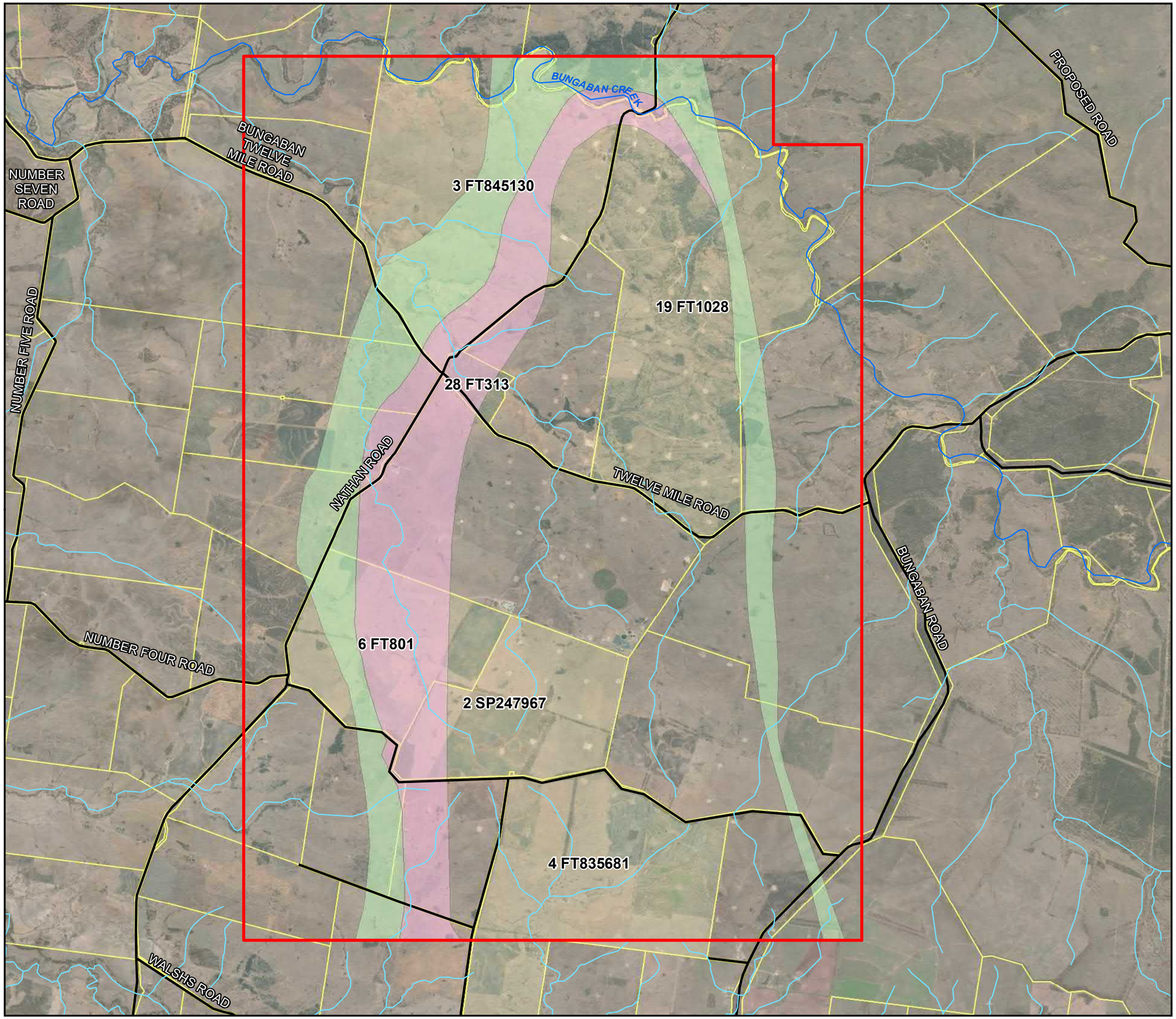
Scientific name	Common name	Potential habitat REs	Potential habitat vegetation condition
Egernia rugosa	Yakka skink	11.3.2, 11.3.39, 11.9.1, 11.9.5, 11.9.10, 11.10.7, 11.10.9 and 11.10.11.	Remnant and high-value regrowth (HVR)

1.4 Scope and objectives

The objective of this assessment is to augment existing information on ecological values and condition within the Project Area, to determine habitat quality scores for the relevant MNES target values outlined in Table 1. These assessments focus on Phases 3 and 4 of the Project Area and the scope of work included the following tasks:

- Conduct a desktop review of available databases and previous studies in the Project Area to understand the ecological characteristics, including previous data collected for the area and potential presence and extent of MNES target values
- Undertake terrestrial ecological surveys to:
  - document condition of vegetation communities, habitat types and other ecological values within the specified areas of the Project Area that are relevant to the target MNES
  - identify the presence, abundance and quality of habitat resources for target MNES within mapped habitat
- Analyse field collected data and undertake spatial analysis to determine the terrestrial habitat quality scores for MNES target values
- Prepare a technical report including figures that details survey methodology and results.

For this assessment, terrestrial habitat quality scoring methodology as per the Queensland Government *Guide to determining terrestrial habitat quality* (Department of Environment and Heritage Protection [DEHP], 2017) has been utilised to inform the offset habitat quality calculation requirements.



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Metres

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LEGEND

- Roads

Watercourses

- Major
- Minor
- PL 176
- Phase 3 area
- Phase 4 area
- Property boundaries

Data sources:
Office of Groundwater Impact Assessment (OGIA) 2016
Bureau of Meteorology 2018

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

Santos Scotia Ecology Survey

Project Area

PROJECT ID	60607275
CREATED BY	jamie.ernst
LAST MODIFIED	01-Oct-2020
VERSION	v1

Figure 1

A3 size

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2.0 Commonwealth offset approach

There is no stipulated Commonwealth method for assessing the three components of habitat quality. However, the *Guide to determining terrestrial habitat quality* (DEHP, 2017) is commonly utilised for this process. This guide outlines the specific methodology for assessing habitat quality, which is determined by three indicators – site condition, site context and species habitat index. The linkages between the EPBC offsets assessment guide habitat quality components and the Queensland guide are outlined in Table 2.

This assessment has utilised the terrestrial habitat quality scoring methodology as per the Queensland Government *Guide to determining terrestrial habitat quality* (DEHP, 2017) to calculate the Commonwealth habitat quality inputs for MNES target values.

Table 2 Commonwealth habitat quality components and associated Queensland habitat quality indicators

Commonwealth habitat quality components	Queensland habitat quality indicators
Site condition: This is the condition of a site in relation to the ecological requirements of a threatened species or ecological community. This includes considerations such as vegetation condition and structure, the diversity of habitat species present, and the number of relevant habitat features.	Site condition: A general condition assessment of the following vegetation attributes compared to a benchmark: • Canopy height and cover • Shrub cover • Species richness • Recruitment • Number of large trees • Coarse woody debris • Native perennial grass cover and organic litter
Site context: This is the relative importance of a site in terms of its position in the landscape, taking into account the connectivity needs of a threatened species or ecological community. This includes considerations such as movement patterns of the species, the proximity of the site in relation to other areas of suitable habitat, and the role of the site in relation to the overall population or extent of a species or community.	Site context: An analysis of the site in relation to the surrounding environment based on the following landscape attributes: • Patch size • Connectedness • Patch context • Ecological corridors
Species stocking rate: This is the usage and/or density of a species at a particular site. The principle acknowledges that a particular site may have a high value for a particular threatened species, despite appearing to have poor condition and/or context. It includes considerations such as survey data for a site in regards to a particular species population or, in the case of a threatened ecological community this may be a number of different populations. It also includes consideration of the role of the site population in regards to the overall species population viability or community extent.	Species habitat index: The ability of the site to support a species based on the following factors: • Presence and severity of threats to the species • Quality and availability of food and foraging habitat • Quality and availability of shelter • Species mobility capacity • Role of the site to the species overall population in the State

3.0 Assessment methodology

3.1 Desktop assessment

3.1.1 Database review

A review of ecological data and literature was undertaken to characterise the ecological values and identify the potential presence of the target MNES values within the Project Area. Desktop searches were undertaken in June 2020 and included a review of the following:

- DAWE EPBC Act Protected Matters Search Tool (Department of Agriculture Water and the Environment, 2020)
- The Queensland Wildlife Online records database (Department of Environment and Science, 2020b)
- Atlas of Living Australia (ALA) records database (Australian Government, 2020)
- Regional Ecosystem Description Database (REDD) (Queensland Herbarium, 2019)
- DNRME Regulated Vegetation Management Map (Department of Natural Resources Mines and Energy, 2020)
- DNRME Vegetation Management Watercourse Map (Department of Natural Resources Mines and Energy, 2019)
- Scotia Ecology Survey (AECOM, 2016).

3.2 Previous 2016 survey

AECOM previously conducted an ecological within the Project Area. This study was reviewed to gain an understanding of the ecological values across the area as well as the methods utilised to determine possible presence of the target MNES values. The methods adopted and results of this study are summarised below.

Scotia ecology survey 2016

An ecological survey was conducted during November - December 2015 by AECOM focussing on the completion of field validated high resolution mapping of Regional Ecosystems and habitat for selected fauna species on properties within the Santos Scotia Gas Field. This entailed Regional Ecosystem (RE) assessments, functional RE assessments and habitat mapping assessments.

The flora surveys employed an assessment of floral taxa and vegetation communities, in keeping with the methodology employed by the Queensland Herbarium for the survey of REs (Neldner, Thompson, Bean, & Dillewaard, 2012). The surveys employed a number of standard methods including 62 quaternary survey sites and random meander search areas. Functionality assessments were undertaken on non-remnant vegetation communities listed as Endangered and Of Concern (biodiversity status). The purpose of the functionality assessments was to determine the potential for a non-remnant community to provide for ecological functioning in the landscape. The assessment followed the Santos methodology “Functional Thresholds for Assessing Regional Ecosystem Functionality”. During the field program, field based assessments were undertaken at all flora survey sites, using the Habitat Mapping and Assessment Tool (HMAT). The HMAT incorporates both landscape and microhabitat factors into the site assessment.

Results of the survey included:

- Field assessment recorded ten REs. Of the REs identified four are listed as Endangered, two listed as Of Concern and four listed as No Concern at present (biodiversity status). Patches of vegetation not attributable to an RE but identified as functional regrowth were also recorded.
- Brigalow (*Acacia harpophylla* dominant and co-dominant) EPBC threatened ecological community (TEC) confirmed and included vegetation consistent with RE 11.3.1, 11.9.1 and 11.9.5.
- Habitat for seven fauna species of conservation significance was identified. These include:

- Collared delma (*Delma torquata*)
- Dunmall's snake (*Furina dunmalli*)
- Koala (*Phascolarctos cinereus*)
- Australian painted snipe (*Rostratula australis*)[1]
- South-eastern long-eared bat (*Nyctophilus corbeni*)
- Squatter pigeon (*Geophaps scripta scripta*) [1]
- Yakka skink (*Egernia rugosa*).

3.3 AECOM field survey

A field survey was conducted across the Project Area between the 1–5 July 2020 by two suitably qualified ecologists. The methods adopted for the field survey are described below.

3.3.1 Flora assessment

The flora assessment consisted of vegetation community assessments and site condition assessments (Sections 3.3.1.1 and 3.3.1.2 respectively). The vegetation community assessments were undertaken to confirm and validate the presence of the target RE for that location. Site condition assessments were undertaken to collect baseline habitat quality data in the correct associated RE as part of the 'site condition' indicator of the terrestrial habitat quality assessment (i.e. Commonwealth site condition component of 'habitat quality').

3.3.1.1 Vegetation community assessment

Previously ground-truthed mapping of vegetation communities as per Neldner et al., (2012) (AECOM, 2016) was utilised which assigned an RE to each assessed vegetation patch as per the Regional Ecosystem Description Database (REDD) (Queensland Herbarium, 2019).

The exception was areas previously mapped as non-remnant vegetation but containing functional regrowth as per Santos methodology "Functional Thresholds for Assessing Regional Ecosystem Functionality". Areas mapped as functional regrowth in 2016 were considered analogous to Category C; High Value Regrowth (HVR) during the 2020 assessment.

RE at each site was confirmed in the field from a combination of dominant canopy species associations, vegetation structure and landform present.

3.3.1.2 Site condition assessment

Vegetation was delineated into Assessment Units and the condition quantified and assessed in accordance with the *Guide to determining terrestrial habitat quality* (DEHP, 2017). An Assessment Unit (AU) refers to vegetated areas with similar REs and vegetation status (remnant or regrowth) which can be grouped together reflecting a single vegetation community. Condition assessment focussed on AUs identified to be targeted for surveying to assist in determining terrestrial habitat quality (site condition component of Commonwealth Government habitat quality) for these values. Site condition assessments involved the collection of 13 site-based attributes as outlined in Table 3 within a 100 m x 50 m nested sampling plot. In total, 17 site condition assessments (Eyre et al., 2015) were completed across the Project Area.

Table 3 Site condition attributes

Attributes	Assessment plot
Site Condition	
Large trees	100 x 50 m plot
Tree canopy height	100 x 50 m plot

[1] Subsequent assessments commissioned by Santos identified that the Australian painted snipe (*Rostratula australis*) and Squatter pigeon (*Geophaps scripta scripta*) are considered unlikely to be present within the Project Area and therefore are not considered further in this report.

Attributes	Assessment plot
Recruitment of canopy species	100 x 50 m plot
Tree canopy cover (%)	100 m transect
Shrub layer cover (%)	100 m transect
Coarse woody debris	50 x 20 m plot
Native plant species richness for four life forms	100 x 50 m (trees) 50 x 10 m (shrubs, grasses and forbs)
Non-native plant cover	50 x 10 m plot
Native perennial grass cover (5)	1 x 1 m quadrat
Organic leaf litter	1 x 1 m quadrat

3.3.1.3 Flora specimen identification

Where plant species could not be identified in the field, samples were pressed and dried and positive identification of plant specimens were subsequentially made under laboratory conditions for identification.

3.3.2 Fauna assessment

The fauna assessment consisted of general habitat assessments and species-specific habitat assessments. These assessments were undertaken to collect baseline data on the species habitat index component of the terrestrial habitat quality assessment, which also contributes the Commonwealth species stocking rate component of the 'habitat quality' (as detailed in Section Table 2).

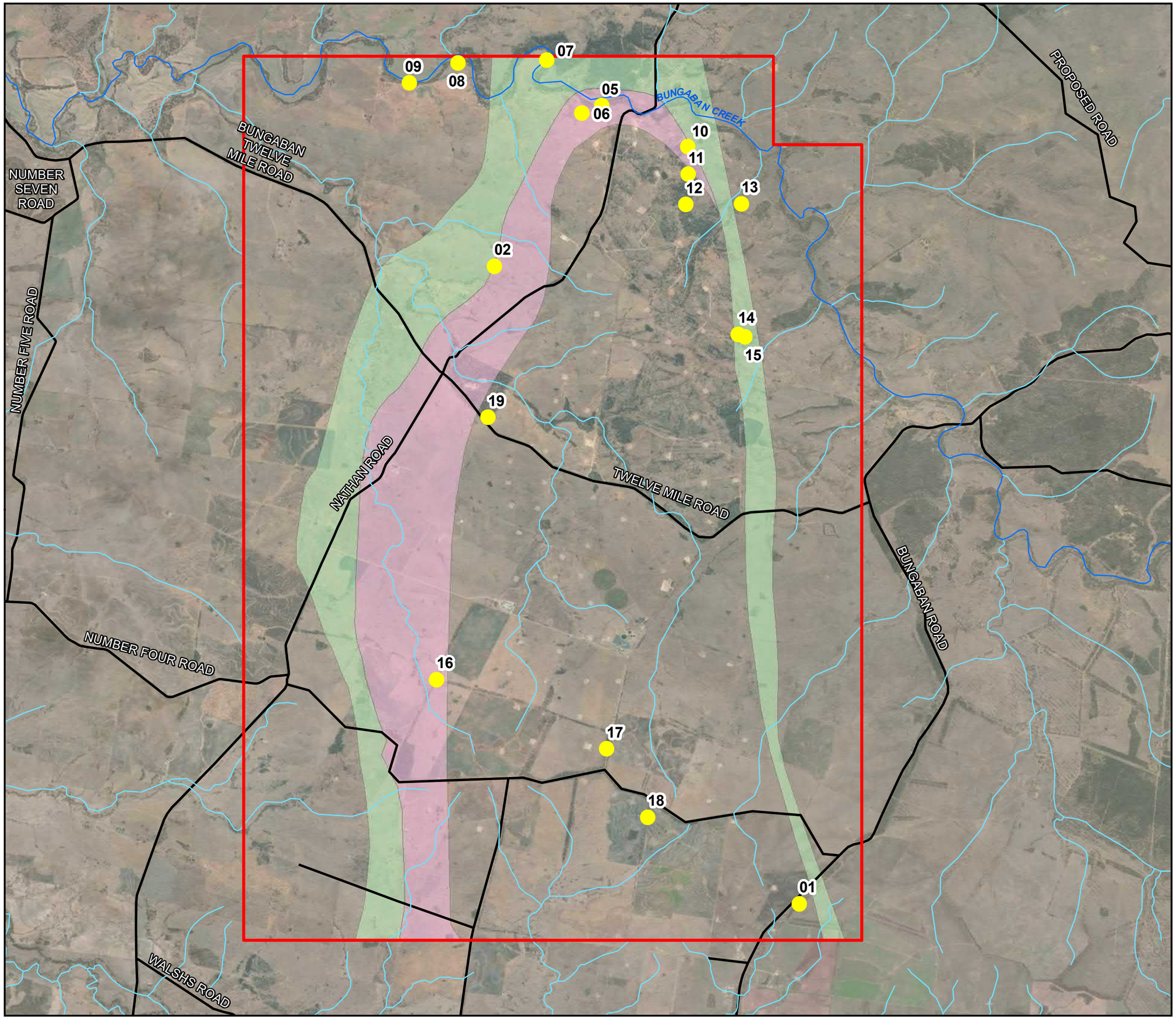
3.3.2.1 Habitat assessments

Targeted habitat assessments were undertaken to collect data on the presence and abundance of species-specific habitat resources within the AU. Attributes examined include, but are not limited to, tree hollow size and abundance, presence and abundance of decorticating bark, leaf litter, woody debris, understorey cover and abundance of koala food trees.

Targeted habitat assessments were conducted to populate the fauna species habitat index as per the *Guide to Determining Terrestrial Habitat Quality* (Department of Environment and Heritage Protection, 2017). The fauna species habitat index examines the capacity of a site to support a species, which also contributes the Commonwealth species stocking rate component of the 'habitat quality'. This assessment represents an evaluation of the quality and availability of habitat for a target species, and the likelihood of continued survival of the target species within the site utilising the following attributes:

- Threats to species
- Quality and availability of food and foraging habitat
- Quality and availability of shelter
- Species mobility capacity
- Role of site location to species overall population in the state.

Fauna habitat assessments were completed in conjunction with the site condition assessments. Table 7 in Appendix A provides a breakdown of categorised attributes for each target value that were collected during the fauna assessments and utilised to provide habitat quality scores.



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LEGEND

- Terrestrial habitat survey points
- Roads

Watercourses

- Major
- Minor
- PL 176
- Phase 3 area
- Phase 4 area

Data sources:
Office of Groundwater Impact Assessment (OGIA) 2016
Bureau of Meteorology 2018

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS

Santos Scotia Ecology Survey

Terrestrial habitat survey sites

PROJECT ID	60607275
CREATED BY	jamie.ernst
LAST MODIFIED	01-Oct-2020
VERSION	v1

Figure 2

A3 size

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3.4 Data analysis

Spatial data collected during the 2020 field survey and previous 2015 field survey was imported into ArcMap GIS to map vegetation community and habitat boundaries as well as calculate patch size. Target values identified during the field surveys were attributed to the appropriate vegetation communities and habitat types.

RE mapping from AECOM (2016) was used to undertake site context assessments. Site context was analysed in accordance with the *Guide to determining terrestrial habitat quality* (DEHP, 2017). This involved calculating size of patch, connectivity and context following the methodology described in Eyre et al. (2015), while categorising ecological corridors as described in the guideline. The spatial layers used to assess the site context attributes were:

- AECOM (2016) RE mapping of the Project Area
- Regulated Vegetation Mapping (Version 11) for surrounding areas outside of the Project Area
- Biodiversity Planning Assessment for Brigalow Belt mapping.

3.5 Terrestrial habitat quality scoring

Site condition and fauna species habitat index data collected in the field as well as site context data analysed in GIS were evaluated to provide an overall terrestrial habitat quality score (impact site Commonwealth habitat quality score) for the Project Area and associated MNES targeted values. The terrestrial habitat quality scoring follows the methods described by (DEHP, 2017).

As per the method, site condition field data was compared against corresponding benchmark data (data from a representative vegetation community i.e. RE in an undisturbed state) and scored accordingly. Benchmark data was sourced from DES (2019a). If benchmark data was unavailable for a particular RE, benchmark data from a RE in the same broad vegetation group (BVG) was utilised.

The following steps were undertaken to determine the terrestrial habitat quality score for each field validated AU identified to potentially support a target MNES value.

1. Determine the terrestrial habitat quality score (Measured) for each sampling site using the formula:

Site Condition (Measured) + Site Context (Measured) + Species Habitat Index (Measured) = Terrestrial Habitat Quality Score (Measured)

2. Determine the terrestrial habitat quality score (Maximum) by summing together the highest possible score attainable for each measured attribute and using the formula:

Site Condition (Maximum) + Site Context (Maximum) + Species Habitat Index (Maximum) = Terrestrial Habitat Quality Score (Maximum)

The maximum scores that can be obtained for each attribute are:

   a. Site Condition: 80
   b. Site Context: 26
   c. Species habitat index: 50

3. Determine the terrestrial habitat quality score using the formula:

[Terrestrial Habitat Quality Score (Measured)/Terrestrial Habitat Quality Score (Maximum)] x 10 = Terrestrial Habitat Quality Score

A Terrestrial Habitat Quality Score will give a total less than ten. Once a Terrestrial habitat Quality Score is derived for each site, scores are averaged for each AU if there is more than one site per AU. To provide an overall score for each target MNES value, the scores of all applicable AU's (i.e. associated REs for each target value) were averaged.

3.6 Limitations

3.6.1 Species detectability

A flora field survey has inherent limitations associated with the variability of vegetation communities across a survey location, and changes to the detectability and presence of species over time. The seasonal conditions during which the survey was undertaken was conducive to a relatively high degree of detectable floral diversity. However, it is recognised that a single field study cannot always account for 100% of potential floral diversity present across a survey location.

The detection of fauna species during habitat assessments is limited, given the cryptic and nocturnal nature of many fauna. Further, seasonality and weather conditions influence the detectability of some taxa.

3.6.2 Weighting Assessment Units

Following the *Guide to determining terrestrial habitat quality* (Department of Environment and Heritage Protection, 2017) the final steps in determining the Habitat Quality Score for each MNES target value include weighting the Assessment Units to determine how much each contributes to the weighted assessment unit Habitat Quality Score. Assessment Units are represented by a particular RE or a group of similar REs. Therefore, to determine how much area of an Assessment Unit needs to be considered for the weighted assessment, the area of each RE must be used. However, the location of infrastructure for Phase 3 and 4 is yet to be finalised, therefore areas of RE to be impacted are currently under review. As an alternative, total scores were averaged across the AUs relevant to the target species.

4.0 Survey results

4.1 Survey conditions

The nearest Bureau of Meteorology weather station to the Project Area is located at the Taroom Post Office (station 035070 located approximately 55 km north of Wandoan). Recorded daily observations include rainfall, minimum and maximum temperatures; these have been summarised for the field survey.

During the survey period, daily temperatures were mild to cool/cold with minimums ranging from 0.9°C to 11.7°C and maximums from 18.8°C to 26.5°C (Table 4). There was no recorded rainfall.

Table 4 Taroom BoM station observations during survey period

Parameter	01/07/2020	02/07/2020	03/07/2020	04/07/2020	05/07/2020
Rainfall (mm)	0	0	0	0	0
Min temperature (°C)	11.7	8.9	10.7	5.5	0.9
Max temperature (°C)	24.3	25.6	26.5	20.2	18.8

4.2 Vegetation communities, condition and habitat

Six remnant and one regrowth vegetation community were confirmed to occur within the areas targeted during field surveys (refer Table 5). These REs met the associations for all target MNES fauna values that are to be impacted by the Project (Table 2).

Vegetation condition was variable but typically in average to poor condition, with isolated regrowth areas exhibiting the greatest disturbance (edge effect and grazing). Table 5 below describes the vegetation communities surveyed and briefly describes habitat values present at each survey location. Site condition assessment data for each vegetation community is provided in Appendix B. Ground-truthed REs are shown in Figure 3a to Figure 3c.

Table 5 Vegetation communities recorded at survey sites

Target value	RE (Site) AU	Site condition and habitat	VM Act status	Image
Dunmall's snake Koala South eastern long-eared bat Yakka skink	Remnant 11.3.2 (7) AU1	*Eucalyptus populnea* woodlands to 20m on alluvial plains. Other tree canopy species include *Eucalyptus melanophloia* and *Callitris glaucophylla.* The shrub layer is sparse to very sparse with records of *Eremophila deserti* and *Geijera parviflora.* The ground layer was dominated by a combination of native and exotic grasses. Native grass species diversity was high and includes *Aristida calycina, Chloris divaricata, Cymbopogon refractus, Digitaria divaricatissima, Eragrostis sororia, Heteropogon contortus and Themeda triandra. Cenchrus ciliaris* and *Urochloa mosambicensis* were the most common exotic grasses and dominated the ground layer. Hollows of all size classes occasional to frequent in the woodland vegetation. Light grazing is evident within much of the area.	OC	

Target value	RE (Site) AU	Site condition and habitat	VM Act status	Image
Koala South eastern long-eared bat	Remnant 11.3.25 (5, 8, 9) AU2	*Eucalyptus camaldulensis* fringing riparian open forest to woodland averaging up to 23 m in height with taller individuals to 31 m. Other canopy species include *Angophora floribunda* and occasional *Eucalyptus populnea*. A very sparse shrub layer occurs including *Grewia latifolia* and *Maireana microphylla*. Native grasses are largely absent with *Cenchrus ciliaris* dominating. Hollows of all size classes were common to abundant in large eucalypts along the drainage line. Smaller eucalypts on upper slope have few hollows due to age. Heavy cattle disturbance, with the abundant exotic grasses heavily grazed. Bare ground is only evident along creek banks, with leaf litter very rare due to grass cover. Some large boulders and bedrock along creek. Woody debris is rare to occasional. Creek is holding water in disconnected pools.	LC	

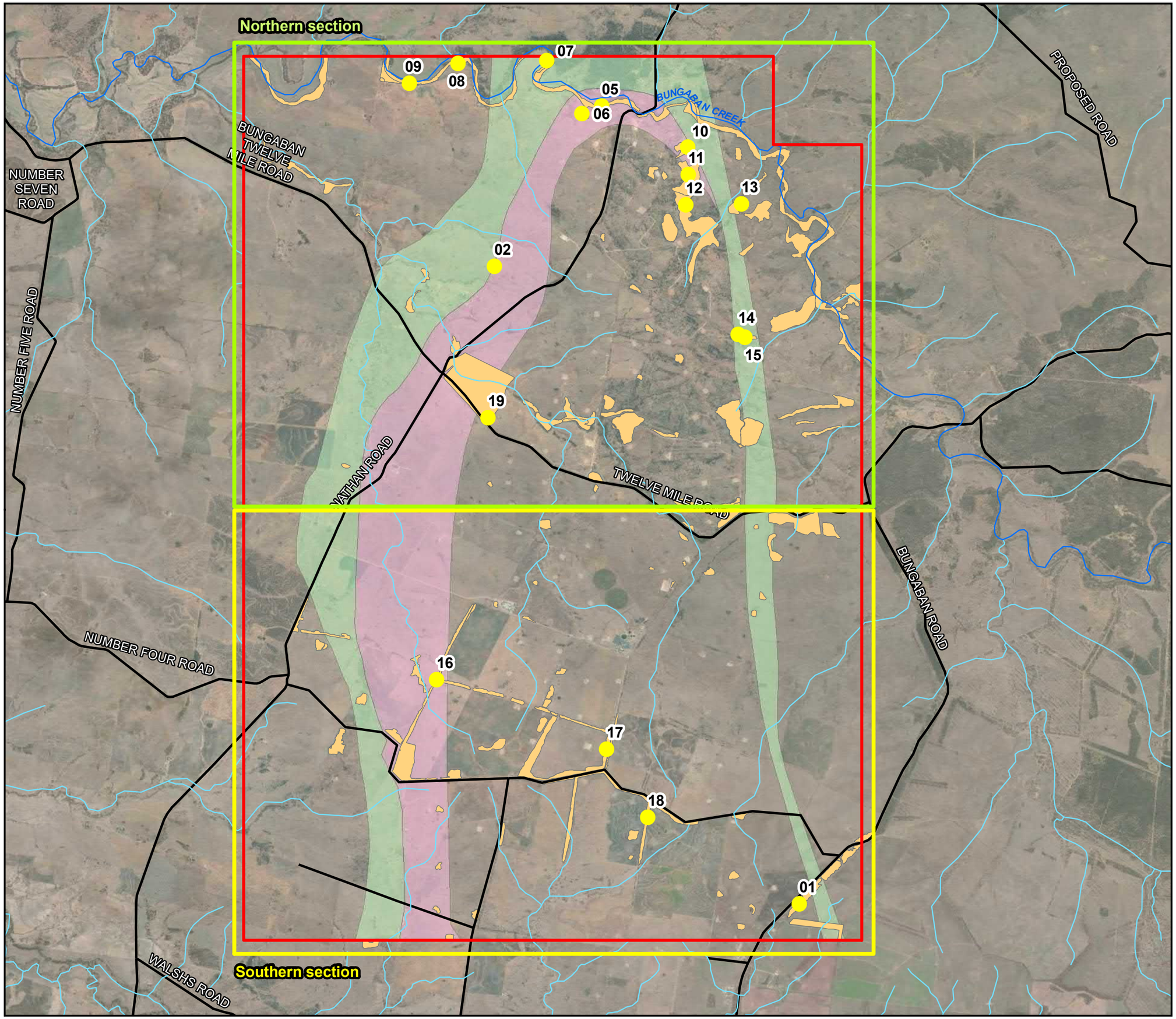
Target value	RE (Site) AU	Site condition and habitat	VM Act status	Image
Collared delma Dunmall's snake South eastern long-eared bat Yakka skink	Remnant 11.9.5 east (1,17, 18) AU3	*Acacia harpophylla* open forest with *Casuarina cristata* to 17 m. Large areas within patches where canopy trees are absent. A mid dense to sparse sub canopy and tall shrub layer dominated by *Geijera parviflora* and *Eremophila mitchellii*, with *Santalum lanceolatum* occasionally present. Height of the sub canopy to averaged 6m. The ground layer was dominated by exotic grasses notably *Cenchrus ciliaris.* Few native grasses were recorded but native forbs retain a higher diversity although were usually scattered. Forbs noted during surveys include *Enchylaena tomentosa, Einadia hastata, Einadia nutans* subsp*. linifolia, Sclerolaena muricata* and *Tetragonia tetragonoides*. Very heavily impacted by thinning, cattle and edge effects. Hollows were extremely rare, although fissures and decorticating bark may provide potential habitat for some species (South Eastern Long Eared Bat). Ground timber is small to large and abundant. The abundant ground timber is heavily influenced by dozing/clearing which is evident. Fine leaf litter is common and abundant in some areas. Areas with rocks of any size are absent. Grass cover is low and heavily grazed.	E	

Target value	RE (Site) AU	Site condition and habitat	VM Act status	Image
Collared delma Dunmall's snake South eastern long-eared bat Yakka skink	High Value Regrowth 11.9.5 east (2,16) AU4	*Acacia harpophylla* low woodland up to 9 m. Other canopy species include *Brachychiton rupestris* and *Eremophila mitchellii*. The shrub layer is sparse with the presence of a diversity of species including *Alectryon diversifolius* and *Geijera parviflora, Apophyllum anomalum and Citrus glauca*. The ground layer was dominated by exotic grasses notably *Cenchrus ciliaris* with *Bothriochloa decipiens var. decipiens* one of the few native grass recorded. Native forbs were scattered and include *Atriplex muelleri, Capparis lasiantha, Portulaca oleracea* and *Zygophyllum apiculatum*. Vegetation is heavily impacted by grazing and edge effects. Hollow bearing trees are very rare as is decorticating bark suitable for habitat. Small and large ground timber is abundant; however, the ground layer is otherwise heavily modified with sparse non-native ground cover impacted by grazing. Bare ground is common.	E	

Target value	RE (Site) AU	Site condition and habitat	VM Act status	Image
Collared delma Dunmall's snake Koala South eastern long-eared bat Yakka skink	Remnant 11.10.7 (6, 10,11,19) AU5	*Eucalyptus melanophloia* woodland up to 22 m with *Callitris glaucophylla* dominating a tall T2 layer up to 16m. Vegetation contains a sparse shrub-layer dominated by *Psydrax odorata* with a diversity of other species notably *Alectryon diversifolius, Geijera parviflora* and *Pittosporum spinescens*. The ground layer is sparse and dominated by *Cenchrus ciliaris* but a diversity of native grasses is also present. These include: *Ancistrachne uncinulata, Aristida caput-medusae, Enteropogon acicularis, Enneapogon avenaceus* and *Eragrostis sororia*. Native forbs had a lower diversity when compared to native grasses but frequently included *Cheilanthes sieberi* subsp. *sieberi*, *Fimbristylis dichotoma* and *Eustrephus latifolius*. Vegetation is generally in poor condition with significant evidence of selective clearing. Ground timber is common to abundant, but partly influenced by clearing. Leaf litter is common to abundant, but deep mats are only occasionally present, whereas bare ground abundant. Rocks are common and abundant on the upper slopes where large boulders and rock pavements are present. Overhangs, cracks, fissures provide high value habitat for a range of reptiles and mammals- up to 1m. Small and medium hollows are rare to occasional and may be due to clearing of large trees. Grazing impacts are evident in most vegetation patches.	LC	

Target value	RE (Site) AU	Site condition and habitat	VM Act status	Image
Collared delma Dunmall's snake Koala South eastern long-eared bat Yakka skink	Remnant 11.10.9 (12, 13) AU6	*Callitris glaucophylla* woodland with *Eucalyptus melanophloia* in the tree canopy up to 20 m. The sub canopy averages 8 m in height and also comprises *C. glaucophylla* in addition to occasional *Eucalyptus populnea* and *Grevillea striata.* A very sparse shrub layer contains a low diversity of native species which include *Acacia decora, C. glaucophylla, Geijera parviflora* and *Hovea longipes*. A sparse grassy ground layer is present dominated by *Cenchrus ciliaris* but a diversity of native species also occurs. Native species includes *Aristida calycina, Aristida caput-medusae, Bothriochloa decipiens* var. *decipiens, Cymbopogon refractus, Enneapogon avenaceus* and *Heteropogon contortus*. Native forbs had a lower diversity when compared to native grasses but frequently included *Cheilanthes sieberi* subsp. *sieberi*, *Fimbristylis dichotoma, Grewia retusa* and *Sida hackettiana.* Generally, vegetation patches are in poor condition. Grazing impacts and fire scars were noted. Small, medium and large hollows are common in large *E. melanophloia* and stags. Leaf litter is common in some areas with deep mats rare to occasional, with bare ground common to abundant. Ground timber common (small to large) which is influenced by selective clearing or thinning of which there is significant evidence. Rocks mostly absent with exception of in eroded drainage lines.	LC	

Target value	RE (Site) AU	Site condition and habitat	VM Act status	Image
Collared delma Dunmall's snake Koala South eastern long-eared bat Yakka skink	Remnant 11.10.11 (14, 15) AU7	*Eucalyptus populnea, E melanophloia, E. crebra* and *Callitris glaucophylla* predominates forming an open woodland canopy averaging 18 m in height. Often *C. glaucophylla* forms a lower subcanopy layer of varying density. A very sparse shrub layer is present dominated by *C. glaucophylla, Carissa ovata* and *Geijera parviflora.* The ground layer is sparse and dominated by *Cenchrus ciliaris* with scattered mixed native perennial grasses and forbs. Typical native species include: *Ancistrachne uncinulata, Aristida calycina, Aristida caput-medusae, Chloris ventricosa, Cheilanthes sieberi* subsp*. sieberi, Cyperus gracilis, Enneapogon lindleyanus, Eragrostis sororia* and *Sida hackettiana.* Disturbed patches of vegetation adjacent to cleared areas experiencing edge effects. Occasional small and medium hollows. Rocks and boulders common on upper slopes but are absent from lower slopes. Patchy grass provides abundant bare ground with leaf litter and ground timber common. Deep leaf litter mats present in small patches where cover is high in shrub and canopy. Occasional terrestrial termitaria noted.	LC	



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DATUM GDA 1994, PROJECTION MGA ZONE 55

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Metres

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LEGEND

- PL 176
- Phase 3 area
- Phase 4 area
- Roads

Watercourses

- Major
- Minor
- Terrestrial habitat survey points
- Ground-truthed REs

Data sources:
Office of Groundwater Impact Assessment (OGIA) 2016
Bureau of Meteorology 2018

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

Santos Scotia Ecology Survey

Field verified regional ecosystems

PROJECT ID	60607275
CREATED BY	McKeeJ2
LAST MODIFIED	16-Oct-2020
VERSION	v1

Figure 3a

A3 size

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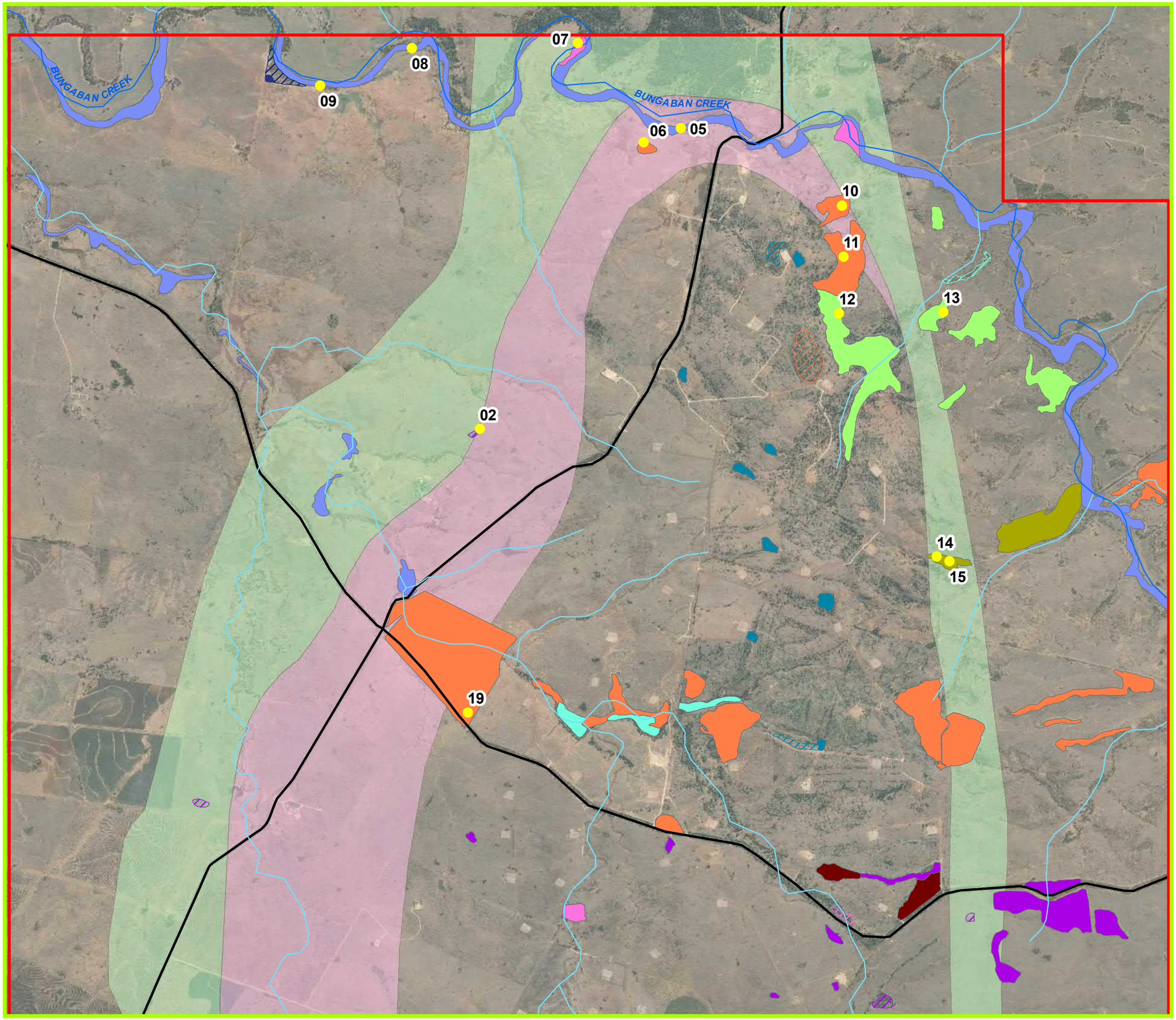

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N

DATUM GDA 1994, PROJECTION MGA ZONE 55

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Metres

1:40,000 (when printed at A3)

LEGEND

- PL 176
- Phase 3 area
- Phase 4 area
- Roads

Watercourses

- Major
- Minor
- Terrestrial habitat survey points

Ground-truthed REs

- Remnant 11.3.1
- Remnant 11.3.2
- Remnant 11.3.25
- Remnant 11.3.39
- Remnant 11.9.1
- Remnant 11.9.5
- Remnant 11.9.10
- Remnant 11.10.7
- Remnant 11.10.9
- Remnant 11.10.11
- HVR 11.3.1
- HVR 11.3.2
- HVR 11.3.25
- HVR 11.3.39
- HVR 11.9.1
- HVR 11.9.5
- HVR 11.9.10
- HVR 11.10.7
- HVR 11.10.9
- HVR 11.10.11

Data sources:
Office of Groundwater Impact Assessment (OGIA) 2016
Bureau of Meteorology 2018

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

Santos Scotia Ecology Survey

Field verified regional ecosystems (Northern section)

PROJECT ID	60607275
CREATED BY	McKeeJ2
LAST MODIFIED	16-Oct-2020
VERSION	v1

Figure 3b

A3 size

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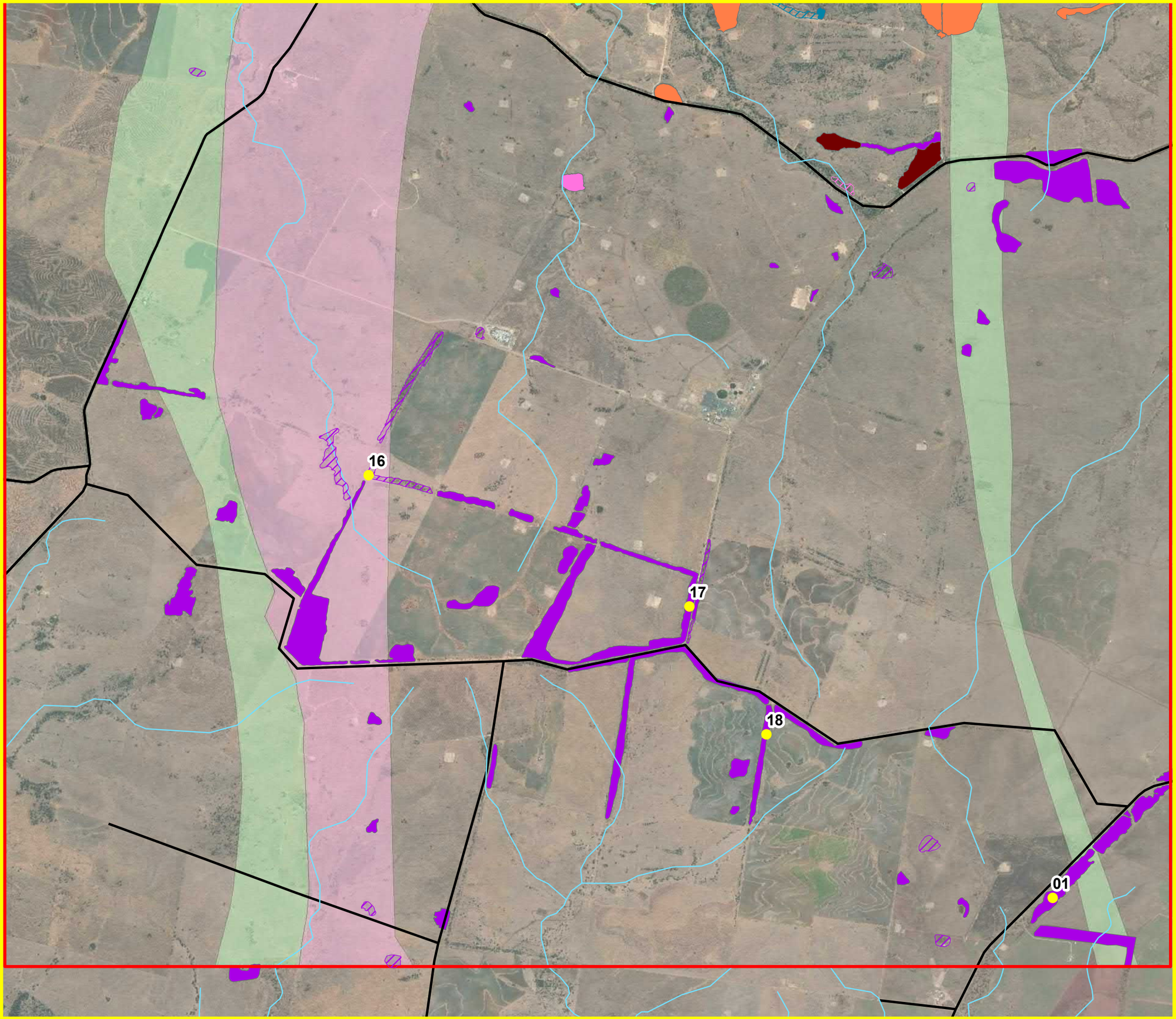

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DATUM GDA 1994, PROJECTION MGA ZONE 55

0 495 990 1,980
Metres

1:40,000 (when printed at A3)

LEGEND

- PL 176
- Phase 3 area
- Phase 4 area
- Roads

Watercourses

- Major
- Minor
- Terrestrial habitat survey points

Ground-truthed REs

- Remnant 11.3.2
- Remnant 11.3.39
- Remnant 11.9.1
- Remnant 11.9.5
- Remnant 11.9.10
- Remnant 11.10.7
- HVR 11.3.2
- HVR 11.9.1
- HVR 11.9.5

Data sources:
Office of Groundwater Impact Assessment (OGIA) 2016
Bureau of Meteorology 2018

Service Layer Credits: Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User

Santos Scotia Ecology Survey

Field verified regional ecosystems (Southern section)

PROJECT ID	60607275
CREATED BY	McKeeJ2
LAST MODIFIED	16-Oct-2020
VERSION	v1

Figure 3c

A3 size

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4.3 Landscape values

The Phase 3 and 4 areas are located within a landscape which has been highly modified for agriculture (cattle grazing and irrigated cropping). Historical land use practices have resulted in a largely cleared landscape, with fragmented patches of remnant vegetation remaining, primarily associated with riparian zones or road reserves.

Vegetation within Phase 3 and 4 areas was found to have variable landscape connectivity and context value. The northern section of the Project Area contains the largest extent of vegetation in close proximity to each other and as such these areas are of higher value contextually. Across the central and southern Project Area vegetation is largely cleared grazing or cropping land surrounding isolated and small habitat fragments generally associated with fence-lines or road reserves.

In the north, small habitat patches associated with Bungaban Creek have a moderate to high level of connectivity (Survey Site 5 to 9). Riparian habitat (RE 11.3.25) associated with this creek-line contain large, tall and spreading canopy species (i.e. *Eucalyptus camaldulensis*) providing dispersal opportunities for a range of fauna species. The largest patches of vegetation occur within Phase 3, with unsurveyed vegetation to the north of Bungaban Creek (Survey Site 5) providing the largest area of vegetation within the Project Area. A second patch of vegetation greater than 100 hectares is situated adjacent to the junction of Nathan and Twelve Mile Road (Survey Site 19). This patch of vegetation contains disturbances due to extractive resources and only linked to other vegetation via narrow road reserve vegetation.

Site context assessment data for each vegetation community is provided in Appendix B.

5.0 Target value habitat quality scores

A summary of habitat quality scores for each target MNES value is provided in Table 6 below. A habitat quality score of 6 is attributed to koala, while habitat quality scores for the remaining target MNES values were each calculated to be 5.

Site condition and context scores per survey site and AU are detailed in Appendix B. Species habitat index scoring per relevant survey site and AU are detailed in Appendix C. Scores could not be weighted as infrastructure placement is yet to be finalised, therefore total scores were averaged across the AUs relevant to the target species.

Table 6 Impact scores for target MNES values

Commonwealth target value	Average Site condition	Maximum Site Condition	Average Site Context	Maximum Site Context	Average Species Habitat Index	Maximum Habitat Index	Overall habitat quality score
Collared delma	53	80	4	26	18	50	**5**
Dunmall's snake	53		3		26		**5**
Koala	56		8		31		**6**
South-eastern long-eared bat	53		7		22		**5**
Yakka skink	53		4		21		**5**

6.0 Summary and conclusion

AECOM were engaged to undertake a BioCondition ecology survey of the Phase 3 and 4 areas of the Scotia gas field. Field surveys were completed to document condition and extent of vegetation communities, habitat types and other ecological values relevant to the target MNES values in accordance with the Queensland *Guide to determining terrestrial habitat quality* (DEHP, 2017).

Seventeen sites, represented by six REs and one HVR community, were selected for assessment. Site selection was based on the site being likely to contain habitat suitable for the target MNES and being representative of the habitat for each MNES within Phase 3 and 4 areas.

Vegetation condition within the Project Area was variable but typically in average to poor condition, with isolated regrowth areas exhibiting the greatest level of disturbance (edge effect and grazing). Riparian communities associated with Bungaban Creek provide the greatest connectivity in a landscape context.

Site condition and fauna species habitat index data collected in the field as well as site context data analysed in GIS were evaluated to provide an overall Habitat Quality Score for the target MNES values. Overall Habitat Quality Scores for each target MNES were:

- Collared delma - 5
- Dunmall's snake - 5
- Koala – 6
- South-eastern long-eared bat - 5
- Yakka skink - 5.

7.0 References

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Appendix A

Fauna habitat index scoring criteria

Appendix A Fauna habitat index scoring criteria

Table 7 Categorised species habitat index for each MNES

Collared delma		
Attribute	**Categorised attribute**	**Score**
Threats to species	Large (>80ha) patches of woodland or open forest on land zone 3, 9 or 10 with abundant surface rocks, native grasses common to abundant and protected from clearing OR any patch of habitat with a known population.	15
	Small to Medium (<80 but >10 ha) patches of woodland or open forest on land zone 3, 9 or 10 with surface rocks occasional to abundant, native grasses common to abundant	10
	Small (<10ha but >2ha) patches of woodland or open forest on land zone 3, 9 or 10 with surface rocks occasional to abundant, native grasses common to abundant	4
	Very small (<2ha) patches of vegetation with surface rocks rare to absent	1
Quality and availability of food and foraging habitat	Forest or woodland, with a high abundance of microhabitat features suitable for insects, spiders and cockroaches (i.e. leaf litter, woody debris, grass)	10
	Forest or woodland, with microhabitat features suitable for insects, spiders and cockroaches (i.e. leaf litter, woody debris, grass) between moderate and high abundance	8
	Forest or woodland, with a low to moderate abundance of microhabitat features suitable for insects, spiders and cockroaches (i.e. leaf litter, woody debris, grass)	5
	Forest, woodland or HVR, with uncommon to rare microhabitat features suitable for insects, spiders and cockroaches (i.e. leaf litter, woody debris, grass)	1
Quality and availability of shelter	Forest or woodland, with a high abundance of microhabitat shelter features (i.e. rocks, logs, bark coarse woody debris, mats of leaf litter (30-100mm thick))	10
	Forest or woodland, with a moderate abundance of microhabitat shelter features (i.e. rocks, logs, bark coarse woody debris, mats of leaf litter (30-100mm thick))	7
	Forest or woodland, with uncommon to rare microhabitat shelter features (i.e. rocks, logs, bark coarse woody debris, mats of leaf litter (30-100mm thick))	4
	Forest or woodland, with a rare to absent microhabitat shelter features (i.e. rocks, logs, bark coarse woody debris, mats of leaf litter (30-100mm thick))	1
Species mobility capacity *	NA	
	NA	
	NA	
	NA	
Role of site location to species overall population in the state	Critical to species' survival	5
	Likely to be critical to species' survival	4
	Not or unlikely to be critical to species' survival	1

*Species is almost sedentary. As per the guideline this index does not require assessment

Dunmall's Snake		
Attribute	**Categorised attribute**	**Score**
Threats to species	Large (>100ha) patches of suitable habitat protected from clearing, with no impact from grazing, no alteration of water quality or quantity affecting gilgai or riparian habitat.	15
	Medium (<100ha but >20ha) patches of suitable habitat protected from clearing, with no impact from grazing, no alteration of water quality or quantity affecting gilgai or riparian habitat.	10
	Medium (<100ha but >20ha) patches of suitable habitat, which are either/both/OR all: protected from clearing, within grazing landuse, includes gilgai or riparian habitat affected by alteration of water quality or quantity.	7
	Small (<20ha but >2ha) patches of suitable habitat, which are either/both/OR all: protected from clearing, within grazing landuse, includes gilgai or riparian habitat affected by alteration of water quality or quantity.	4
	Very small (<2ha) patches of suitable habitat not protected or partially not protected from clearing, and either OR both: within grazing landuse, includes gilgai or riparian habitat affected by alteration of water quality or quantity.	1
Quality and availability of food and foraging habitat	Forest or woodland, with a high abundance of microhabitat features suitable for skinks and geckos (i.e. leaf litter, woody debris, soil cracks, grass, rocks, gilgai)	10
	Forest or woodland, with microhabitat features suitable for skinks and geckos (i.e. leaf litter, woody debris, soil cracks, grass, rocks, gilgai) between moderate and high abundance	8
	Forest or woodland, with a low to moderate abundance of microhabitat features suitable for skinks and geckos (i.e. leaf litter, woody debris, soil cracks, grass, rocks, gilgai)	5
	Forest, woodland or HVR, with uncommon to rare microhabitat features suitable for skinks and geckos (i.e. leaf litter, woody debris, soil cracks, grass, rocks, gilgai)	1
Quality and availability of shelter	Forest or woodland, with a high abundance of microhabitat shelter features (i.e. leaf litter, woody debris, soil cracks)	10
	Forest or woodland, with microhabitat shelter features (i.e. leaf litter, woody debris, soil cracks, grass, rocks, gilgai) between moderate and high abundance	8
	Forest or woodland, with a moderate abundance of microhabitat shelter features (i.e. leaf litter, woody debris, soil cracks)	5
	Forest or woodland, with uncommon to rare microhabitat shelter features (i.e. leaf litter, woody debris, soil cracks)	1
Species mobility capacity	Forest or woodland, with a high abundance of microhabitat shelter features (i.e. leaf litter, woody debris, soil cracks) and within a functionally connected landscape greater than 10 ha	10
	Forest or woodland, with a moderate to high abundance of microhabitat shelter features (i.e. leaf litter, woody debris, soil cracks) and within a functionally connected landscape greater than 10 ha	8
	Forest or woodland, with a moderate abundance of microhabitat shelter features (i.e. leaf litter, woody debris, soil cracks) and within a functionally connected landscape greater than 5 ha	5
	Forest or woodland, with uncommon to rare microhabitat shelter features (i.e. leaf litter, woody debris, soil cracks) or moderate to abundant features in area not functionally connected to at least 10 ha of habitat	1
Role of site location to species overall population in the state	Critical to species' survival	5
	Likely to be critical to species' survival	4
	Not or unlikely to be critical to species' survival	1

Koala		
Attribute	**Categorised attribute**	**Score**
Threats to species	Habitat areas >1.5km from road; no known wild dog population or not within proximity to domestic houses with dogs (>1.5km); area protected from clearing (i.e. mapped as remnant)	15
	Habitat areas <1.5km from road AND/OR, within proximity to domestic or wild dog population; area protected from clearing	7
	Habitat areas <1.5km AND/OR, within proximity to domestic or wild dog population; area not protected or partially not protected from clearing	1
Quality and availability of food and foraging habitat	Forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species, OR 1 food tree species that accounts for >50% of the vegetation in the relevant strata. The community must have reliable access to soil moisture (stream order 3 or above).	10
	Forest, woodland or shrubland with emerging trees with 1 species of known koala food tree present	5
	Scattered known koala food trees or food tree species present but <10cm DBH	1
Quality and availability of shelter	Remnant forest or woodland with >50% of the EDL layer dominated by koala habitat trees (including Eucalyptus, Angophora, Melaleuca, Corymbia) with DBH >10cm	10
	Remnant, non-remnant or HVR community which contains >10% but <50% koala habitat trees with DBH >10cm community which	5
	Non-remnant or regrowth community which contains <10% koala habitat trees with DBH >10cm	1
Species mobility capacity	Area is part of a contiguous functional landscape ≥ 1000ha	10
	Area is part of a contiguous functional landscape <1000ha, but ≥ 750ha	7
	Area is part of a contiguous functional landscape <750ha, but ≥ 500ha	4
	None of the above	1
Role of site location to species overall population in the state	Critical to species' survival	5
	Likely to be critical to species' survival	4
	Likely to provide importance to species at a regional level due to landscape connectivity	3
	Not or unlikely to be critical to species' survival	1

South Eastern Long Eared Bat		
Attribute	**Categorised attribute**	**Score**
Threats to species	Large (>500ha) connected patches of suitable habitat protected from clearing.	15
	Medium (<500ha but >200ha) connected patches of suitable habitat protected from clearing.	7
	Small and medium (<500ha) connected patches of suitable habitat not protected or partially not protected from clearing	1
Quality and availability of food and foraging habitat	Forest or woodland, with a distinct canopy and dense, cluttered understorey layer (>30% cover).	10
	Forest, woodland or HVR, with moderate to sparse understorey (5%-29%).	5
	Forest, woodland or HVR, with very sparse understorey (<5%).	1
Quality and availability of shelter	Tree hollows AND/OR decorticating bark/crevices/fissures suitable for shelter abundant (>10 potential roosts per hectare).	10
	Tree hollows AND/OR decorticating bark/crevices/fissures suitable for shelter occasional (<10 but ≥4 potential roosts per hectare).	5
	Tree hollows AND/OR decorticating bark/crevices/fissures suitable for shelter rare (<3 potential roosts per hectare).	1
Species mobility capacity	Remnant communities with distinct canopy and dense, cluttered understorey (>30% cover), connected to large tracts of potential habitat in wider landscape.	10
	Forest, woodland or HVR, with moderate to sparse understorey (5%-29%) AND either:	7
	Forest, woodland or HVR, with very sparse understorey (<5%) connected to large tracts of potential habitat in wider landscape; OR	4
	Sparse understorey (<5%) and not connected to large habitat patches or narrow and linear connected habitat patches.	1
Role of site location to species overall population in the state	Critical to species' survival	5
	Likely to be critical to species' survival	4
	Not or unlikely to be critical to species' survival	1

Yakka skink		
Attribute	**Categorised attribute**	**Score**
Threats to species	Large (>100ha) patches of forest or woodland on LZ 3, 4, 5, 7, 9, 10 (NOT 8) protected from clearing, outside of road reserve	15
	Medium (<100ha but >20ha) patches of forest or woodland on LZ 3, 4, 5, 7, 9, 10 (NOT 8) protected from clearing, outside of road reserve	10
	Medium (<100ha but >20ha) patches of forest or woodland, on LZ **8** or partly within road reserve	7
	Small (<20ha but >2ha) patches of forest or woodland on LZ 3, 4, 5, 7, 8, 9, 10.	4
	Very small (<2ha) patches of forest or woodland on LZ 3, 4, 5, 7, 8, 9, 10.	1
Quality and availability of food and foraging habitat	Forest or woodland, with a moderate to high abundance of soft plants, fruits AND high abundance of microhabitat features suitable for invertebrate prey	10
	Forest or woodland, with a low to moderate abundance of soft plants, AND/OR high abundance of microhabitat features suitable for invertebrate prey	8
	Forest or woodland, with a moderate abundance of soft plants or microhabitat features suitable for invertebrate prey	5
	Forest, woodland or HVR, with soft plants or microhabitat features suitable for invertebrate prey absent to uncommon	1
Quality and availability of shelter	Forest or woodland, with a high abundance of cavities under and between partly buried rocks, logs or tree stumps, root cavities, abandoned animal burrows, large hollow logs	10
	Forest or woodland, with between moderate and high abundance of cavities under and between partly buried rocks, logs or tree stumps, root cavities, abandoned animal burrows, large hollow logs	7
	Forest or woodland, with a moderate abundance of cavities under and between partly buried rocks, logs or tree stumps, root cavities, abandoned animal burrows, large hollow logs	5
	Forest or woodland, with cavities under and between partly buried rocks, logs or tree stumps, root cavities, abandoned animal burrows, large hollow logs absent to rare	1
Species mobility capacity	Forest or woodland, with a high abundance of rocks, logs, tree stumps, root cavities etc evenly distributed throughout the area such that the patch is functionally connected	10
	Forest or woodland, with a medium to high abundance of rocks, logs, tree stumps, root cavities etc however areas of no to low abundance of these features (>10m) exist throughout which effectively functionally fragment the patch	5
	Forest or woodland, with abundance of rocks, logs, tree stumps, root cavities etc absent to rare	1
Role of site location to species overall population in the state	Critical to species' survival	5
	Likely to be critical to species' survival	4
	Not or unlikely to be critical to species' survival	1

Appendix B

Site Condition and Context Assessment Scores

Appendix B Site condition and context assessment scores

Table 8 Survey site condition and context assessment data

Assessment Unit (AU)	1		2						3	
Site Number	7		5		8		9		1	
Previously Ground truthed RE	11.3.2		11.3.25		11.3.25		11.3.25		11.9.5	
Regional Ecosystem (RE)	11.3.2		11.3.25		11.3.25		11.3.25		11.9.5	
Benchmark RE utilised (in absence of a benchmark)										
	Raw value	Score	Raw value	Score	Raw value	Score	Raw value	Score	Raw value	Score
Field based attributes										
Recruitment of woody perennial species	66	3	50	3	66	3	100	5	100	5
Native plant species richness										
Trees	3	5	4	5	6	5	5	5	4	5
Shrubs	2	5	0	0	4	5	3	5	3	2.5
Grasses	9	5	0	0	0	0	4	2.5	2	2.5
Forbs	2	0	2	0	2	0	6	2.5	7	2.5
Tree Canopy Height	20	5	23	5	26	5	25	5	14	3
Tree Canopy Cover	3	0	5	2	3	2	4	2	5	0
Shrub canopy cover	0	0	0	0	1	5	0	0	6	5
Native perennial grass cover	12	1	0	0	0	0	6	3	0.4	1
Organic litter cover	57	5	52	3	43	3	30	5	51.8	5
Large trees	22	10	28	15	44	15	32	15	10	5
Coarse woody debris	272	5	301	5	499	5	345	5	1765	5
Weed cover	20	5	70	0	35	3	40	3	48	3
Total Field based attributes (maximum 80)		**49**		**38**		**51**		**58**		**44.5**
GIS based attributes										
Fragmented - Patch size (input score manually)		5		7		5		5		2
Fragmented - Connectivity (l, m, h, or vh)		4		2		0		0		0
Fragmented - Context (input score manually)		2		2		2		2		0
Ecological Corridors	within	6	within	6	within	6	within	6	not within	0
Total GIS attributes (maximum 26)		**17**		**17**		**13**		**13**		**2**
Total site and context score		**66**		**55**		**64**		**71**		**46.5**

Assessment Unit (AU)	3				4				5	
Site Number	17		18		2		16		6	
Previously Ground truthed RE	11.9.5		11.9.5		Functional regrowth 11.9.5		Functional regrowth 11.9.5		11.10.7	
Regional Ecosystem (RE)	11.9.5		11.9.5		11.9.5 HVR		11.9.5 HVR		11.10.7	
Benchmark RE utilised (I absence of a benchmark)									11.10.4	
	Raw value	Score	Raw value	Score	Raw value	Score	Raw value	Score	Raw value	Score
Field based attributes										
Recruitment of woody perennial species	100	5	100	5	50	3	100	5	66	3
Native plant species richness										
Trees	3	5	3	5	2	5	3	5	3	2.5
Shrubs	4	2.5	11	5	7	2.5	8	2.5	10	5
Grasses	0	0	1	2.5	3	2.5	1	2.5	6	5
Forbs	7	2.5	10	5	4	2.5	5	2.5	4	2.5
Tree Canopy Height	14	3	12	3	11	3	10	3	11	3
Tree Canopy Cover	5	0	4	0	3	0	2	0	3	2
Shrub canopy cover	1	0	8	5	1	0	2	3	6	5
Native perennial grass cover	0	0	1.4	1	0.4	1	5	5	4	1
Organic litter cover	61.4	5	48	5	40.4	5	46.4	5	47.8	5
Large trees	16	5	14	5	10	5	6	5	42	15
Coarse woody debris	2700	5	934	2	1885	5	1250	2	928	2
Weed cover	8	5	2	10	15	5	15	5	3	10
Total Field based attributes (maximum 80)		**38**		**53.5**		**39.5**		**45.5**		**61**
GIS based attributes										
Fragmented - Patch size (input score manually)		5		0		0		0		0
Fragmented - Connectivity (l, m, h, or vh)		0		0		0		0		0
Fragmented - Context (input score manually)		2		0		0		2		2
Ecological Corridors	not within	0	not within	0	not within	0	not within	0	not within	0
Total GIS attributes (maximum 26)		**7**		**0**		**0**		**2**		**2**
Total site and context score		**45**		**53.5**		**39.5**		**47.5**		**63**

Assessment Unit (AU)	5						6			
Site Number	10		11		19		12		13	
Previously Ground truthed RE	11.10.7		11.10.7		11.10.7		11.10.9		11.10.9	
Regional Ecosystem (RE)	11.10.7		11.10.7		11.10.7		11.10.9		11.10.9	
Benchmark RE utilised (in absence of a benchmark)	11.10.4		11.10.4		11.10.4		11.5.4		11.5.4	
	Raw value	Score	Raw value	Score	Raw value	Score	Raw value	Score	Raw value	Score
Field based attributes										
Recruitment of woody perennial species	75	5	50	3	75	5	75	5	100	5
Native plant species richness										
Trees	4	5	4	5	5	5	5	5	4	5
Shrubs	13	5	9	5	8	5	7	5	5	5
Grasses	8	5	8	5	5	5	2	0	9	2.5
Forbs	5	5	6	5	4	2.5	1	0	6	2.5
Tree Canopy Height	18	5	20	5	17.5	5	17	5	17	5
Tree Canopy Cover	3	2	4	2	4	2	6	2	2	0
Shrub canopy cover	10	3	12	3	2	5	2	3	4	5
Native perennial grass cover	6	1	1.6	0	9.2	1	3	1	3.2	1
Organic litter cover	29.4	5	36.8	5	33	5	42.4	5	42	5
Large trees	36	15	36	15	66	15	44	15	62	15
Coarse woody debris	744	5	307	5	560.5	5	852	2	521	2
Weed cover	25	3	8	5	40	3	20	5	10	5
Total Field based attributes (maximum 80)		**64**		**63**		**63.5**		**53**		**58**
GIS based attributes										
Fragmented - Patch size (input score manually)		2		5		5		5		2
Fragmented - Connectivity (l, m, h, or vh)		0		0		0		0		0
Fragmented - Context (input score manually)		2		2		2		2		2
Ecological Corridors	not within	0	not within	0	not within	0	not within	0	not within	0
Total GIS attributes (maximum 26)		**4**		**7**		**7**		**7**		**4**
Total site and context score		**68**		**70**		**70.5**		**60**		**62**

Assessment Unit (AU)	7			
Site Number	14		15	
Previously Groundtruthed RE	11.10.11		11.10.11	
Regional Ecosystem (RE)	11.10.11		11.10.11	
Benchmark RE utilised (absence of a benchmark)				
	Raw value	Score	Raw value	Score
Field based attributes				
Recruitment of woody perennial species	50	3	75	5
Native plant species richness				
Trees	4	5	4	5
Shrubs	7	5	10	5
Grasses	2	0	7	2.5
Forbs	0	0	4	0
Tree Canopy Height	18	5	18	5
Tree Canopy Cover	7	2	5	2
Shrub canopy cover	4	5	6	5
Native perennial grass cover	0	0	0.4	0
Organic litter cover	41	5	70.6	5
Large trees	128	15	78	15
Coarse woody debris	655	2	599	2
Weed cover	18	5	8	5
Total Field based attributes (maximum 80)		**52**		**56.5**
GIS based attributes				
Fragmented - Patch size (input score manually)		0		0
Fragmented - Connectivity (l, m, h, or vh)		0		0
Fragmented - Context (input score manually)		0		0
Ecological Corridors	not within	0	not within	0
Total GIS attributes (maximum 26)		**0**		**0**
Total site and context score		**52**		**56.5**

Appendix C

MNES fauna habitat index scores

Appendix C MNES fauna habitat index scores

Table 9 Collared delma species habitat quality scores

Assessment Unit (AU)	1	2			3					4				5		6	
Site Number	7	5	8	9	1	2	16	17	18	6	10	11	19	12	13	14	15
Regional Ecosystem (RE)	11.3.2	11.3.25	11.3.25	11.3.25	11.9.5	11.9.5	11.9.5	11.9.5	11.9.5	11.10.7	11.10.7	11.10.7	11.10.7	11.10.9	11.10.9	11.10.11	11.10.11
Threats to Species	NA	NA	NA	NA	1	1	NA	4	NA	NA	10	10	1	4	4	4	4
Quality and availability of food and foraging habitat					10	1		5			8	8	5	5	5	8	10
Quality and Availability of Shelter					4	4		7			7	10	4	7	4	7	7
Species Mobility Capacity					NA	NA		NA			NA	NA	NA	NA	NA	NA	NA
Role of Site Location to Species Overall Population in the State					1	1		1			1	1	1	1	1	1	1
Total species habitat quality score					**16**	**7**		**17**			**26**	**29**	**11**	**17**	**14**	**20**	**22**

Table 10 Dunmall's snake species habitat quality scores

Assessment Unit (AU)	1	2			3					4				5		6	
Site Number	7	5	8	9	1	2	16	17	18	6	10	11	19	12	13	14	15
Regional Ecosystem (RE)	11.3.2	11.3.25	11.3.25	11.3.25	11.9.5	11.9.5	11.9.5	11.9.5	11.9.5	11.10.7	11.10.7	11.10.7	11.10.7	11.10.9	11.10.9	11.10.11	11.10.11
Threats to Species	NA	NA	NA	NA	4	1	4	4	1	NA	10	7	7	7	4	4	4
Quality and availability of food and foraging habitat					5	5	5	5	10		8	10	5	5	5	8	8
Quality and Availability of Shelter					5	5	5	8	10		8	10	5	5	5	8	8
Species Mobility Capacity					5	1	5	7	10		5	10	5	5	5	8	10
Role of Site Location to Species Overall Population in the State					1	1	1	1	1		1	1	1	1	1	1	1
Total species habitat quality score					**20**	**13**	**20**	**25**	**32**		**32**	**38**	**23**	**23**	**20**	**29**	**31**

Table 11 Koala species habitat quality scores

Assessment Unit (AU)	1	2			3					4				5		6	
Site Number	7	5	8	9	1	2	16	17	18	6	10	11	19	12	13	14	15
Regional Ecosystem (RE)	11.3.2	11.3.25	11.3.25	11.3.25	11.9.5	11.9.5	11.9.5	11.9.5	11.9.5	11.10.7	11.10.7	11.10.7	11.10.7	11.10.9	11.10.9	11.10.11	11.10.11
Threats to Species	15	7	15	15	NA	NA	NA	NA	NA	7	7	7	7	7	7	7	7
Quality and availability of food and foraging habitat	10	10	10	10						5	5	5	10	10	5	5	5
Quality and Availability of Shelter	10	10	10	10						5	5	10	10	10	5	5	10
Species Mobility Capacity	10	10	10	10						1	1	1	1	1	1	1	1
Role of Site Location to Species Overall Population in the State	3	3	3	3						1	1	1	1	1	1	1	1
Total species habitat quality score	**48**	**40**	**48**	**48**						**19**	**19**	**24**	**29**	**29**	**19**	**19**	**24**

Table 12 South-eastern long-eared bat species habitat quality scores

Assessment Unit (AU)	1	2			3					4				5		6	
Site Number	7	5	8	9	1	2	16	17	18	6	10	11	19	12	13	14	15
Regional Ecosystem (RE)	11.3.2	11.3.25	11.3.25	11.3.25	11.9.5	11.9.5	11.9.5	11.9.5	11.9.5	11.10.7	11.10.7	11.10.7	11.10.7	11.10.9	11.10.9	11.10.11	11.10.11
Threats to Species	7	7	7	7	NA	1	NA	1	1	1	1	1	1	1	1	1	1
Quality and availability of food and foraging habitat	5	1	5	1		5		5	10	5	5	5	5	5	5	5	5
Quality and Availability of Shelter	10	10	10	10		5		1	5	10	10	10	10	10	10	10	10
Species Mobility Capacity	7	5	7	1		5		5	1	1	7	5	5	4	5	5	5
Role of Site Location to Species Overall Population in the State	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
Total species habitat quality score	**30**	**24**	**30**	**20**		**17**		**13**	**18**	**18**	**24**	**22**	**22**	**21**	**22**	**22**	**22**

Table 13 Yakka skink species habitat quality scores

Assessment Unit (AU)	1	2			3					4				5		6	
Site Number	7	5	8	9	1	2	16	17	18	6	10	11	19	12	13	14	15
Regional Ecosystem (RE)	11.3.2	11.3.25	11.3.25	11.3.25	11.9.5	11.9.5	11.9.5	11.9.5	11.9.5	11.10.7	11.10.7	11.10.7	11.10.7	11.10.9	11.10.9	11.10.11	11.10.11
Threats to Species	15	NA	NA	NA	4	1	4	4	1	1	4	10	10	10	4	4	4
Quality and availability of food and foraging habitat	5				5	1	5	5	10	1	5	8	5	5	5	5	8
Quality and Availability of Shelter	1				5	1	5	7	10	1	5	5	5	1	5	7	5
Species Mobility Capacity	5				5	1	5	8	5	5	5	5	5	1	5	5	10
Role of Site Location to Species Overall Population in the State	1				1	1	1	1	1	1	1	1	1	1	1	1	1
Total species habitat quality score	**27**				**20**	**5**	**20**	**25**	**27**	**9**	**20**	**29**	**26**	**18**	**20**	**22**	**28**

Appendix C: Summary Scores – Impact Site

PL176 – Scotia

	11.3.2	11.3.25	11.3.25	11.3.25	11.9.5	11.9.5	11.9.5	11.9.5	11.9.5	11.10.7	11.10.7	11.10.7	11.10.7	11.10.9	11.10.9
Condition	Remnant	Remnant	Remnant	Remnant	Remnant	Remnant	Remnant	Remnant	Regrowth	Remnant	Remnant	Remnant	Remnant	Remnant	Remnant
Recruitment of woody perennial species	3	3	3	5	5	3	5	5	5	3	5	3	5	5	5
Native plant species richness - trees	5	5	5	5	5	5	5	5	5	2.5	5	5	5	5	5
Native plant species richness - shrubs	5	0	5	5	2.5	2.5	2.5	5	2.5	5	5	5	5	5	5
Native plant species richness - grasses	5	0	0	2.5	2.5	2.5	2.5	2.5	0	5	5	5	5	0	2.5
Native plant species richness - forbs	0	0	0	2.5	2.5	2.5	2.5	5	2.5	2.5	5	5	2.5	0	2.5
Tree canopy height	5	5	5	5	3	3	3	3	3	3	5	5	5	5	5
Tree canopy cover	0	2	2	2	0	0	0	0	0	2	2	2	2	2	0
Shrub canopy cover	0	0	5	0	5	0	3	5	0	5	3	3	5	3	5
Native perennial grass cover	1	0	0	3	1	1	5	1	0	1	1	0	1	1	1
Organic litter cover	5	3	3	5	5	5	5	5	5	5	5	5	5	5	5
Large trees	10	15	15	15	5	5	5	5	5	15	15	15	15	15	15
Coarse woody debris	5	5	5	5	5	5	2	2	5	2	5	5	5	2	2
Weed cover	5	0	3	3	3	5	5	10	5	10	3	5	3	5	5
Final score	**49**	**38**	**51**	**58**	**44.5**	**39.5**	**45.5**	**53.5**	**38**	**61**	**64**	**63**	**63.5**	**53**	**58**
Out of possible maximum	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**
Adjusted score out of 3/out of 7	**4.288**	**3.325**	**4.463**	**5.075**	**3.894**	**3.456**	**3.981**	**4.681**	**3.325**	**5.338**	**5.600**	**5.513**	**5.556**	**4.638**	**5.075**
Context															
Size of patch	5	7	5	5	2	0	0	0	5	0	2	5	5	5	2
Connectedness	4	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Context	2	2	2	2	0	0	2	0	2	2	2	2	2	2	2
Ecological Corridors	6	6	6	6	0	0	0	0	0	0	0	0	0	0	0
Final score	**17**	**17**	**13**	**13**	**2**	**0**	**2**	**0**	**7**	**2**	**4**	**7**	**7**	**7**	**4**
Out of possible maximum	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**
Adjusted score out of 3	**1.962**	**1.962**	**1.500**	**1.500**	**0.231**	**0.000**	**0.231**	**0.000**	**0.808**	**0.231**	**0.462**	**0.808**	**0.808**	**0.808**	**0.462**
Combined score out of 6/out of 10	**6.249**	**5.287**	**5.963**	**6.575**	**4.125**	**3.456**	**4.212**	**4.681**	**4.133**	**5.568**	**6.062**	**6.320**	**6.364**	**5.445**	**5.537**
Weighting by size	**0.045704**	**0.173675**	**0.173675**	**0.173675**	**0.374771**	**0.374771**	**0.374771**	**0.374771**	**0.045704**	**0.219378**	**0.219378**	**0.219378**	**0.219378**	**0.140768**	**0.140768**
Weighted score from 6/from 10	**0.285605**	**0.918137**	**1.035535**	**1.14191**	**1.545752**	**1.295304**	**1.578545**	**1.754399**	**0.18888**	**1.221558**	**1.329771**	**1.386514**	**1.396112**	**0.766508**	**0.779366**

Species stocking rate	Brigalow TEC	Dunmall's Snake	Yakka Skink	Collared Delma	SELE Bat	Koala
Quality and availability of food and foraging habitat (score per DES Guide)	N/A	6	4.9	6.3	4.8	7.5
Quality and availability of shelter (score per DES Guide)	N/A	6.2	4.4	5.8	8.7	8.3
Role of site location to species / TEC overall population in the state (score per DES Guide)	N/A	1	1	1	1	1.7
Threats to the species/ TEC (score per DES Guide)	N/A	5.2	5.7	4.8	2.6	9
Species mobility capacity (score per DES Guide)	N/A	5.8	4.8	N/A	4.5	4.0
Species/TEC present on site (yes / no)	N/A	15	15	15	15	15
Species/TEC present on adjacent properties (yes / no)	N/A	No	No	No	No	No
Evidenced species usage of site (not habitat, dispersal, feeding, breeding)	N/A	Nil	Nil	Nil	Nil	Nil
Key source population for breeding (yes / no)	N/A	No	No	No	No	No
Key source population for dispersal (yes / no)	N/A	No	No	No	No	No
Necessary for maintaining genetic diversity (yes / no)	N/A	No	No	No	No	No
Near the limit of the species range (yes / no)	N/A	No	No	No	No	No
Species density in LGA (as a range)	N/A	N/A	N/A	N/A	Very low	Very low
Final score	N/A	39.2	35.8	32.8	36.7	45.5
Out of a possible maximum	N/A	65	65	65	65	65
Adjusted score out of 4	N/A	2.4123	2.2009	2.0154	2.2564	2.8000
Final combined score, including weighted vegetation quality	**4.1201**	**4.8368**	**4.6254**	**4.4399**	**4.8662**	**5.9165**
Final combined score out of 10, with rounding	**4**	**5**	**5**	**4**	**5**	**6**

PL 90 and PL 234 - Lonesome

	11.3.17	11.3.17	11.3.17	11.3.17	11.9.5	11.9.5	11.9.5	11.9.5	11.9.5	11.9.5a	11.9.5a	11.9.10	11.9.10	11.10.7
Condition	Remnant	Remnant	Regrowth	Regrowth	Remnant	Remnant	Remnant	Regrowth	Regrowth	Remnant	Remnant	Remnant	Remnant	Remnant
Recruitment of woody perennial species	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Native plant species richness - trees	5	5	2.5	2.5	5	5	5	2.5	2.5	5	5	5	5	5
Native plant species richness - shrubs	5	2.5	2.5	2.5	5	5	5	5	5	5	5	5	2.5	5
Native plant species richness - grasses	5	5	2.5	2.5	5	5	5	5	2.5	5	5	5	5	5
Native plant species richness - forbs	2.5	2.5	2.5	2.5	5	5	2.5	2.5	2.5	5	2.5	2.5	2.5	5
Tree canopy height	5	4	1.5	1.5	1.5	5	5	1.5	1.5	4	5	5	5	5
Tree canopy cover	4	4	2.5	5	3.5	3.5	5	5	2.5	4	2.5	4	1.5	2.5
Shrub canopy cover	3	3	3	5	5	3	5	3	5	5	3	5	3	3
Native perennial grass cover	1	3	1	1	1	1	1	1	0	3	0	5	3	3
Organic litter cover	3	5	5	5	5	5	5	5	5	5	5	5	5	5
Large trees	10	5	5	5	15	15	15	5	0	10	15	15	10	15
Coarse woody debris	2	5	0	2	2	5	5	2	0	2	2	5	2	5
Weed cover	10	10	5	5	10	5	10	10	3	10	5	10	10	10
Final score	61	59	38	45	68	68	74	53	35	68	60	77	60	74
Out of possible maximum	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**
Adjusted score out of 3/out of 7	**5.294**	**5.163**	**3.325**	**3.894**	**5.950**	**5.906**	**6.431**	**4.594**	**3.019**	**5.950**	**5.250**	**6.694**	**5.206**	**6.431**
Context														
Patch size	10	5	2	7	5	10	10	7	5	10	10	10	10	10
Connectivity	5	2	0	0	5	5	4	0	0	4	5	4	5	5
Context	5	4	2	4	5	5	5	2	2	4	5	5	4	4
Ecological Corridors	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Final score	**26**	**17**	**10**	**17**	**21**	**26**	**25**	**15**	**13**	**24**	**26**	**25**	**25**	**25**
Out of possible maximum	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**
Adjusted score out of 3	**3.000**	**1.962**	**1.154**	**1.962**	**2.423**	**3.000**	**2.885**	**1.731**	**1.500**	**2.769**	**3.000**	**2.885**	**2.885**	**2.885**
Combined score out of 6/out of 10	**8.294**	**7.124**	**4.479**	**5.855**	**8.373**	**8.906**	**9.316**	**6.325**	**4.519**	**8.719**	**8.250**	**9.578**	**8.091**	**9.316**
Weighting by size	**0.16952**	**0.16952**	**0.09977**	**0.09977**	**0.15596**	**0.15596**	**0.15596**	**0.47691**	**0.47691**	**0.01970**	**0.01970**	**0.04714**	**0.04714**	**0.03100**
Weighted score from 6/from 10	**1.40595**	**1.20766**	**0.44687**	**0.58421**	**1.30584**	**1.38900**	**1.45288**	**3.01625**	**2.15505**	**0.17174**	**0.16250**	**0.45155**	**0.38142**	**0.28877**

Species stocking rate	Brigalow TEC	Dunmall's Snake	Yakka Skink	Collared Delma	SELE Bat	Koala	Squatter Pigeon	Red Goshawk	Black-breasted Button Quail
Quality and availability of food and foraging habitat (score per DES Guide)	N/A	5	5	5	5	5	5	5	5
Quality and availability of shelter (score per DES Guide)	N/A	5	5	5	5	5	5	5	5
Role of site location to species / TEC overall population in the state (score per DES Guide)	N/A	4	4	4	4	4	4	4	4
Threats to the species/ TEC (score per DES Guide)	N/A	7	7	7	7	7	7	7	7
Species mobility capacity (score per DES Guide)	N/A	4	4	4	4	4	4	4	4
Species/TEC present on site (yes / no)	N/A	15	15	15	15	15	15	15	15
Species/TEC present on adjacent properties (yes / no)	N/A	No	No	No	No	No	No	No	No
Evidenced species usage of site (not habitat, dispersal, feeding, breeding)	N/A	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Key source population for breeding (yes / no)	N/A	No	No	No	No	No	No	No	No
Key source population for dispersal (yes / no)	N/A	No	No	No	No	No	No	No	No
Necessary for maintaining genetic diversity (yes / no)	N/A	No	No	No	No	No	No	No	No
Near the limit of the species range (yes / no)	N/A	No	No	No	No	No	No	No	No
Species density in LGA (as a range)	N/A	N/A	N/A	N/A	Very low	Very low			
Final score	N/A	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
Out of a possible maximum	N/A	65	65	65	65	65	65	65	65
Adjusted score out of 4	N/A	2.461538462	2.461538462	2.461538462	2.461538462	2.461538462	2.461538462	2.461538462	2.461538462
Final combined score, including weighted vegetation quality	**6.0809**	**6.6647**	**6.6647**	**6.6647**	**6.6647**	**6.0123**	**6.0123**	**6.6647**	**7.7462**
Final combined score out of 10, with rounding	**6**	**7**	**7**	**7**	**7**	**6**	**6**	**7**	**8**

Appendix D: Summary Scores – Offset Site

Current State

	11.10.7	11.10.7	11.3.25	11.9.5	11.9.4	11.10.7	11.9.5	11.10.7	11.10.7	11.9.7	11.9.7	11.10.7	11.9.5	11.9.5	11.10.7
Condition	Remnant	Remnant	Remnant	Remnant	Remnant	Remnant	Remnant	Remnant	Remnant	Remnant	Young Regrowth	Advanced Regrowth	Advanced Regrowth	Young Regrowth	Remnant
Recruitment of woody perennial species in EDL	3	3	5	3	5	5	5	5	5	5	5	5	3	3	5
Native plant species richness - trees	2.5	2.5	2.5	5	5	2.5	5	2.5	2.5	2.5	2.5	2.5	5	5	5
Native plant species richness - shrubs	0	2.5	5	5	5	2.5	5	2.5	5	5	2.5	5	5	2.5	2.5
Native plant species richness - grasses	3.75	2.5	3.75	5	1.25	2.5	2.5	2.5	5	2.5	3.75	2.5	5	3.75	2.5
Native plant species richness - forbs	2.5	2.5	5	3.75	2.5	1.25	0	1.25	2.5	1.25	1.25	3.75	3.75	1.25	2.5
Tree canopy height (average of emergent, canopy, sub-canopy)	5	5	5	5	5	5	5	5	5	5	3	5	3	3	5
Tree canopy cover (average of emergent, canopy, sub-canopy)	2	5	5	5	5	2	5	2	2	3	5	5	2	5	5
Shrub canopy cover	5	3	5	3	3	5	3	3	3	3	5	3	5	5	5
Native grass cover	3	5	3	5	5	3	3	2	3	4	5	5	5	5	5
Organic litter	4	4	3	5	5	5	3	5	5	3	5	5	3	5	5
Large trees (euc plus non-euc)	0	0	0	0	15	10	5	5	15	0	0	0	0	5	15
Coarse woody debris	5	5	5	2	5	5	2	5	5	5	5	5	2	2	2
Non-native plant cover	10	10	5	10	10	3	3	5	10	10	0	10	3	3	3
Final Score	**45.75**	**50**	**52.25**	**56.75**	**71.75**	**51.75**	**46.5**	**45.75**	**68**	**49.25**	**43**	**56.75**	**44.75**	**48.5**	**62.5**
Out of possible maximum	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**
Adjusted score out of 3/out of 7	**4.003125**	**4.375**	**4.571875**	**4.965625**	**6.278125**	**4.528125**	**4.06875**	**4.003125**	**5.95**	**4.309375**	**3.7625**	**4.965625**	**3.915625**	**4.24375**	**5.46875**
Context															
Size of patch	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Connectedness	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Context	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Ecological Corridors	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Final Score	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**
Out of possible maximum	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***	***26***
Adjusted score out of 3	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**
Combined score out of 6/out of 10	**6.080048**	**6.451923**	**6.648798**	**7.042548**	**8.355048**	**6.605048**	**6.145673**	**6.080048**	**8.026923**	**6.386298**	**5.839423**	**7.042548**	**5.992548**	**6.320673**	**7.545673**
Weighting by Size	**0.078281**	**0.078281**	**0.01326**	**0.118922**	**0.065729**	**0.078281**	**0.118922**	**0.078281**	**0.118922**	**0.030864**	**0.011317**	**0.05487**	**0.043781**	**0.021605**	**0.078281**
Weighted score from 6/from 10	**0.475951**	**0.505061**	**0.088164**	**0.837517**	**0.549172**	**0.517048**	**0.730858**	**0.475951**	**0.954581**	**0.197108**	**0.066084**	**0.386422**	**0.262362**	**0.136558**	**0.590681**

Species Stocking Rate	Brigalow TEC	SELE Bat	Koala	Collared Delma	Yakka Skink	Dunmall's Snake
Quality and availability of food and foraging habitat (score per DEHP Guide)	N/A	5	5	5	5	5
Quality and availability of shelter (score per DEHP Guide)	N/A	5	5	5	5	5
Role of site location to species/TEC overall population in the state (score per DEHP Guide)		1	1		1	1
Threats to the species/TEC (score per DEHP Guide)	N/A	7	7	7	7	7
Species mobility capacity (score per DEHP Guide)	N/A	10	7	7	7	7
Species/TEC present on site (Yes/No)	N/A	No	No	No	No	No
Species/TEC present on adjacent properties (Yes/No)	N/A	Yes - 5	No	No	Yes - 5	No
Evidenced species usage of site (not habitat, dispersal, feeding, breeding)	N/A	No	No	No	No	No
Key source population for breeding (Yes/No)	N/A	No	No	No	No	No
Key source population for dispersal (Yes/No)	N/A	No	No	No	No	No
Necessary for maintaining genetic diversity (Yes/No)		No	No	No	No	No
Near the limit of the species range (Yes/No)		No	No	No	No	No
Species density in LGA (as a range)	N/A			N/A	N/A	N/A
Final Score	**N/A**	**33**	**25**	**24**	**30**	**25**
Out of possible maximum	**N/A**	**65**	**65**	**65**	**65**	**65**
Adjusted score out of 4	**N/A**	**2.030769**	**1.538462**	**1.476923**	**1.846154**	**1.538462**
Final Combined score, including weighted vegetation quality	**6.773518418**	**6.108173**	**5.615866**	**5.554327**	**5.923558**	**5.615866**
Final Combined score, with adjusted weighting	**6.844719778**	**6.151034**	**5.658726**	**5.597188**	**5.966418**	**5.658726**
Final Combined score out of 10, with rounding	**7**	**6**	**6**	**6**	**6**	**6**

Future State (Completion Criteria)

	11.10.7	11.10.7	11.3.25	11.9.5	11.9.4	11.10.7	11.9.5	11.10.7	11.10.7	11.9.7	11.9.7	11.10.7	11.9.5	11.9.5	11.10.7
Condition	Remnant	Remnant	Remnant	Remnant	Remnant	Remnant	Remnant	Remnant	Remnant	Remnant	Young Regrowth	Advanced Regrowth	Advanced Regrowth	Young Regrowth	Remnant
Recruitment of woody perennial species in EDL	3	3	5	3	5	5	5	5	5	5	5	5	3	3	5
Native plant species richness - trees	2.5	2.5	2.5	5	5	2.5	5	2.5	2.5	2.5	2.5	2.5	5	5	5
Native plant species richness - shrubs	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Native plant species richness - grasses	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Native plant species richness - forbes	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Tree canopy height (average of emergent, canopy, sub-canopy)	5	5	5	5	5	5	5	5	5	5	3	5	3	3	5
Tree canopy cover (average of emergent, canopy, sub-canopy)	2	5	5	5	5	2	5	2	2	3	5	5	2	5	5
Shrub canopy cover	5	3	5	3	3	5	3	3	3	3	5	3	5	5	5
Native grass cover	3	5	3	5	5	3	3	2	3	4	5	5	5	5	5
Organic litter	4	4	3	5	5	5	3	5	5	3	5	5	3	5	5
Large trees (euc plus non-euc)	0	0	0	0	15	10	5	5	15	0	0	0	0	5	15
Coarse woody debris	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Non-native plant cover	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Final Score	**54.5**	**57.5**	**58.5**	**61**	**78**	**67.5**	**64**	**59.5**	**70.5**	**55.5**	**60.5**	**60.5**	**56**	**66**	**80**
Out of possible maximum	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**	**80**
Adjusted score out of 3/out of 7	**4.76875**	**5.03125**	**5.11875**	**5.3375**	**6.825**	**5.90625**	**5.6**	**5.20625**	**6.16875**	**4.85625**	**5.29375**	**5.29375**	**4.9**	**5.775**	**7**
Context															
Size of patch	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Connectedness	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Context	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Ecological Corridors	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Final Score	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**	**18**
Out of possible maximum	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**	**26**
Adjusted score out of 3	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**	**2.076923**
Combined score out of 6/out of 10	**7.108173**	**7.195673**	**7.414423**	**8.901923**	**7.983173**	**7.676923**	**7.283173**	**8.245673**	**6.933173**	**7.370673**	**7.370673**	**6.976923**	**7.851923**	**9.076923**	**7.108173**
Weighting by Size	**0.078281**	**0.01326**	**0.118922**	**0.065729**	**0.078281**	**0.118922**	**0.078281**	**0.118922**	**0.030864**	**0.011317**	**0.05487**	**0.043781**	**0.021605**	**0.078281**	**0.078281**
Weighted score from 6/from 10	**0.556433**	**0.095416**	**0.881741**	**0.585117**	**0.624929**	**0.912958**	**0.570132**	**0.980595**	**0.213987**	**0.083413**	**0.404427**	**0.30546**	**0.16964**	**0.710548**	**0.556433**

Species Stocking Rate	Brigalow TEC	SELE Bat	Koala	Collared Delma	Yakka Skink	Dunmall's Snake
Quality and availability of food and foraging habitat (score per DEHP Guide)	N/A	5	5	5	5	5
Quality and availability of shelter (score per DEHP Guide)	N/A	5	5	5	5	5
Role of site location to species/TEC overall population in the state (score per DEHP Guide)		1	1		1	1
Threats to the species/TEC (score per DEHP Guide)	N/A	7	7	7	7	7
Species mobility capacity (score per DEHP Guide)	N/A	10	7	7	7	7
Species/TEC present on site (Yes/No)	N/A	No	No	No	No	No
Species/TEC present on adjacent properties (Yes/No)	N/A	Yes - 5	No	No	Yes - 5	No
Evidenced species usage of site (not habitat, dispersal, feeding, breeding)	N/A	No	No	No	No	No
Key source population for breeding (Yes/No)	N/A	No	No	No	No	No
Key source population for dispersal (Yes/No)	N/A	No	No	No	No	No
Necessary for maintaining genetic diversity (Yes/No)	No	No	No	No	No	No
Near the limit of the species range (Yes/No)	No	No	No	No	No	No
Species density in LGA (as a range)	N/A	N/A	N/A	N/A	N/A	N/A
Final Score	**N/A**	**46**	**43**	**37**	**43**	**38**
Out of possible maximum	**N/A**	**65**	**65**	**65**	**65**	**65**
Adjusted score out of 4	**N/A**	**2.830769**	**2.646154**	**2.276923077**	**2.646153846**	**2.338461538**
Final Combined score, including weighted vegetation quality	**7.630681174**	**7.275529**	**7.090913**	**6.721682516**	**7.090913286**	**6.783220978**
Final Combined score, with adjusted weighting	**7.710892793**	**7.322251**	**7.137635**	**6.768404604**	**7.137635373**	**6.829943065**
Final Combined score out of 10, with rounding	**8**	**7**	**7**	**7**	**7**	**7**

Appendix E: Offset Assessment Guides – Stage 2

A reconciliation of actual and predicted but yet to be actualised residual significant impacts against offsets secured for Stage 2 was undertaken and a shortfall in offsets provided was identified. These OAGs present a calculation of the shortfall in Stage 2 offset requirements that will be delivered with Stage 3 offset obligations.

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Brigalow
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes	Brigalow TEC (Regional Eccsystesm 11.9.5).	**Area**	0.62	Hectares	GFD Project EPBC Act Offset Plan Stage 2.
			Quality	**6**	Scale 0-10	
			Total quantum of impact	0.37	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	Yes	0.37	Adjusted hectares	Sprinwater Offset Area	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	6	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	0.43	114.35%	Yes	
									Future area without offset (adjusted hectares)	6.0	**Future area with offset (adjusted hectares)**	6.0								
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**7**	**Future quality without offset (scale of 0-10)**	**7**	**Future quality with offset (scale of 0-10)**	**8**	1.00	90%	0.90	0.71				
Threatened species habitat																				
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0								
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	0.372	0.43	114.35%	**Yes**	$0.00	N/A	$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	South-Eastern Long-eared Bat
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	South-eastern Long-eared Bat	**Area**	6.85	Hectares	GFD Project EPBC Offset Plan - Stage 2
			Quality	**6**	Scale 0-10	
			Total quantum of impact	4.11	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0										
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	4.11	Adjusted hectares	Springwater Offset Area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	48	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	90%	0.00	0.00	4.15	100.99%	Yes		
									Future area without offset (adjusted hectares)	48.0	**Future area with offset (adjusted hectares)**	48.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	4.11	4.15	100.99%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Koala
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Koala Habitat	**Area**	4.58	Hectares	GFD Project EPBC Offset Plan - Stage 2
			Quality	**5**	Scale 0-10	
			Total quantum of impact	2.29	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0										
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	2.29	Adjusted hectares	Springwater Offset Area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	27	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	2.33	101.96%	Yes		
									Future area without offset (adjusted hectares)	27.0	**Future area with offset (adjusted hectares)**	27.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	2.29	2.33	101.96%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Collared Delma and Dunmalls Snake
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Collared Delma and Dunmalls Snake Habitat	**Area**	6.85	Hectares	GFD Project EPBC Offset Plan - Stage 2
			Quality	**5**	Scale 0-10	
			Total quantum of impact	3.43	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																				
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**									
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**									
Threatened species habitat																				
Area of habitat	Yes	3.43	Adjusted hectares	Springwater Offset Area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	40	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	3.46	100.99%	Yes	
									Future area without offset (adjusted hectares)	40.0	**Future area with offset (adjusted hectares)**	40.0								
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86				
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**	**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																			
Condition of habitat Change in habitat condition, but no change in extent	No																			
Threatened species																				
Birth rate e.g. Change in nest success	No																			
Mortality rate e.g Change in number of road kills per year	No																			
Number of individuals e.g. Individual plants/animals	No																			

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	3.425	3.46	100.99%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Yakka Skink
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes	Yakka Skink Habitat	**Area**	6.61	Hectares	GFD Project EPBC Offset Plan - Stage 2
			Quality	**5**	Scale 0-10	
			Total quantum of impact	3.31	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	3.31	Adjusted hectares	Springwater Offset Area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	39	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	3.37	102.04%	Yes		
									Future area without offset (adjusted hectares)	39.0	**Future area with offset (adjusted hectares)**	39.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	3.305	3.37	102.04%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Appendix F: Offset Assessment Guides - Stage 3

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Black-breasted Button Quail
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	0.61	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	**8**	Scale 0-10	
			Total quantum of impact	0.49	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	0.49	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	5.7	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	0.49	101.01%	Yes		
									Future area without offset (adjusted hectares)	5.7	**Future area with offset (adjusted hectares)**	5.7									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0.488	0.49	101.01%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Brigalow
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes		**Area**	19.6	Hectares	GFD Project EPBC Act Offset Plan - Stage 3
			Quality	**6**	Scale 0-10	
			Total quantum of impact	11.76	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	11.76	Adjusted hectares	Springwater Offset Area	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	166	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	11.77	100.08%	Yes		
									Future area without offset (adjusted hectares)	166.0	**Future area with offset (adjusted hectares)**	166.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**7**	**Future quality without offset (scale of 0-10)**	**7**	**Future quality with offset (scale of 0-10)**	**8**	1.00	90%	0.90	0.71					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	11.76	11.77	100.08%	**Yes**	$0.00	N/A	$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Collared Delma
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	30.97	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	7	Scale 0-10	
			Total quantum of impact	21.68	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	21.68	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	251	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	21.71	100.12%	Yes		
									Future area without offset (adjusted hectares)	251.0	**Future area with offset (adjusted hectares)**	251.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	6	**Future quality without offset (scale of 0-10)**	6	**Future quality with offset (scale of 0-10)**	7	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	21.679	21.71	100.12%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Dunmalls snake
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	30.97	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	7	Scale 0-10	
			Total quantum of impact	21.68	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0										
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	21.68	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	251	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	21.71	100.12%	Yes		
									Future area without offset (adjusted hectares)	251.0	**Future area with offset (adjusted hectares)**	251.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	6	**Future quality without offset (scale of 0-10)**	6	**Future quality with offset (scale of 0-10)**	7	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	21.679	21.71	100.12%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Red Goshawk
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	30.97	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	**6**	Scale 0-10	
			Total quantum of impact	18.58	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	18.58	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	215	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	18.59	100.05%	Yes		
									Future area without offset (adjusted hectares)	215.0	**Future area with offset (adjusted hectares)**	215.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	18.582	18.59	100.05%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Koala
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	10.76	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	**6**	Scale 0-10	
			Total quantum of impact	6.46	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	6.46	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	75	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	6.49	100.46%	Yes		
									Future area without offset (adjusted hectares)	75.0	**Future area with offset (adjusted hectares)**	75.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	6.456	6.49	100.46%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Collared Delma
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	30.97	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	**6**	Scale 0-10	
			Total quantum of impact	18.58	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	18.58	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	288	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	24.90	134.03%	Yes		
									Future area without offset (adjusted hectares)	288.0	**Future area with offset (adjusted hectares)**	288.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	18.582	24.90	134.03%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	South-eastern Long-eared Bat
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	30.97	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	**7**	Scale 0-10	
			Total quantum of impact	21.68	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	21.68	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	251	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	90%	0.00	0.00	21.71	100.12%	Yes		
									Future area without offset (adjusted hectares)	251.0	**Future area with offset (adjusted hectares)**	251.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	21.679	21.71	100.12%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Squatter Pigeon
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	10.76	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	**6**	Scale 0-10	
			Total quantum of impact	6.46	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	6.46	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	75	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	6.49	100.46%	Yes		
									Future area without offset (adjusted hectares)	75.0	**Future area with offset (adjusted hectares)**	75.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	6.456	6.49	100.46%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Yakka Skink
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	30.97	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	**7**	Scale 0-10	
			Total quantum of impact	21.68	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	21.68	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	251	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	21.71	100.12%	Yes		
									Future area without offset (adjusted hectares)	251.0	**Future area with offset (adjusted hectares)**	251.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	21.679	21.71	100.12%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Brigalow
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	**1.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	Yes		**Area**	4.6	Hectares	GFD Project EPBC Act Offset Plan - Stage 3
			Quality	**4**	Scale 0-10	
			Total quantum of impact	1.84	Adjusted hectares	
Threatened species habitat						
Area of habitat	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	Yes	1.84	Adjusted hectares	Springwater Offset Area	**Risk-related time horizon (max. 20 years)**	20	**Start area (hectares)**	26	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	1.84	100.18%	Yes		
									Future area without offset (adjusted hectares)	26.0	**Future area with offset (adjusted hectares)**	26.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**7**	**Future quality without offset (scale of 0-10)**	**7**	**Future quality with offset (scale of 0-10)**	**8**	1.00	90%	0.90	0.71					
Threatened species habitat																					
Area of habitat	No				**Time over which loss is averted (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	0				$0.00		$0.00
Area of community	1.84	1.84	100.18%	**Yes**	$0.00	N/A	$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Collared Delma
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	10.44	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	**4**	Scale 0-10	
			Total quantum of impact	4.18	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	4.18	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	48.5	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	4.19	100.43%	Yes		
									Future area without offset (adjusted hectares)	48.5	**Future area with offset (adjusted hectares)**	48.5									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	4.176	4.19	100.43%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Dunmall's snake
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	10.44	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	**5**	Scale 0-10	
			Total quantum of impact	5.22	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0										
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	5.22	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	60.5	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	5.23	100.22%	Yes		
									Future area without offset (adjusted hectares)	60.5	**Future area with offset (adjusted hectares)**	60.5									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	5.22	5.23	100.22%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Koala
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	7.74	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	**6**	Scale 0-10	
			Total quantum of impact	4.64	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	4.64	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	54	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	4.67	100.55%	Yes		
									Future area without offset (adjusted hectares)	54.0	**Future area with offset (adjusted hectares)**	54.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	4.644	4.67	100.55%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	South-eastern Long-eared Bat
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	12.34	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	**5**	Scale 0-10	
			Total quantum of impact	6.17	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	6.17	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	72	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	90%	0.00	0.00	6.23	100.91%	Yes		
									Future area without offset (adjusted hectares)	72.0	**Future area with offset (adjusted hectares)**	72.0									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	6.17	6.23	100.91%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Yakka Skink
EPBC Act status	Vulnerable
Annual probability of extinction Based on IUCN category definitions	**0.2%**

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator

Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
Ecological communities						
Area of community	No		**Area**			
			Quality			
			Total quantum of impact	0.00		
Threatened species habitat						
Area of habitat	Yes		**Area**	10.44	Hectares	GFD Project EPBC Offset Plan - Stage 3
			Quality	**5**	Scale 0-10	
			Total quantum of impact	5.22	Adjusted hectares	
Protected matter attributes	**Attribute relevant to case?**	**Description**	**Quantum of impact**		**Units**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Threatened species						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator

Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)		Start area and quality		Future area and quality without offset		Future area and quality with offset		Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)		% of impact offset	Minimum (90%) direct offset requirement met?	Cost ($ total)	Information source
Ecological Communities																					
Area of community	No				**Risk-related time horizon (max. 20 years)**		**Start area (hectares)**		**Risk of loss (%) without offset**		**Risk of loss (%) with offset**										
									Future area without offset (adjusted hectares)	0.0	**Future area with offset (adjusted hectares)**	0.0									
					Time until ecological benefit		**Start quality (scale of 0-10)**		**Future quality without offset (scale of 0-10)**		**Future quality with offset (scale of 0-10)**										
Threatened species habitat																					
Area of habitat	Yes	5.22	Adjusted hectares	Springwater offset area	**Time over which loss is averted (max. 20 years)**	20	**Start area (hectares)**	60.5	**Risk of loss (%) without offset**	0%	**Risk of loss (%) with offset**	0%	0.00	95%	0.00	0.00	5.23	100.22%	Yes		
									Future area without offset (adjusted hectares)	60.5	**Future area with offset (adjusted hectares)**	60.5									
					Time until ecological benefit	20	**Start quality (scale of 0-10)**	**6**	**Future quality without offset (scale of 0-10)**	**6**	**Future quality with offset (scale of 0-10)**	**7**	1.00	90%	0.90	0.86					
Protected matter attributes	**Attribute relevant to case?**	**Total quantum of impact**	**Units**	**Proposed offset**	**Time horizon (years)**		**Start value**		**Future value without offset**		**Future value with offset**		**Raw gain**	**Confidence in result (%)**	**Adjusted gain**	**Net present value**		**% of impact offset**	**Minimum (90%) direct offset requirement met?**	**Cost ($ total)**	**Information source**
Number of features e.g. Nest hollows, habitat trees	No																				
Condition of habitat Change in habitat condition, but no change in extent	No																				
Threatened species																					
Birth rate e.g. Change in nest success	No																				
Mortality rate e.g Change in number of road kills per year	No																				
Number of individuals e.g. Individual plants/animals	No																				

Summary

Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost ($)		
					Direct offset ($)	Other compensatory measures ($)	Total ($)
Birth rate	0				$0.00		$0.00
Mortality rate	0				$0.00		$0.00
Number of individuals	0				$0.00		$0.00
Number of features	0				$0.00		$0.00
Condition of habitat	0				$0.00		$0.00
Area of habitat	5.22	5.23	100.22%	**Yes**	$0.00	N/A	$0.00
Area of community	0				$0.00		$0.00
					$0.00	**$0.00**	**$0.00**

Appendix G: Risk Assessment

The following risk assessment assesses the risk of failure to achieve the Offset Plan objectives for the offset values. For each risk identified, the potential consequence of the risk (rated from 1 (no impact) to 6 (irreversible impact)) was assessed against the likelihood of that risk occurring (rated from 'remote' to 'almost certain') to determine risk rating as follows:

1. No impact to MNES
2. Small-scale impact to MNES, or potential surface or groundwater impact
3. Moderate scale impact to MNES, or localised surface or groundwater impact
4. Large-scale impact to MNES, or moderate scale surface water impact, or localised impact to groundwater with potential or known beneficial use
5. Extensive population or community scale impact to MNES
6. Irreversible impact to MNES

Risk Event	Risk Description	Initial Risk Ranking*			Management Measures / Actions	Residual Risk Ranking*			Performance Criteria	Management Triggers	Corrective actions	Monitoring Mechanism
		L	C	R		L	C	R				
Mining of the SOA	Exploration Permit Coal (EPC) 1110 was granted 28 May 2008 and includes the entire SOA.	A	VI	3	Limited mitigations measures can be implemented. Although the prospectively of the coal resource or the future plans of the coal tenure holders is unknown it seems unlikely that particular patch would be developed. The legal security over the SOA makes it known that the area is an offset. The area is now listed as Development of this is possible but offset obligations would be greater.	A	V	3	No development or mining of the offset area.	Application for a Mining Lease Any proposals or actions of development and/or mining.	Provide mining tenement holder the details of the Environmental Offset.	Annual review of mining tenements present within the SOA.
Drought	Prolonged drought may impact the natural regeneration capacity of the vegetation within the SOA. The condition of habitat and TEC is expected to decrease during periods of drought. A decrease in condition would make achievement of completion criteria impossible.	B	V	3	Limited mitigations measures can be implemented.	B	III	2	No condition loss due to drought	Drought declarations. Less than average rainfall during the summer wet season.	Extend program timeframe to allow for completion of offset criteria.	The Offset Area Report will document vegetation condition and report on drought impacts.
Timber harvesting/collection	Unauthorised access to SOA results in timber harvesting/collection.	B	III	2	Installation of signage at all vehicle accesses identifying the areas as an environmental offset Installation of fences. All field monitoring (rapid and detailed) will report on any evidence of timber harvesting.	A	III	1	No unauthorised access. No evidence of clearing within the offset area. Offset Area mapped as Category A on PMAV.	Fences are damaged and associated with vehicle tracks. Timber cutting in observed in the SOA. Removal of trees in the SOA.	Investigation into the cause of timber harvesting. Determine access route and ensure fencing is secure. Determine if the offset completion criteria will be impacted.	The Offset Area Report will document any illegal/unauthorised timber harvesting. All field monitoring will report on the presence of any unauthorised access and clearing.
Unplanned clearing	The SOA occurs within the Springwater property which is used for beef production. In addition, the SOA is located within Petroleum Leases operated by Santos. It is possible for unplanned / illegal clearing for agriculture or petroleum activities. Clearing can also occur by vehicles traversing the area off designated roads/tracks and/or illegal camping.	C	V	4	Installation of signage at all vehicle accesses identifying the areas as an environmental offset. Installation of fences. The SOA is shown as an exclusion zone within the Santos Geographic Information System. All field monitoring (rapid and detailed) will report on any evidence of clearing.	B	IV	2	No unauthorised access. No evidence of clearing within the offset area. Offset Area mapped as Category A on PMAV.	Fences are damaged and associated with vehicle tracks. Clearing observed in the SOA. Removal of trees in the SOA.	Dedicated revegetation project to re-instate cleared vegetation. Illegal clearing will be reported. Revegetation plan will be developed within two months following a fire. Reporting of clearing to Queensland Department of Environment and Science.	The Offset Area Report will document any illegal/unauthorised vegetation clearing/damage. All field monitoring will report on the presence of any unauthorised access and clearing.
Unplanned / uncontrolled fire in SOA	Unplanned burns during dry times can be sever and intense resulting in significant change in condition. Fires within intolerant vegetation communities. Given the high proportion of fire intolerant Regional Ecosystems (RE 11.9.5 and RE 11.9.4).	D	V	4	Fire will be completely excluded from the fire intolerant Regional Ecosystems present in the SOA (RE 11.9.5 and RE 11.9.4). Fire break will be maintained separating exotic grasses and fire intolerant Regional Ecosystems. A firebreak will be maintained around the SOA. This firebreak will not clear or impact on MNES.	B	III	2	Unplanned/ uncontrolled fire in SOA. Encroachment of fire on Fire intolerant vegetation communities.	Any uncontrolled fire. Fire damage to SOA. All field monitoring (rapid and detailed) will report on any evidence of fire observed.	Identify source of the fire and ensure encroachment pathway managed. After any unplanned fire the following will occur: • inspect and repair, and widen if necessary, all firebreaks; • inspect and repair fences to a stock proof condition; • reassess fuel load reduction practices;	All field monitoring (rapid and detailed) will report on any evidence of fire observed. Fire breaks will be inspected annually and inform the maintenance measures.

Risk Event	Risk Description	Initial Risk Ranking*			Management Measures / Actions	Residual Risk Ranking*			Performance Criteria	Management Triggers	Corrective actions	Monitoring Mechanism
		L	C	R		L	C	R				
					Fire will not be used as a tool for regrowth management on the offset areas. Fires on site will be started accordance with the Fire management guidelines for each regional ecosystem (e.g. when there is good soil moisture). Fire break maintenance undertaken once per year in mid to late autumn or early spring to clear firebreak, remove overhanging trees or fallen debris.						• exclude grazing until the ground layer at the end of the dry season is at least 60% of benchmark groundcover; and • Weed monitoring and control will be at monthly intervals post a fire event to maintain low levels of weed cover as the natural grass cover re-establishes. Undertake firebreak maintenance. Revegetation works may be required. An independent consultant will determine if this remedial action is required and the scope of the remedial action. This determination will occur within two months of a fire.	
New infestations of invasive weed species in SOA	Infestation of previously unidentified invasive weeds within the SOA.	C	III	2	Access to the offset are will be limited. All vehicles accessing the SOA are required to have a weed declaration form confirming their vehicle is free of weeds.	B	II	1	No recruitment of new weed species in SOA.	New invasive weed species are detected during annual monitoring. Establishment of new declared weeds. Failure of previous weed control attempts.	Implement control measures within one month. Independent ecologist to determine measures in accordance with the control measures outlined in the Biosecurity Queensland Fact Sheets. Isolation of area and chemical treatment to control any outbreaks. Increase monitoring if required. Treatment of a new infestation will be completed within two months of detection and monitored following the rapid monitoring event	The annual Offset Area Report will document if any new invasive weed species are detected during annual monitoring, the weed control measures to be implemented to control the new weed species.
Expansion of existing infestations of invasive weed species in SOA	The extent of existing infestations of invasive weed species expand or the weed species become more abundant within the area.	D	III	3	Access to the offset are will be limited. All vehicles accessing the SOA are required to have a weed declaration form confirming their vehicle is free of weeds. Independent ecologists report on proposed weed management measures will be conducted as part of the annual monitoring events. Chemical and/or mechanical control of all environmental weeds in accordance with the control measures outlined in the Biosecurity Queensland Fact Sheets.	B	II	1	Locations of class 1-3 declared weed populations known and being monitored / controlled. No increase in density of WoNS Decrease in exotic pasture cover. Prevent the introduction, establishment and spread of non-native weeds. Control existing infestations of non-native weeds including Prohibited or Restricted pest plants under the Biosecurity Act 2014 (Qld).	New infestation area identified. Existing infestations expand or become more abundant. Failure of previous weed control attempts. Weed cover >10%.	Implement control measures within one month. Independent ecologist to determine measures in accordance with the control measures outlined in the Biosecurity Queensland Fact Sheets. Isolation of area and chemical treatment to control any outbreaks. Increase monitoring if required. Treatment of a new infestation will be completed within two months of detection and monitored following the rapid monitoring event.	The annual Offset Area Report will document the weed presence, weed control measures and extent of grass cover during the reporting period and the relevant responsive actions.

Risk Event	Risk Description	Initial Risk Ranking*			Management Measures / Actions	Residual Risk Ranking*			Performance Criteria	Management Triggers	Corrective actions	Monitoring Mechanism
		L	C	R		L	C	R				
									Non- native weeds cover less than 10%.			
Increased population of feral animals in SOA.	Populations of pest species are present on Springwater. Any increase in pest numbers may directly impact on the MNES fauna values through direct predation (e.g. Cats) or through competition for resources (e.g. Hares).	D	III	3	All field monitoring (rapid and detailed) and regional pest animal monitoring will report on any evidence of feral animals. Pest animals will be controlled in conjunction with the existing pest animal control program run by Southern Queensland Landscapes.	B	II	1	No increase in abundance or of feral animals Maintain pest animal trapping program No evidence of new pest species.	An increase in abundance or of feral animals in the offset, greater level of impact by feral animals or evidence of new pest species	Development of species-specific additional measures to manage pest animals.	The annual Offset Area Report will document pest fauna present, and develop species-specific additional measures to manage pest animals, where required.
Unauthorised grazing in SOA	Grazing will be utilised as a tool to reduce fuel load associated with exotic pasture species, particularly buffel grass. Extensive grazing can promote and exacerbate the condition decline of vegetation communities by reducing ground cover diversity.	D	III	3	Fences are in working order and allow for exclusion of cattle when needed. Signage will be installed on all major access gates to ensure the Environmental Offset Area is well signposted. gates remain utilised to excluded cattle when required. Stocking rates are not fixed as this region is subject to significant changes in grass cover with seasonal conditions. However, grazing used as required when ground cover exceeds 60% and the fire risk is high.	B	II	1	No evidence of stock damage in Management Area 3. Fences to remain in working order.	Any signs of damage to the fence cause by cattle. Evidence of waterlogged soils and pugging will result in stock exclusion within 5 days of detection.	Upon being notified or becoming aware of groundcover falling below 30% cattle will be removed within seven days. Grazing period can recommence when the ground cover is greater than 60%. Undertake fence maintenance and repairs to re-secure the offset area within 10 days.	The annual Offset Area Report will document grazing pressure and the locations in which grazing by cattle was observed.
Brigalow regrowth prejudices desired Brigalow structure	Regrowth development stalling due to stem density. This reduces the ability for Brigalow to achieve the height and cover of an undisturbed remnant patch and thus prejudices desired species habitat requirements for species that use this community.	B	IV	2	Stem density assessed during annual monitoring events. Canopy analysis will be conducted in regrowth patches during every annual monitoring event.	A	II	1	Stems/ha within appropriate benchmark range.	Brigalow regrowth with >10,000 stems/ha.	Restoration thinning and regrowth management. Undertake selective thinning where Brigalow regrowth is >10,000 stems/ha.	The annual Offset Area Report will document Brigalow canopy analysis results and stem density.