



QGC

**VALKYRIE OFFSET AREA MANAGEMENT
PLAN**

QCLNG-BX00-ENV-RPT-000117 Rev 3

15 August 2017

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DECLARATION OF ACCURACY

I declare that:

1. To the best of my knowledge, all the information contained in, or accompanying this Management Plan¹ (*QGC Valkyrie offset area management plan*) is complete, current and correct.
2. I am duly authorised to sign this declaration on behalf of the approval holder.
3. I am aware that:
 - a. Section 490 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence for an approval holder to provide information in response to an approval condition where the person is reckless as to whether the information is false or misleading.
 - b. Section 491 of the EPBC Act makes it an offence for a person to provide information or documents to specified persons who are known by the person to be performing a duty or carrying out a function under the EPBC Act or the *Environment Protection and Biodiversity Conservation Regulations 2000* (Cth) where the person knows the information or document is false or misleading.
 - c. The above offences are punishable on conviction by imprisonment, a fine or both.

Signed



Full name (please print)

David Reinke

Organisation (please print)

QGC Pty Ltd

Date 15/8/2017

¹ QGC Valkyrie offset area management plan. QCLNG-BX00-ENV-RPT-000117 Rev 3

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1 Introduction

1.1 PURPOSE

In accordance with Commonwealth and State approvals obtained for the development of the Queensland Curtis Liquefied Natural Gas (QCLNG) project and associated Surat Basin Acreage Development (SBAD) project, QGC Pty Ltd a Shell group Business (QGC) is required to provide an Offset Area Management Plan (OAMP).

The purpose of the OAMP is to identify the management objectives and outcomes, and the actions necessary to fulfil the statutory requirements for the provision of an offset area and management plan under approvals (EPBC 2008/4398, EPBC 2008/4399 and EPBC 2013/7047) granted under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). This OAMP has been developed to meet Condition 32 of EPBC 2008/4398, Condition 21 of EPBC 2008/4399 and Condition 18 of EPBC 2013/7047, as well as associated requirements under the EPBC Act and the *Queensland Biodiversity Offset Policy Version 1.1 2014*.

In response to Conditions 34–41 of EPBC 2008/4398, this OAMP also contains a Rehabilitation Area Management Plan for a Rehabilitation Area Offset for the Brigalow threatened ecological community, which is listed as endangered under the EPBC Act.

This OAMP details the management measures to protect and enhance the Commonwealth and State offset values within the nominated offset area, and includes the management measures to protect and enhance the Brigalow Rehabilitation Area. It also specifies monitoring programs to track the performance of the offset values and maintenance of the nominated offset area for compliance purposes. The management approach for the nominated offset area is designed to minimise the risks associated with key threatening processes and more specifically the recognised threats to threatened species and ecological communities that are of relevance to the nominated offsets in this plan.

1.2 BACKGROUND

QGC is developing coal seam gas in the Surat Basin of southern Queensland for domestic and export markets through the QCLNG and SBAD projects. These projects source coal seam gas from the Walloon Fairway of the Surat Basin and transport it to the Curtis Island Liquefied Natural Gas facility via a 540 km subsurface gas transmission pipeline.

The QCLNG project received approval from the Commonwealth Department of Environment (DoE) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in October 2010 (EPBC 2008/4399 and EPBC 2008/4398). The QCLNG project was approved by the Queensland Coordinator General in June 2010.

The SBAD received approval from the Commonwealth DoE under the EPBC Act in December 2014 (EPBC 2013/7047) and the Queensland Department of Environment and Heritage Protection (DEHP) in September 2014.

As part of QGC's process to obtain the required Commonwealth and State offsets for both projects, several rural land holdings were identified and assessed at the desktop level to determine which landholdings would be best suited to satisfying QGC's offset commitments for both projects. QGC has now acquired Valkyrie a 9,636 hectare rural land holding as shown on Figure 1-1.

Field surveys were undertaken to validate Commonwealth and State offset values contained within the Valkyrie property. The survey determined that Valkyrie is capable of satisfying the majority of the Commonwealth and State offset requirements for the QCLNG and SBAD projects.

Within Valkyrie, QGC has nominated specific areas which acquit discrete aspects of the required offsets. These are referred to as the nominated offset areas throughout the remainder of this document.

1.3 COMMONWEALTH OFFSET REQUIREMENTS

1.3.1 QCLNG

The EPBC Act approvals (EPBC 2008/4399 and EPBC 2008/4398) for the QCLNG project require QGC to secure direct land based offsets for the following Matters of National Environmental Significance (MNES), as detailed in Table 1-1

Table 1-1 Commonwealth offset requirements for QCLNG

MNES	Required offset (ha)
QCLNG Gas Fields	
Brigalow remnant (<i>Acacia harpophylla</i> dominant and codominant) threatened ecological community (TEC)	219
Brigalow regrowth (<i>Acacia harpophylla</i> dominant and codominant) TEC	511
Brigalow rehabilitation area (<i>Acacia harpophylla</i> dominant and codominant) TEC, comprising a mix of remnant and regrowth vegetation	700
Yakka Skink (<i>Egernia rugosa</i>) habitat, which includes microhabitat for the species habitat	343
Brigalow Scaly-foot (<i>Paradelma orientalis</i>), which includes microhabitat for the species	235
Land suitable for receiving no less than 1,104 translocated/propagated Large-fruited Zamia (<i>Cycas megacarpa</i>) *	18
<i>Philotheca sporadica</i> habitat *	80
QCLNG Pipeline	
Semi-evergreen vine thickets of the Brigalow Belt and Nandewar Bioregions (SEVT) TEC	20
<i>Philotheca sporadica</i> habitat *	40

* *P. sporadica* and *C. megacarpa* offsets are not covered by this plan

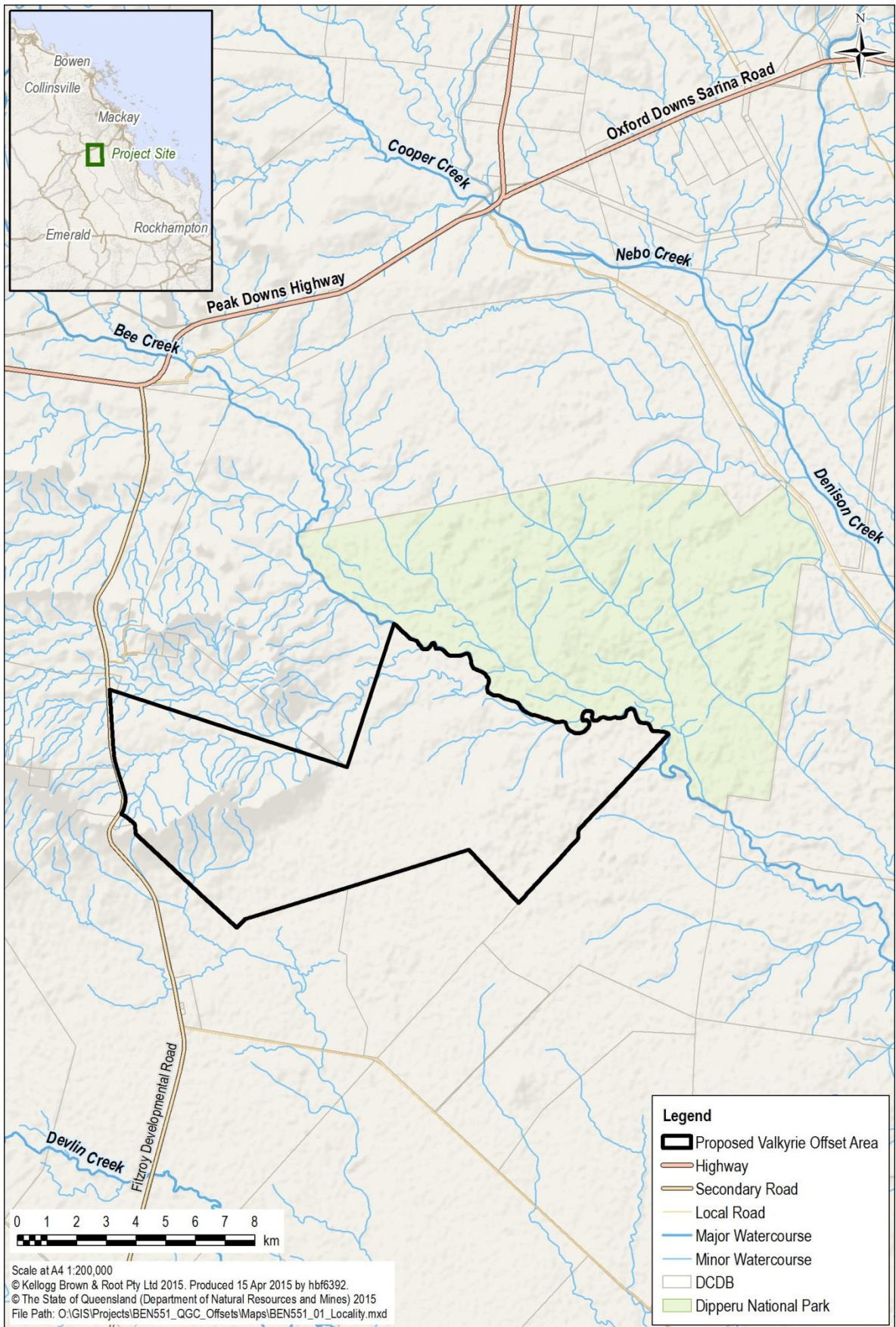


Figure 1-1
VALKYRIE

It is a requirement under the conditions of approval that the 730 ha Brigalow TEC offset be comprised of approximately 30% remnant vegetation and 70% regrowth vegetation. The 700 ha Brigalow rehabilitation area needed is to be a mix of remnant and regrowth vegetation with no specific percentages required.

The proposed 710.5 ha Brigalow rehabilitation area comprises 632 ha of Brigalow remnant that is in a degraded state due to agricultural land use (livestock grazing), which has been impacted by weed invasion and edge effects, and 78.5 ha of Brigalow regrowth that has been previously cleared. The selection of degraded remnant and regenerating Brigalow ensures that rehabilitation activities will facilitate an improvement to the condition and ecological function of the Brigalow Rehabilitation Area.

In March 2015 QGC applied to the Commonwealth Threatened Species Scientific Committee (TSSC) to have *Philothea sporadica* removed from the Commonwealth threatened species list. The application was made on the basis the species had a larger population size and greater geographic distribution than was previously known. Ecology surveys between 2010 and 2014 recorded a significant increase in the number of individuals identified - increasing by 250% (from 58,000 to 159,000 individuals) at over 3,100 locations in addition to those recorded in the HERBREC's data base at that time; including several new populations which extended the area of occupancy for the species by 100% (to 9,500ha). A decision on the listing of *Philothea sporadica* is yet to be made. Given this uncertainty QGC proposes to not provide *Philothea sporadica* offsets at this time, and commits to prepare and submit a revised plan providing *Philothea sporadica* offsets:

- within one month of a decision to retain the *Philothea sporadica* listing; or
- by 1 July 2018.

1.3.2 SBAD

The EPBC Act approval (EPBC 2013/7047) for the SBAD project requires QGC to secure direct land based offsets for impacts to MNES in accordance with the *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy 2012*. The MNES requiring offsets for the SBAD are presented in Table 1-2.

The Commonwealth offset requirements for the SBAD project are based upon predicted impacts based on the revised infrastructure layout.

For any EPBC Act listed threatened species and EPBC Act listed ecological communities not identified in table 1 of the EPBC Act approval (EPBC 2013/7047), the procedure for identifying significant residual impacts and proposed offsets will be in accordance with the QGC Surat basin Acreage Development Significant Species management Plan (QGC 2014).

Table 1-2 Commonwealth offset requirements for SBAD

MNES	Predicted impact area (ha)	*Required offset (ha)
Brigalow remnant (<i>Acacia harpophylla</i> dominant and codominant) TEC	4.4	25

MNES	Predicted impact area (ha)	*Required offset (ha)
Yakka Skink (<i>Egernia rugosa</i>) habitat	9.6	29.3
Koala (<i>Phascolarctos cinereus</i>) habitat	7.1	29
South-eastern Long-eared Bat (<i>Nyctophilus corbeni</i>) habitat	14.7	60

* The required predicted offsets for the SBAD project have been evaluated in the *SBAD Commonwealth offset site verification report - Property-H Valkyrie* (October, 2015). There is no offset proposed where no significant residual impact is predicted to occur for species listed in the EPBC Act approval (EPBC 2013/7047) disturbance limits.

1.4 STATE OFFSET REQUIREMENTS

1.4.1 QCLNG

The QCLNG Project received approval from the Queensland Government through the Coordinator General's report on the Environmental Impact Statement in June 2010. The Coordinator General's report includes conditions requiring the delivery of biodiversity offsets to compensate the unavoidable impacts to threatened species. The proposed offsets have been prepared in accordance with the applicable offset policy at the time of approval; the Queensland Government Environmental Offset Policy (QGEO), which came into effect on 1 July 2008.

The field investigations and desktop assessments undertaken for the *QCLNG offset site verification report - Property-H Valkyrie* (August, 2015), determined that Valkyrie can accommodate the majority of QGC's State offset requirements for the QCLNG project, including:

- Endangered regional ecosystems comprising Broad Vegetation Groups (BVGs) 7a, 17a and 25a
- Of Concern regional ecosystems comprising BVGs 16a, 16c, 17a, 17b and 34d.
- Yakka Skink (*Egernia rugosa*) habitat
- Brigalow Scaly-foot (*Paradelma orientalis*) habitat.

Where offset values aligned, the State offsets have been co-located with the Commonwealth offsets. This has resulted in Brigalow regional ecosystem offsets being co-located with Brigalow TEC offsets, and SEVT regional ecosystem offset requirements being co-located with SEVT TEC offsets.

The State offset requirements for the QCLNG project are based upon predicted impacts as of 30 March 2015 and a reconciliation process is required until project completion. Therefore, the required offsets for the project will change in response to the reconciliation of project impacts.

The State offsets for regional ecosystems for the QCLNG project on Valkyrie is presented in Table 1-3

Table 1-3 State offsets for endangered and of concern regional ecosystems for the QCLNG project on Valkyrie.

**Impacted BVG	Nominated regional ecosystem (BVG) for offsets on Valkyrie	Biodiversity status (NC Act)	Allocated offset (ha)
Regional Ecosystem offsets			
Endangered 7a	Current impact of 0.4 ha is <1ha. This impact will carry forward to next reconciliation.	N/A	x
Endangered 17a	RE 11.3.2 (BVG 17a) – <i>Eucalyptus populnea</i> woodland on alluvial plains, allocated at a ratio of 1:4 for the deficit of BVG 17a endangered	Of concern	2.4
Endangered 25a	RE 11.4.9 (BVG 25a) – <i>Acacia harpophylla</i> shrubby woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	Endangered	68.6
Of concern 13c	Current impact of 0.2 ha is <1ha. This impact will carry forward to next reconciliation.	N/A	x
Of concern 16a	RE 11.3.25 (BVG 16a) – <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	Of concern	87.8
Of concern 16c	RE 11.3.4 (BVG 16c) – <i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains	Of concern	31.0
Of concern 17a	RE 11.3.2 (BVG 17a) – <i>Eucalyptus populnea</i> woodland on alluvial plains	Of concern	51.4
Of concern 17b	RE 11.3.2 (BVG 17a) – <i>Eucalyptus populnea</i> woodland on alluvial plains, allocated for the deficit of BVG 17b Of concern	Of concern	3.0
Of concern 34d	11.3.27i (BVG 34d) – Palustrine wetland (vegetated swamp), <i>Eucalyptus camaldulensis</i> or <i>E. tereticornis</i> woodland to open woodland with sedgeland ground layer, in depressions on floodplains	Of concern	5.4

** (as at 30 March 2015)

1.4.2 SBAD

The State offsets for the SBAD project are to be provided in accordance with the *Queensland Biodiversity Offset Policy Version 1.1 January 2014* (QBOP), which is an offset policy under QGEOP.

The field investigations and desktop assessments undertaken for the *SBAD State offset site verification report - Property-H Valkyrie* (October, 2015), determined that Valkyrie can accommodate the majority of QGC's State offset requirements for the SBAD project, including:

- Endangered regional ecosystems:
 - 11.3.1 – *Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains (BVG 25a)
 - 11.9.5 – *Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks (BVG 25a).

- Of concern regional ecosystem:
 - 11.3.2 – *Eucalyptus populnea* woodland on alluvial plains (BVG 17a).
- Threatened fauna species habitat:
 - Glossy Black-cockatoo (*Calyptorhynchus lathami lathami*)
 - Pale Imperial Hairstreak (*Jalmenus eubulus*).

In accordance with QBOP v1.1, the *Ecological Equivalence Methodology Guideline* Version 1 (2011) (EEM), was applied to determine the offsetting requirements for residual impacts upon endangered (RE 11.3.1 and 11.9.5) and of concern regional ecosystem (RE 11.3.2).

Where offset values aligned, the State offsets have been co-located with the Commonwealth offsets. This has resulted in Brigalow regional ecosystem offsets being co-located with Brigalow TEC offsets.

The nominated State offsets for endangered and of concern regional ecosystems for the SBAD project on Valkyrie is presented in Table 1-4.

Table 1-4 Nominated State offsets for endangered and of concern regional ecosystems for the SBAD project on Valkyrie

Impacted BVG	Nominated regional ecosystem (BVG) for offsets on Valkyrie	Biodiversity status (NC Act) of nominated offsets	Area (ha)
Endangered 17a	RE 11.3.2 (BVG 17a) – <i>Eucalyptus populnea</i> woodland on alluvial plains	Of concern	15
Endangered 25a	RE 11.4.9 (BVG 25a) – <i>Acacia harpophylla</i> shrubby woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	Endangered	5.6

The nominated State offsets for threatened flora and fauna species for the SBAD project on Valkyrie is presented in Table 1-5.

Table 1-5 State offsets for threatened fauna species habitats for the SBAD project on Valkyrie

Threatened fauna species habitat	Nominated regional ecosystems as habitat offsets	Area (ha)
Glossy Black-cockatoo (<i>Calyptorhynchus lathami lathami</i>)	RE 11.3.25 - <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	21
Pale Imperial Hairstreak (<i>Jalmenus eubulus</i>)	RE 11.3.1 - <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	9

2 Management plan overview

2.1 RELEVANT POLICIES AND GUIDELINES

Multiple offset policies, reference guidelines and additional documents have been utilised in the preparation of this OAMP.

2.1.1 Relevant Commonwealth and State Legislation

Listed below is the legislation of relevance to the preparation of this management plan for the nominated offset areas:

- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*
- *Vegetation Management Act 1999 (VM Act)*
- *Nature Conservation Act 1992 (NC Act)*
- *Biosecurity Act 2014 (QLD)*
- *Environmental Protection Act 1994 (EP Act)*
- *Aboriginal Cultural Heritage Act 2003*
- *Native Title Act 1993.*

2.1.2 Commonwealth environmental offset Policy and guidelines

The relevant Commonwealth offset policies and guidelines that have informed the requirements of this OAMP include:

- Environmental Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy, October 2012
- Species Profiles and Threats Database (SPRAT), Commonwealth website
- Key threatening processes listed under the EPBC Act, Commonwealth website
- Weeds of National Significance (WoNS), Australian Weeds Committee website
- Invasive species, Commonwealth website.

2.1.3 Queensland environmental offset policies and guidelines

The relevant Queensland State offset guidelines and reference documents that have informed the development of this OAMP include:

- Queensland Government Environmental Offsets Policy, 1 July 2008 (QGEOP) – QCLNG project
- Queensland Biodiversity Offset Policy (Version 1.1), January 2014 (QBOP) – SBAD project

- Ecological Equivalence Methodology Guideline – Policy for Vegetation Management Offsets – Queensland Biodiversity Offset Policy – Version 1, 3 October 2011 (EEM)
- Methodology for Survey and Mapping of Regional Ecosystem and Vegetation Communities in Queensland Version 3.2, August 2012
- Regional Ecosystem Descriptions Database (REDD) Version 8.1, 2014, State website
- Bio-Condition Benchmarks for Regional Ecosystem Condition Assessment - Brigalow Belt Bioregion
- Queensland's Bioregional Ecosystems – Chapter 11 Brigalow Belt Version 6.1
- Threatened species, State website
- Invasive Plants and Animals, State website.

The relevant offsets frameworks for the QCLNG and SBAD projects are those that were in place at the time of each respective approval. Therefore, the QGEOP (1 July 2008) is the framework on which QCLNG offsets are based and the QBOP (January 2014) is the framework on which the SBAD offsets are based.

2.2 LEGAL MECHANISMS FOR SECURING OFFSETS

QGEOP and QBOP both list the following mechanisms for legally securing State offsets:

- declaration as a nature refuge under section 46 or a protection area under section 29(1) of the *Nature Conservation Act 1992*
- declaration as an area of high nature conservation value under section 19F of the *Vegetation Management Act 1999*
- statutory covenant for environmental purposes under the *Land Act 1994* or *Land Title Act 1994*
- secured or declared via other mechanisms administered and approved by the State Government such as to negotiate the transfer and dedication of the offset as a State managed National Park, Regional park or Conservation Park under the *Nature Conservation Act 1992* (Qld), as previously demonstrated with the Monte Cristo property.

QGC will implement one of the above mechanisms to secure the offset site, and is currently the registered owner of the property. QGC will pursue dedication of the offset as a State managed Regional Park for transition to a National Park under the *Nature Conservation Act 1992* (Qld). In the interim QGC will seek to apply a declaration as an area of high nature conservation value under section 19F of the *Vegetation Management Act 1999* to protect the offset areas by 20 October 2017.

The completion criteria will be met upon achieving the target quality score increase for the SBAD offset areas. An increase in the habitat quality score will be measured at the monitoring locations for each Matter. If the habitat quality score increase of one unit is achieved in less than the maximum twenty-year time period, then the completion criteria will be deemed to have been achieved. Ongoing monitoring and reporting for any

remaining years within the maximum twenty year period will be completed to ensure no further active management is required to maintain the final habitat quality score.

With respect to QCLNG Gas Field and Pipeline offset areas, improvement in the ecological condition of existing Brigalow and SEVT TEC and fauna habitat offset areas will be monitored during a proposed 20 year management period. It is anticipated that regeneration of regrowth Brigalow TEC will reach remnant status within a 20 year management timeline. However, Brigalow regrowth and rehabilitation areas will be managed beyond 20 years where required to achieve remnant status.

Further to this, should the offset area be accepted by the State Government for declaration as a Regional Park or National Park, the measures outlined in the OAMP will no longer apply. At this stage the OAMP will be superseded by the long-term objectives and management of the area by the State Government according to the requirements of the Nature Conservation Act 1992 (Qld).

2.3 STRUCTURE OF PLAN

To ensure that the OAMP is effective in achieving the required objectives and outcomes for the nominated Offset areas, it has been developed as a practical ‘what to do’ and ‘how to do it’ living, working document. In this regard it has been developed to guide the user(s) to the specific management actions and monitoring programs that are required for the various offset values within the nominated offset areas to achieve its objectives and outcomes.

The OAMP includes:

- a practical management action table that outlines the management actions, frequency and times of actions, responsibilities and monitoring requirements
- descriptions of the biodiversity values of Valkyrie
- threats to the identified offset values
- the management aims, objectives and outcomes for the nominated offset areas, including any restrictions imposed upon the area
- risk analysis and remedial actions in an adaptive management framework
- a monitoring program including monitoring techniques, timing and frequencies, responsibilities, performance criteria and corrective actions
- requirements for compliance reporting.

2.4 OVERVIEW OF MANAGEMENT PLAN OBJECTIVES

To fulfil Commonwealth and State offset requirements for the QCLNG and SBAD projects, a management plan and monitoring program is required for the nominated offset areas. The management plan for the nominated Offset areas is presented in Section 6, whilst the monitoring program is presented in Section 7. Management of the Brigalow Rehabilitation Area is described in section 8 and the ongoing monitoring of the area in section 9.

The management objectives for the nominated offsets include:

- deliver an overall conservation outcome that improves and maintains the viability of the SEVT and Brigalow TECs
- deliver an overall conservation outcome that improves and maintains the viability of habitats for the threatened species listed under the EPBC Act and/or NC Act, that are being offset on Valkyrie
- provide a direct offset that is in proportion to the level of statutory protection that applies to the endangered TECs (SEVT and Brigalow) and threatened species habitats
- be of a size and scale proportionate to the residual impacts on the SEVT and Brigalow TECs, and threatened species habitats
- effectively account for and manage the risks of the offset not being successful within the required management timeframe
- be commensurate with what is already required as an offset under QBOP for residual impacts upon endangered and of concern regional ecosystems that also constitute TECs
- be efficient, effective, timely, transparent, scientifically robust and reasonable
- have appropriate transparent governance arrangements in place for measuring, monitoring, auditing and enforcing the management of the nominated offset areas in accordance with this OAMP.

QGC will actively manage and monitor the nominated offset areas and rehabilitation area at the level and frequency described in this OAMP, which is consistent with the time needed to meet the required ecological gain.

3 Offset area values

3.1 BIOREGIONAL CONTEXT

Queensland has been sub-divided into 13 biogeographical areas to identify biodiversity features at a regional level. Valkyrie is located within the northern half of the Brigalow Belt Bioregion. This region is characterised by flora and fauna species of open woodland, including the widespread leguminous tree Brigalow. Other vegetation communities within Valkyrie include non-remnant grassland, Eucalypt woodlands and forests, Acacia woodlands and forests, riparian woodlands and forests, and semi-evergreen vine thickets.

3.2 BIODIVERSITY VALUES

Valkyrie is connected to the south-western extent of Dipperu National Park. At the landscape scale, Valkyrie and Dipperu National Park are located at the eastern extent of a significant wildlife corridor that extends westward from both properties, prior to extending north along the Carborough Range. This extensive wildlife corridor, for which Valkyrie and Dipperu National Park are part, is considered to have state significant biodiversity values.

Bee Creek, a stream order six watercourse, is the dividing line between Valkyrie and Dipperu National Park and is the catalyst for connectivity between both properties. Bee Creek supports a riparian corridor that extends from its headwaters approximately 70 km to the northwest of Valkyrie downstream approximately 27 km where it flows into Funnel Creek a stream order seven watercourse.

The Valkyrie side of Bee Creek is comprised of a remnant riparian to floodplain ecosystem that possesses a high level of biodiversity in the form of Semi-evergreen Vine Thicket (SEVT), Eucalypt riparian and floodplain woodlands, Brigalow woodlands and a series of palustrine freshwater wetlands. Valkyrie compliments the biodiversity values that are contained within Dipperu National Park on the opposing side of Bee Creek.

Further away from Bee Creek and in other parts of the property, Valkyrie has been subject to agricultural land use disturbances, such as land clearing and grazing. However, in the context of agricultural land use in Australia, these disturbances are relatively recent, which is evidenced by the ecological condition of the remnant vegetation and the quality of species habitats supported therein.

The southern half of the north-eastern part of the property and the eastern third of the south-western part of the property is primarily a network of Brigalow vegetation communities on a Gilgai landform. This extensive Brigalow on Gilgai ecosystem possesses a high level of biodiversity value, especially during the wet season.

A ridgeline extending southwest to northeast through the middle of the south-western part of the property has been termed 'Valkyrie Rise' for ease of reference. Valkyrie Rise

supports a large area of intact remnant SEVT along the upper ridgeline and southern face, which is surrounded by remnant open Eucalypt and Acacia woodlands. Valkyrie Rise and its lower slopes have a high level of connectivity with the Brigalow on Gilgai ecosystem to the east and more extensive woodland areas to the west beyond the Fitzroy Developmental Road.

Valkyrie has been subject to some relatively recent historical land disturbances but it possesses a high level of biodiversity and retains a substantial amount of connectivity with the surrounding landscape. Valkyrie is a key link between Dipperu National Park and the Carborough Range wildlife corridor and is an integral part of the Bee Creek riparian corridor.

Valkyrie possesses high conservation value and is ideal for the provision of biodiversity offsets or as an addition to Dipperu National Park. It will ensure an ecological gain for the residual impacts resulting from the QCLNG and SBAD projects.

3.3 GROUND-TRUTHING OF REGIONAL ECOSYSTEMS MAPPING

The methodology to ground-truth the published regional ecosystem mapping (Version 8.0) was in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland Version 3.2* (DSITIA, 2012). The published regional ecosystems across Valkyrie are depicted on Figure 3-1.

The ground-truthing surveys involved brief observation points at various locations across the site along vehicle and walking traverses. The survey targeted the regional ecosystems in DEHP’s published mapping, which were identified as being of potential offset value.

Observations were conducted in accordance with Queensland Herbarium quaternary level flora survey method, whilst detailed surveys were equivalent to the Queensland Herbarium tertiary level flora survey method. The ground-truthed mapping is at a scale of 1:10,000.

The ground-truthed regional ecosystems are presented in Figure 3-1 and depicted on Figure 3-2.

Table 3-1 Ground-truthed regional ecosystem mapping across Valkyrie

Regional ecosystem	Short description	Biodiversity status (NC Act)	BVG	TEC	Area (ha)
11.3.1	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	Endangered	25a	Brigalow	94.1
11.3.2	<i>Eucalyptus populnea</i> woodland on alluvial plains	Of concern	17a		176.0
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains	Of concern	16c		68.7
11.3.11	Semi-evergreen vine thicket on alluvial plains	Endangered	7a	SEVT	89.7
11.3.25	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	Of concern	16a		210.7

Regional ecosystem	Short description	Biodiversity status (NC Act)	BVG	TEC	Area (ha)
11.3.27f	Palustrine wetland (vegetated swamp), <i>Eucalyptus coolabah</i> and/or <i>E. tereticornis</i> open woodland to woodland fringing swamps on closed depressions on floodplains associated with old drainage courses	Of concern	34d		11.4
11.3.27i	Palustrine wetland (vegetated swamp), <i>Eucalyptus camaldulensis</i> or <i>E. tereticornis</i> woodland to open woodland with sedgeland ground layer, in depressions on floodplains	Of concern	34d		14.7
11.4.2	<i>Eucalyptus</i> spp. and/or <i>Corymbia</i> spp. Grassy or shrubby woodland on Cainozoic clay plains	Of concern	17a		373.2
11.4.3	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> shrubby open forest on Cainozoic clay plains	Endangered	25a	Brigalow	35.4
11.4.3x	<i>Casuarina cristata</i> and <i>Terminalia oblongata</i> woodland with <i>Eucalyptus cambageana</i> emergent on Cainozoic clay plains	Endangered	25a	No <i>Acacia harpophylla</i>	137.5
11.4.7	<i>Eucalyptus populnea</i> with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest to woodland on Cainozoic clay plains	Endangered	25a	Brigalow	20.7
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	Endangered	25a	Brigalow	1,214.6
11.4.8x	<i>Eucalyptus cambageana</i> , <i>Acacia harpophylla</i> and <i>Casuarina cristata</i> woodland with semi-evergreen vine thicket understory on Cainozoic clay plains	Endangered	25a	Brigalow/ SEVT	14.9
11.4.9	<i>Acacia harpophylla</i> shrubby woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	Endangered	25a	Brigalow	383.3
11.5.3	<i>Eucalyptus populnea</i> ± <i>E. melanophloia</i> ± <i>Corymbia clarksoniana</i> on Cainozoic sand plains and/or remnant surfaces	No concern at present	17a		363.8
11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains/remnant surfaces	No concern at present	18b		848.0
11.5.11	<i>Acacia leptostachya</i> shrubland on Cainozoic sand plains/remnant surfaces	Of concern	24a		96.4
11.11.1	<i>Eucalyptus crebra</i> ± <i>Acacia rhodoxylon</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding	No concern at present	13c		1,274.7
11.11.2	<i>Acacia shirleyi</i> or <i>A. catenulata</i> low open forest on old sedimentary rocks with varying degrees of metamorphism and folding	No concern at present	24a		69.5
11.11.16	<i>Eucalyptus cambageana</i> , <i>Acacia harpophylla</i> woodland on old sedimentary	Of concern	25a		26.6

Regional ecosystem	Short description	Biodiversity status (NC Act)	BVG	TEC	Area (ha)
	rocks with varying degrees of metamorphism and folding. Lowlands				
11.11.18	Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding.	Endangered	7a	SEVT	122.7
Sub-total (remnant vegetation)					5,646.6
11.3.11	Semi-evergreen vine thicket on alluvial plains	Endangered	7a	SEVT	2.8
11.4.3	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> shrubby open forest on Cainozoic clay plains	Endangered	25a	Brigalow	1.9
11.4.7	<i>Eucalyptus populnea</i> with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest to woodland on Cainozoic clay plains	Endangered	25a	No <i>Acacia harpophylla</i>	40.7
11.4.8	<i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains	Endangered	25a	Brigalow	1,047.8
11.4.9	<i>Acacia harpophylla</i> shrubby woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	Endangered	25a	Brigalow	542.8
11.5.3	<i>Eucalyptus populnea</i> ± <i>E. melanophloia</i> ± <i>Corymbia clarksoniana</i> on Cainozoic sand plains and/or remnant surfaces	No concern at present	17a		32.2
11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains and/or remnant surfaces	No concern at present	18b		6.5
11.11.1	<i>Eucalyptus crebra</i> ± <i>Acacia rhodoxylon</i> woodland on old sedimentary rocks with varying degrees of metamorphism and folding	No concern at present	13c		15.2
Sub-total (regrowth vegetation)					1,689.9
Non-remnant vegetation					2,299.5
Total					9,636.0

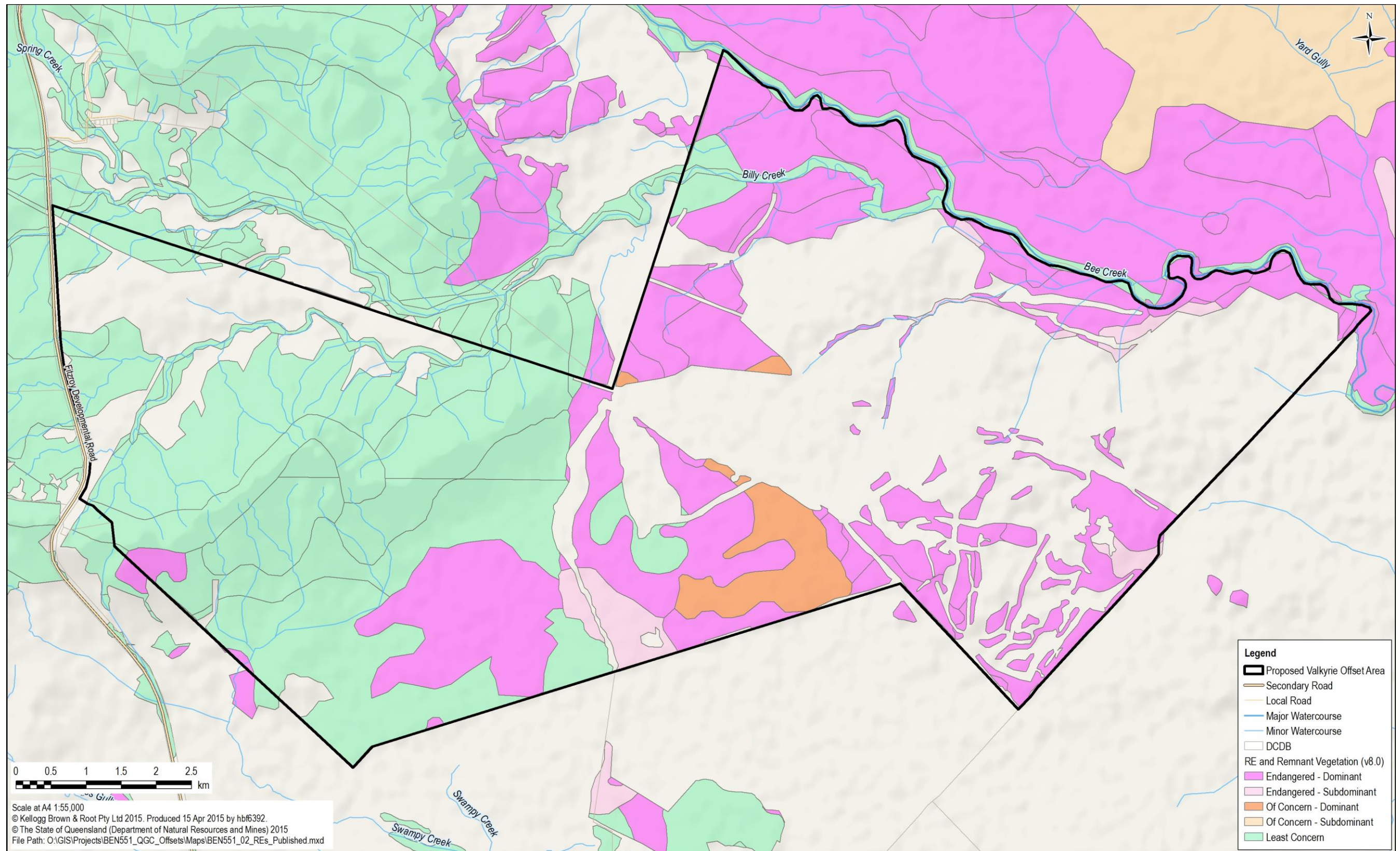


Figure 3-1
DEHP REGIONAL ECOSYSTEM MAPPING VERSION 8.0

3.4 COMMONWEALTH OFFSET VALUES

The Valkyrie property has been confirmed as being able to satisfy the following Commonwealth offset requirements for the QCLNG and SBAD projects:

- Threatened ecological communities:
 - Brigalow remnant (*Acacia harpophylla* dominant and codominant)
 - Brigalow regrowth (*Acacia harpophylla* dominant and codominant)
 - Brigalow rehabilitation area (*Acacia harpophylla* dominant and codominant), comprising a mix of remnant and regrowth vegetation
 - Semi-evergreen vine thickets of the Brigalow Belt and Nandewar Bioregions remnant
- Threatened fauna species habitat:
 - Yakka Skink (*Egernia rugosa*)
 - Brigalow Scaly-foot (*Paradelma orientalis*)
 - South-eastern Long-eared Bat (*Nyctophilus corbeni*)
 - Koala (*Phascolarctos cinereus*)

3.4.1 Threatened ecological communities

A key objective of the Commonwealth offsets for the QCLNG and SBAD projects is to offset the residual impacts to TECs resulting from each project.

In accordance with the EPBC Act, a TEC is an ecological community whose distribution and extent is recognised as being threatened in the wild and are listed as critically endangered, endangered or vulnerable under the Act. Many TECs are also described as endangered or of concern regional ecosystems under the VM Act.

The field assessments associated with the ground-truthing of regional ecosystems has resulted in the identification and verification of TECs within Valkyrie, as detailed in Table 3-2 and depicted on Figure 3-3.

Table 3-2 Extent of TECs on Valkyrie and their corresponding regional ecosystems

Threatened ecological communities	Corresponding regional ecosystems	Area (ha)
Brigalow remnant (<i>Acacia harpophylla</i> dominant and codominant)	REs 11.3.1, 11.4.3, 11.4.7, 11.4.8 and 11.4.9	1,742
Brigalow regrowth (<i>Acacia harpophylla</i> dominant and codominant)	REs 11.4.3, 11.4.8 and 11.4.9	1,593
Semi-evergreen vine thickets of the Brigalow Belt and Nandewar Bioregions remnant	REs 11.3.11 and 11.11.18	212
Semi-evergreen vine thickets of the Brigalow Belt and Nandewar Bioregions regrowth	RE 11.3.11	3

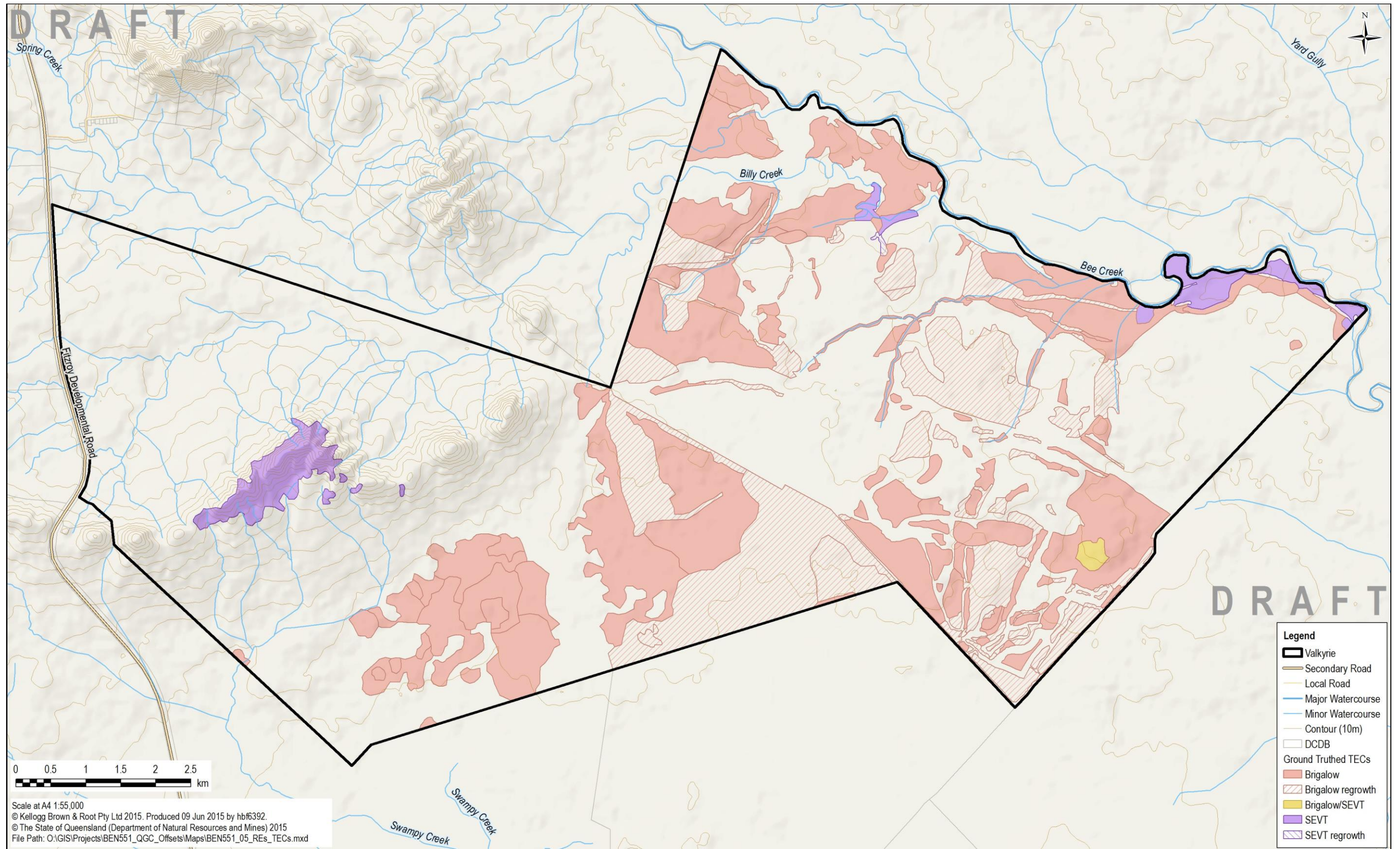


Figure 3-3
GROUND-TRUTHED THREATENED ECOLOGICAL COMMUNITIES

Brigalow remnant (*Acacia harpophylla* dominant and codominant)

The ground-truthing of regional ecosystems within the nominated offset areas has confirmed the availability of 1,742 ha of Brigalow remnant TEC that can be used for offsets, as shown in Figure 3-3.

The condition and quality of the Brigalow remnant within Valkyrie is variable due to past agricultural land use disturbances. However, based upon EEM field data, the majority of the Brigalow remnant is in very good condition and of high quality, whilst some of the more isolated or fragmented patches are degraded, as a result grazing, weed infestation and general edge effects at the extent of historical land clearing.

Of the 1,742 ha of Brigalow remnant available for offsets, 219 ha has been allocated to the Brigalow remnant offset, with an additional 632 ha of Brigalow remnant that has been allocated toward the 710.5 ha Brigalow rehabilitation area offset. A further 22.6 ha of Brigalow remnant has also been allocated to the SBAD offset requirements for impacts upon Brigalow TEC, as shown on Figure 3-4.

The remaining 869 ha of Brigalow remnant within Valkyrie is surplus and will be retained for advanced offsets, as shown on Figure 3.4. The allocation of the remnant Brigalow TEC present within the Valkyrie Offset area is detailed in Table 3-3.

Table 3-3 Allocation of Brigalow remnant as offsets and surplus for advanced offsets

Brigalow remnant allocation	Area (ha)
QCLNG Brigalow remnant offset	219
QCLNG Brigalow Rehabilitation Area (remnant component)	632
SBAD (remnant Brigalow)	25
Surplus Brigalow remnant for advanced offset purposes	866
Total Brigalow remnant on Valkyrie	1,742

Brigalow regrowth (*Acacia harpophylla* dominant and codominant)

The ground-truthing of regional ecosystems within the nominated offset areas has confirmed the availability of 1,593 ha of Brigalow regrowth TEC that can be used for offsets, as shown on Figure 3-3.

The condition and quality of the Brigalow regrowth within Valkyrie is at various stages of regrowth development, ranging from very young recently cleared regrowth (1–5 years) through to advanced regrowth, which in some instances contains remnant components such as relic emergent Brigalow or Blackbutt trees. The varying level of regrowth development is a function of land clearing that has periodically occurred over decades.

Of the 1,593 ha of Brigalow regrowth available for offsets, 511 ha has been allocated to satisfy the Brigalow regrowth offset for the QCLNG project, with an additional 78.5 ha of Brigalow regrowth that has been allocated toward the 710.5 ha Brigalow rehabilitation area offset, as shown on Figure 3-4.

The remaining 1003.5 ha of Brigalow regrowth within Valkyrie is surplus that will be retained for advanced offsets, as shown on Figure 3-4.

The allocation of Brigalow regrowth is detailed in Table 3-4.

Table 3-4 Allocation of Brigalow regrowth as offsets and surplus for advanced offsets

Brigalow regrowth allocation	Area (ha)
QCLNG Brigalow regrowth offset	511
QCLNG Brigalow Rehabilitation Area (regrowth component)	78.5
Surplus Brigalow regrowth for advanced offset purposes	1003.5
Total Brigalow remnant on Valkyrie	1,593

Semi-evergreen vine thickets of the Brigalow Belt and Nandewar Bioregions

The ground-truthing of regional ecosystems within the nominated offset areas has confirmed the availability of 212 ha of remnant SEVT TEC that can be used for offsets, as shown on Figure 3-3. The SEVT is present in two forms within Valkyrie, SEVT on an alluvial floodplain adjacent to Bee Creek and SEVT on old sedimentary rocks with metamorphism and folding, which straddles the ridgeline of Valkyrie rise in the western half of Valkyrie.

The vast majority of remnant SEVT within Valkyrie is in very good condition and is of high quality. This is primarily due to it being located in areas removed from grazing and land clearing. The only evidential signs of degradation are weed infestations along edges that are exposed to access tracks and open paddocks. It possesses high biodiversity and is of ecological significance, in particular the SEVT on the alluvial floodplain.

Of the 212 ha of SEVT remnant available for offsets, 20 ha has been allocated to satisfy the SEVT offset for the QCLNG project, as shown on Figure 3-4. The remaining 192 ha of SEVT remnant within Valkyrie is surplus that will be retained for advanced offsets, as shown on Figure 3-4.

There is a further 3 ha of SEVT that is in a state of regrowth as a result of past land clearing activities. This 3 ha of SEVT regrowth within Valkyrie is surplus that will be retained for advanced offsets, as shown on Figure 3-4.

The allocation of SEVT remnant and regrowth is detailed in Table 3-5.

Table 3-5 Allocation of SEVT remnant and regrowth as offsets and surplus for advanced offsets

SEVT remnant and regrowth allocation	Allocation Amount (ha)
QCLNG SEVT remnant offset	20
Surplus SEVT remnant for advanced offset purposes	192
Surplus SEVT regrowth for advanced offset purposes	3
Total SEVT remnant and regrowth on Valkyrie	215

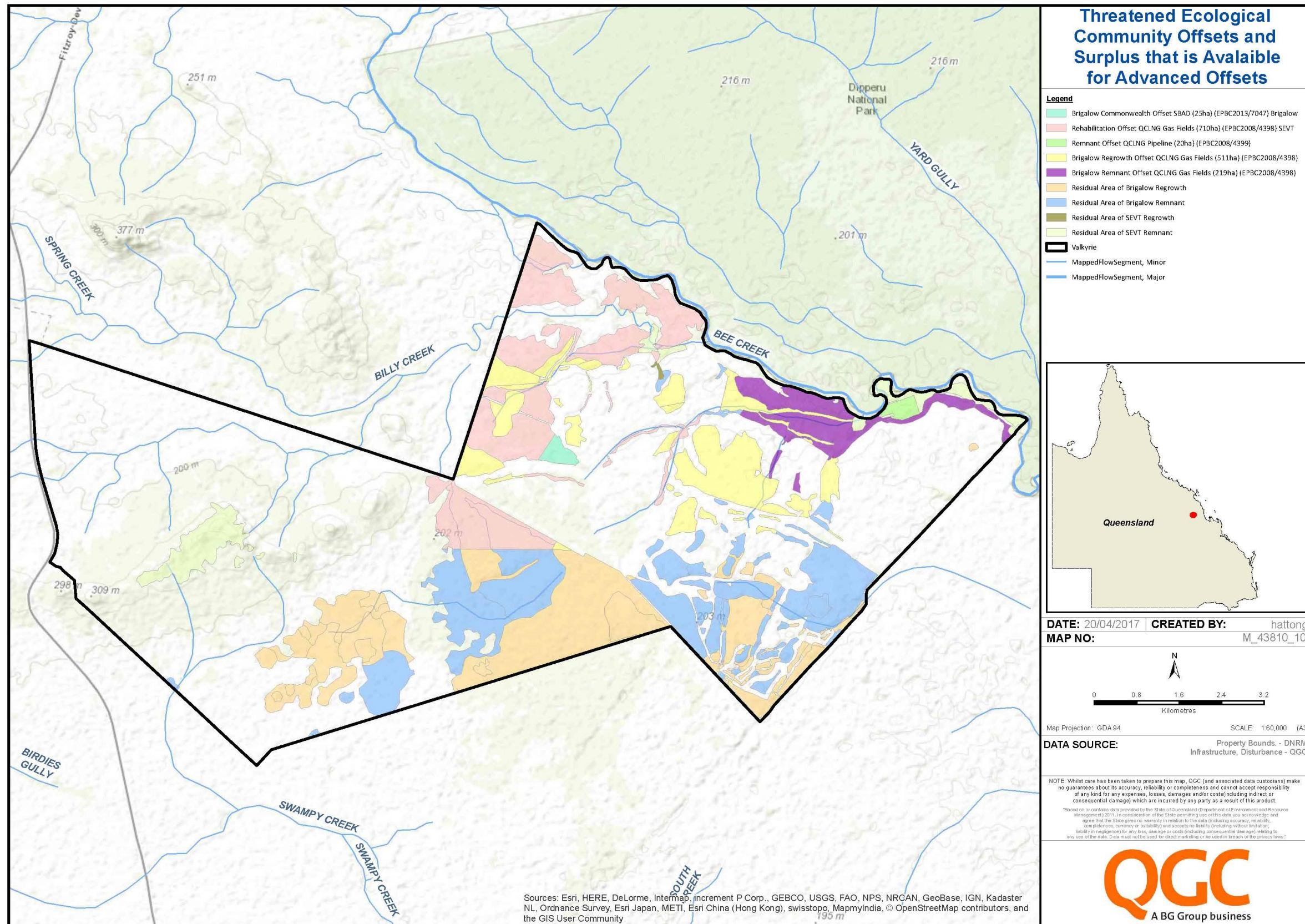


Figure 3-4 THREATENED ECOLOGICAL COMMUNITY OFFSETS AND SURPLUS THAT IS AVAILABLE FOR ADVANCED OFFSETS

3.4.2 Threatened fauna species habitats

Another key objective of the Commonwealth offsets for the QCLNG and SBAD projects is to offset the residual impacts to threatened fauna species and their habitats resulting from each project.

Under the provisions of the EPBC Act, threatened fauna species are recognised as being threatened in the wild and if not appropriately protected and conserved, may be placed at risk of extinction. Threatened fauna species may be listed under Section 178 of the EPBC Act in any one of the categories: extinct, extinct in the wild, critically endangered, endangered, vulnerable, or conservation dependant. Many of the threatened fauna species listed under the EPBC Act are also listed under the NC Act.

The ground-truthing of regional ecosystems and associated assessments has resulted in the identification and verification of threatened fauna habitats within Valkyrie, as detailed in Table 3-6.

Table 3-6 Extent of ground-truthed and verified threatened fauna species habitat required for Commonwealth offsets within Valkyrie

Threatened fauna species habitat	Area (ha)
Yakka Skink (<i>Egernia rugosa</i>) habitat	5,669
Brigalow Scaly-foot (<i>Paradelma orientalis</i>) habitat	5,795
Koala (<i>Phascolarctos cinereus</i>) habitat	3,733
South-eastern Long-eared Bat (<i>Nyctophilus corbeni</i>) habitat	3,844

Yakka Skink (*Egernia rugosa*)

The ground-truthing of regional ecosystems within Valkyrie has confirmed the availability of 5,669 ha of Yakka Skink habitat that can be used for offsets.

The Yakka Skink and Brigalow Scaly-foot are known to co-occur in like habitats (DoE, 2015a), which in reference to Valkyrie means there is no habitat that is preferred by one and not the other. This habitat is comprised of Brigalow woodlands and open forests, Eucalypt woodlands and open forests, riparian forests and woodlands, forested swamps and SEVT, which occurs on regional ecosystem land zones 3, 4 and 5 (DoE, 2015a).

The condition and quality of the Yakka Skink habitat within Valkyrie is variable due to past agricultural land use disturbances. The majority of this habitat is associated with remnant vegetation, which is in good condition and is of high habitat value for the species. However, there are isolated or fragmented patches of habitat that are degraded, as a result of grazing, weed infestation and general edge effects adjacent to historical land clearing.

Of the 5,669 ha of Yakka Skink habitat available for offsets, 343 ha has been allocated to satisfy the offset requirement for QCLNG project and an additional 29.3 ha has been allocated to satisfy the offset requirement for the SBAD project, as shown on Figure 3-5.

The remaining 5,257 ha of Yakka Skink habitat within Valkyrie is surplus that will be retained for advanced offsets, as shown on Figure 3.4. The allocation of Yakka Skink habitat is detailed in Table 3-5.

Table 3-7 Allocation of Yakka Skink habitat as offsets and surplus for advanced offsets

Yakka Skink habitat allocation	Area (ha)
QCLNG Yakka Skink habitat offset	343
SBAD Yakka Skink habitat offset	29.3
Surplus Yakka Skink habitat for Commonwealth advanced offset purposes	5,297
Total Yakka Skink habitat on Valkyrie	5,669

Brigalow Scaly-foot (*Paradelma orientalis*)

The ground-truthing of regional ecosystems within Valkyrie has confirmed the availability of 5,795 ha of Brigalow Scaly-foot habitat that can be used for offsets. This habitat is comprised of Brigalow woodlands and open forests, Eucalypt woodlands and open forests, riparian forests and woodlands, forested swamps and SEVT, which occurs on regional ecosystem land zones 3, 4 and 5 (DoE, 2015b).

As above for the Yakka Skink, the condition and quality of the Brigalow Scaly-foot habitat within Valkyrie is also variable due to past agricultural land use disturbances. The majority of this habitat is associated with remnant vegetation, which is in good condition and is of high habitat value for the species. However, there are isolated or fragmented patches of habitat that are degraded, as a result of grazing, weed infestation and general edge effects adjacent to historical land clearing.

Of the 5,795 ha of Brigalow Scaly-foot habitat available for offsets, 235 ha has been allocated to satisfy the offset requirement for QCLNG project, as shown on Figure 3-6.

The remaining 5,560 ha of Brigalow Scaly-foot habitat within Valkyrie is surplus that will be retained for advanced offsets, as shown on Figure 3-6. The allocation of Brigalow Scaly-foot habitat is detailed in Table 3-8.

Table 3-8 Allocation of Brigalow Scaly-foot habitat as offsets and surplus for advanced offsets

Brigalow Scaly-foot habitat allocation	Area (ha)
QCLNG Scaly-foot habitat offset	235
Surplus Brigalow Scaly-foot habitat for Commonwealth advanced offset purposes	5,560
Total Brigalow Scaly-foot habitat on Valkyrie	5,795

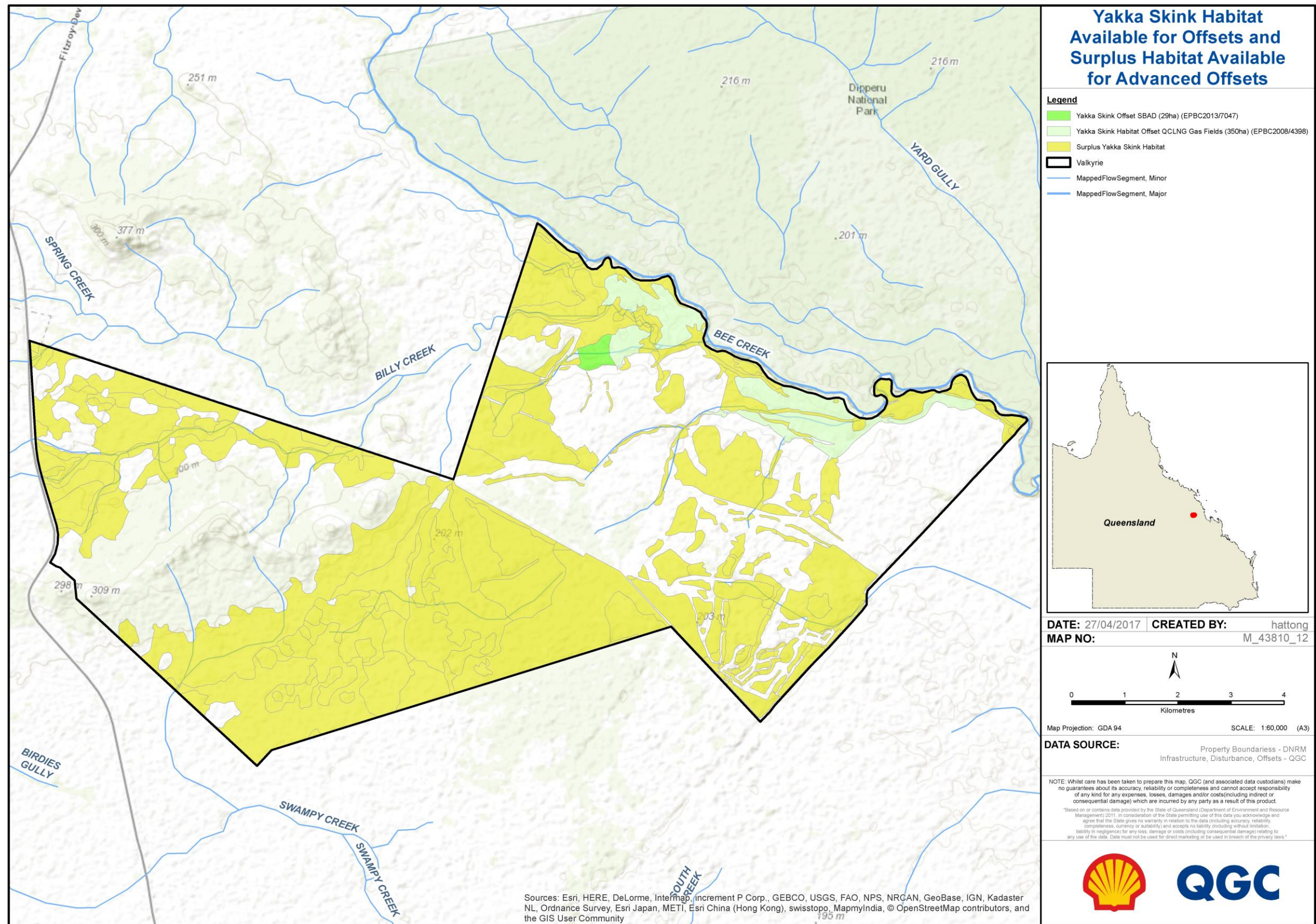


Figure 3-5
YAKKA SKINK HABITAT OFFSET AND SURPLUS HABITAT AVAILABLE FOR ADVANCED OFFSETS

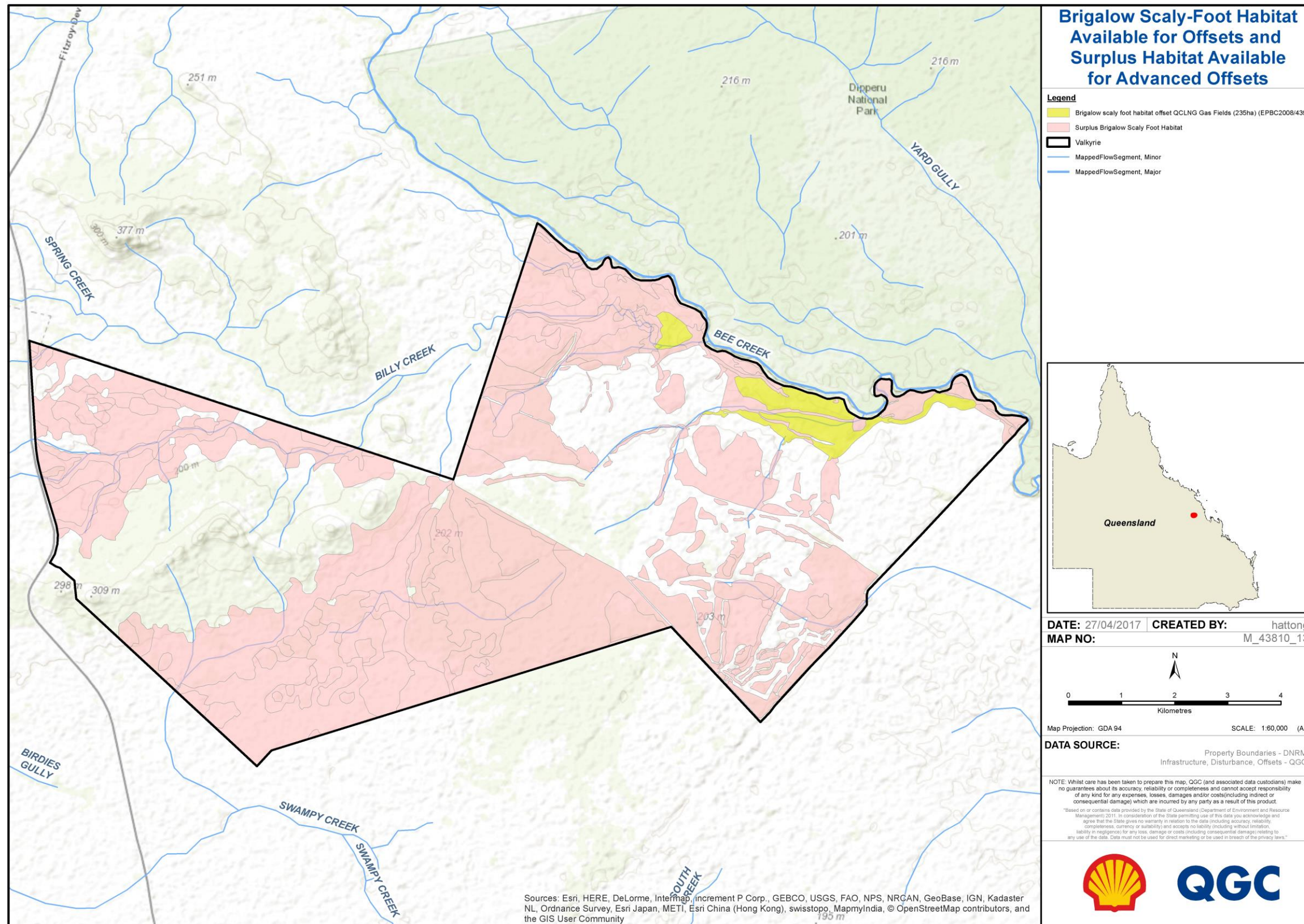


Figure 3-6
BRIGALOW SCALY-FOOT HABITAT OFFSET AND SURPLUS HABITAT AVAILABLE FOR ADVANCED OFFSETS

Koala (*Phascolarctos cinereus*)

The ground-truthing of regional ecosystems within Valkyrie has confirmed the availability of 3,733 ha of Koala habitat that can be used for offsets. On the western slopes, tablelands and plains of Queensland Koalas are found in sub-humid Eucalyptus-dominated forests and woodlands in riparian and non-riparian environments, and some Acacia-dominated forests and woodlands in non-riparian environments (DoE, 2015c).

The habitat available for Koala offsets is in the form of Eucalypt woodlands and open forests, riparian forests and woodlands, Eucalypt forested swamps and SEVT with emergent Eucalypt.

The condition and quality of the Koala habitat within Valkyrie is variable due to past agricultural land use disturbances. The majority of this habitat is associated with remnant vegetation, which is in good condition and is of high habitat value for the species. However, there are isolated or fragmented patches of habitat that are degraded, as a result of grazing, weed infestation and general edge effects adjacent to historical land clearing.

Of the 3,733 ha of Koala habitat available for offset, 29 ha has been allocated to satisfy the offset requirement for SBAD project, as shown on Figure 3-7.

The remaining 3,7104 ha of Koala habitat within Valkyrie is surplus that will be retained for advanced offsets, as shown on Figure 3-7. The allocation of Koala habitat is detailed in Table 3-9.

Table 3-9 Allocation of Koala habitat as offsets and surplus for advanced offsets

Koala habitat allocation	Area (ha)
SBAD Koala habitat offset	29
Surplus Koala habitat for Commonwealth advanced offset purposes	3,704
Total Koala habitat on Valkyrie	3,733

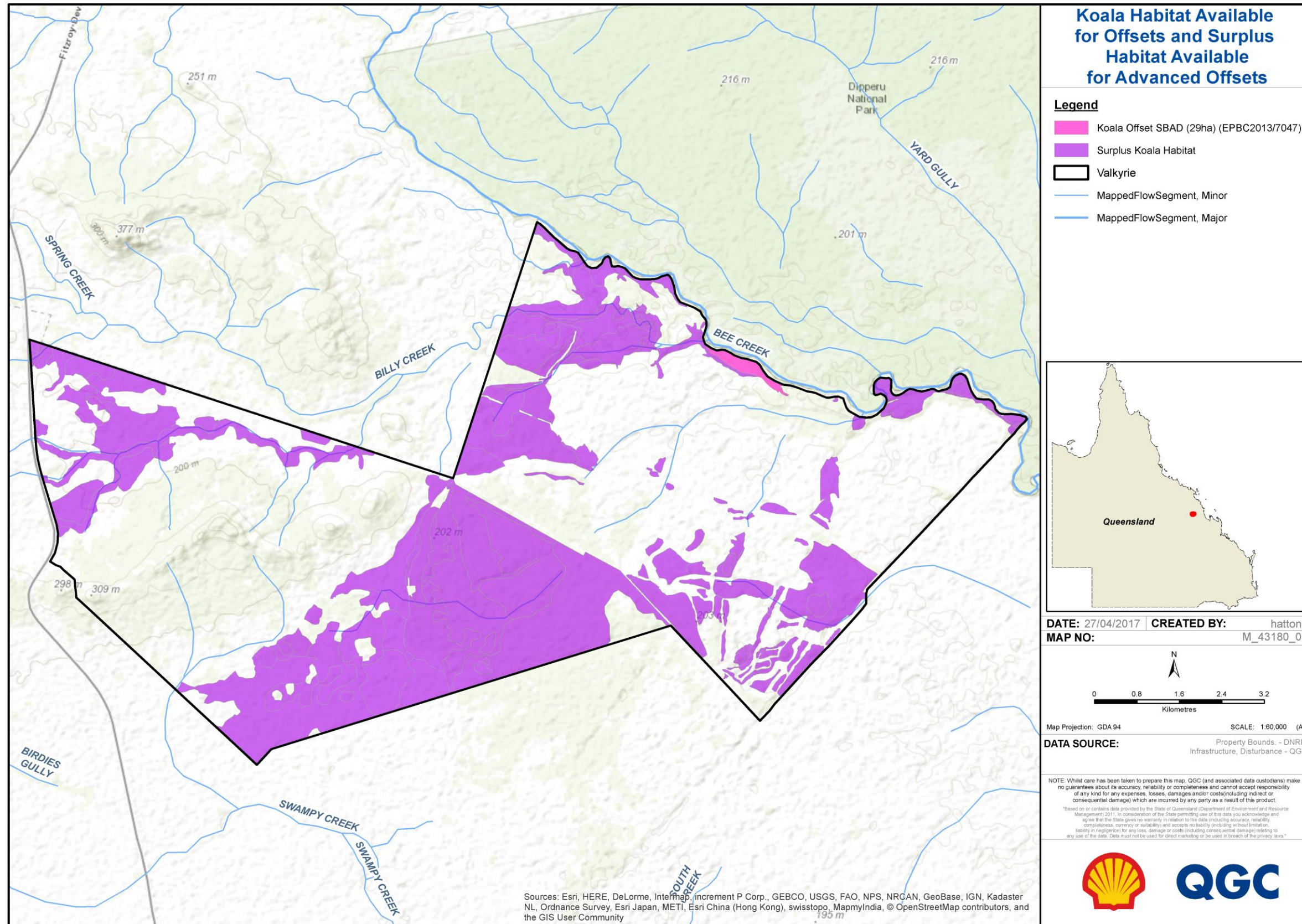


Figure 3-7
KOALA HABITAT AVAILABLE FOR OFFSETS AND SURPLUS HABITAT AVAILABLE FOR ADVANCED OFFSETS

South-eastern Long-eared Bat (*Nyctophilus corbeni*)

The ground-truthing of regional ecosystems within Valkyrie has confirmed the availability of 3,884 ha of South-eastern Long-eared Bat habitat that can be used for offsets.

They are known to inhabit woodland habitats including, Ironbark, Belah, Brigalow, River Red Gum, and Cypress Pine, as well as dry sclerophyll forests, Bonewood scrub and Semi-Evergreen Vine Thicket (SEVT). Inland Queensland habitats are known to be dominated by assorted eucalypt and bloodwood species, and various types of tree Mallee, with populations being most abundant in vegetated areas containing a dense shrub layer and distinct canopy (DoE, 2015d).

The habitat available for South-eastern Long-eared bat offsets is in the form of Eucalypt woodlands and open forests, riparian forests and woodlands, Eucalypt forested swamps and SEVT with emergent Eucalypt.

The condition and quality of the South-eastern Long-eared bat habitat within Valkyrie is variable due to past agricultural land use disturbances. The majority of this habitat is associated with remnant vegetation, which is in good condition and is of high habitat value for the species. However, there are isolated or fragmented patches of habitat that are degraded, as a result of grazing, weed infestation and general edge effects adjacent to historical land clearing.

Of the 3,884 ha of South-eastern Long-eared Bat habitat available for offset, 60 ha has been allocated to satisfy the offset requirement for SBAD project, as shown on Figure 3-8.

The remaining 3,824 ha of South-eastern Long-eared Bat habitat within Valkyrie is surplus that will be retained for advanced offsets, as shown on Figure 3-8. The allocation of South-eastern Long-eared Bat habitat is detailed in Table 3-10.

Table 3-10 Allocation of South-eastern Long-eared Bat habitat as offsets and surplus for advanced offsets

	Area (ha)
South-eastern Long-eared Bat habitat allocation	
SBAD South-eastern Long-eared Bat habitat offset	60
Surplus South-eastern Long-eared Bat habitat for Commonwealth advanced offset purposes	3,824
Total South-eastern Long-eared Bat habitat on Valkyrie	3,884

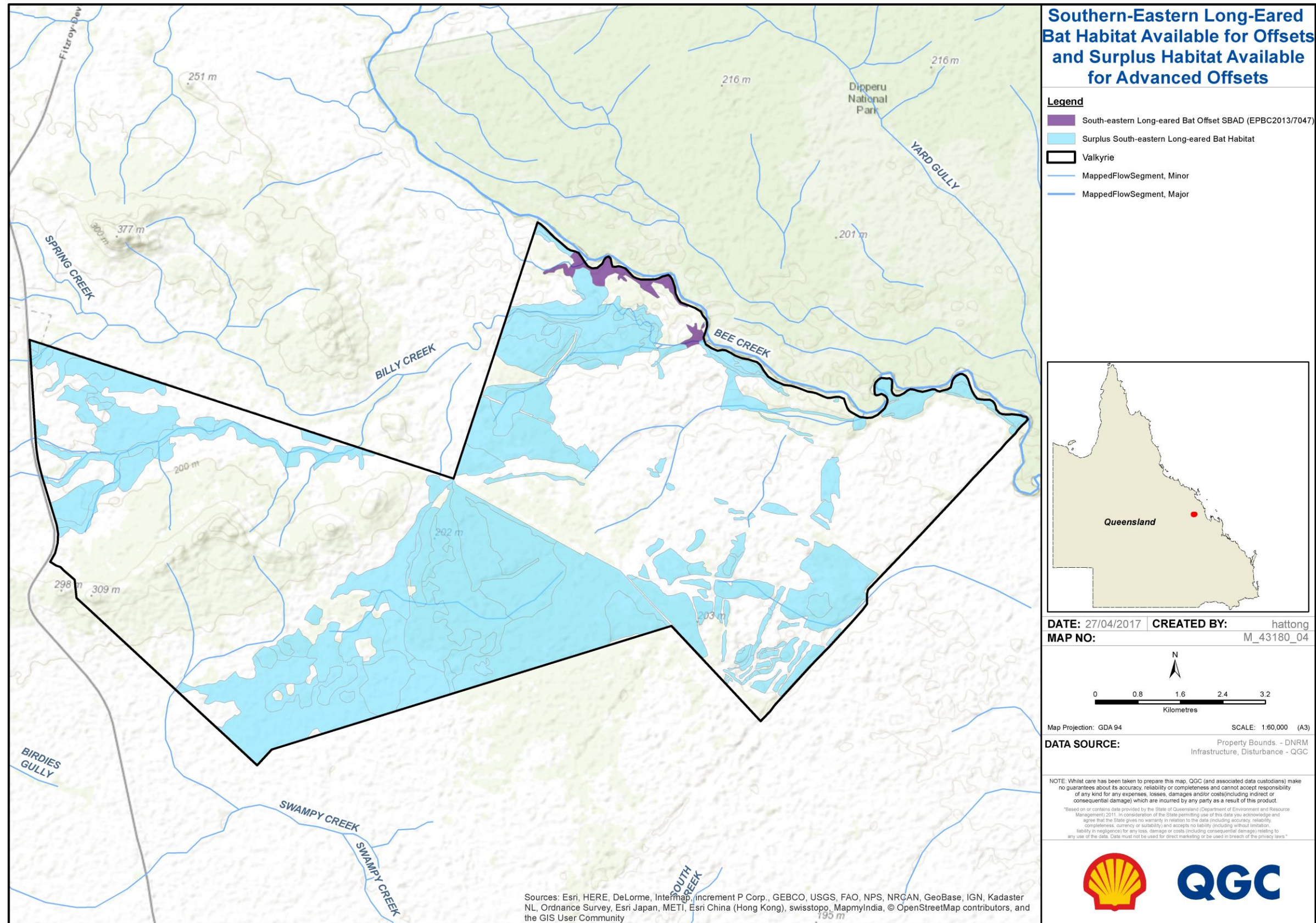


Figure 3-8
SOUTH-EASTERN LONG-EARED BAT HABITAT AVAILABLE FOR OFFSETS AND SURPLUS HABITAT AVAILABLE FOR ADVANCED OFFSETS

3.5 STATE OFFSET VALUES

The Valkyrie property has been confirmed as being able to satisfy the following State offset requirements for the QCLNG and SBAD projects:

QCLNG:

- Endangered regional ecosystems comprising Broad Vegetation Groups (BVGs) 7a, 17a and 25a
- Of concern regional ecosystems comprising BVGs 16a, 16c, 17a, 17b and 34d

SBAD:

- Endangered regional ecosystems:
 - 11.3.1 – *Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains (BVG 25a)
 - 11.9.5 – *Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks (BVG 25a).
- Of concern regional ecosystem:
 - 11.3.2 – *Eucalyptus populnea* woodland on alluvial plains (BVG 17a).
- Threatened fauna species habitat:
 - Glossy Black-cockatoo (*Calyptorhynchus lathami lathami*)
 - Pale Imperial Hairstreak (*Jalmenus eubulus*).

The final required offset areas for each of the state values are progressively reconciled with project impacts as each of the projects progress. The relevant offset areas on Valkyrie are also updated as these updated disturbance numbers become available.

3.5.1 Endangered and of concern regional ecosystem offsets

A key objective of the State offsets for the QCLNG and SBAD projects is to offset the residual impacts to endangered and of concern regional ecosystems resulting from each project.

Under the provisions of the VM Act, endangered and of concern regional ecosystems are regional ecosystems that have been cleared to an extent that is substantially less than their pre-clearing extents and are at risk of total loss if not formerly protected. Endangered and of concern regional ecosystems are listed under Schedule 1 and Schedule 2 of the *Vegetation Management Regulation 2012*. In some instances endangered and of concern regional ecosystems satisfy the definitions of TECs listed under the EPBC Act.

The State offsets for the QCLNG project on Valkyrie is presented in Table 3-11, while the State offsets for the SBAD project is presented in Table 3-12. The endangered and of concern regional ecosystem BVG State offsets for both projects is shown on Figure 3-9.

Table 3-11 State offsets for endangered and of concern regional ecosystems for the QCLNG project on Valkyrie

Impacted BVG	Regional ecosystem (BVG) allocated as offset	Allocated offset (ha)
Endangered 17a	RE 11.3.2 (BVG 17a) – <i>Eucalyptus populnea</i> woodland on alluvial plains, allocated at a ratio of 1:4 for the deficit of BVG 17a endangered	2.4
Endangered 25a	RE 11.4.9 (BVG 25a) – <i>Acacia harpophylla</i> shrubby woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	68.6
Of concern 16a	RE 11.3.25 (BVG 16a) – <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	87.8
Of concern 16c	RE 11.3.4 (BVG 16c) – <i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains	31.0
Of concern 17a	RE 11.3.2 (BVG 17a) – <i>Eucalyptus populnea</i> woodland on alluvial plains	51.4
Of concern 17b	RE 11.3.2 (BVG 17a) – <i>Eucalyptus populnea</i> woodland on alluvial plains, allocated for the deficit of BVG 17b Of concern	3.0
Of concern 34d	11.3.27i (BVG 34d) – Palustrine wetland (vegetated swamp), <i>Eucalyptus camaldulensis</i> or <i>E. tereticornis</i> woodland to open woodland with sedgeland ground layer, in depressions on floodplains	5.4

Table 3-12 State offsets for endangered and of concern regional ecosystems for the SBAD project on Valkyrie

Impacted BVG	Regional ecosystem (BVG) allocated as offset	Allocated offset (ha)
Endangered 17a	RE 11.3.2 (BVG 17a) – <i>Eucalyptus populnea</i> woodland on alluvial plains	15
Endangered 25a	RE 11.4.9 (BVG 25a) – <i>Acacia harpophylla</i> shrubby woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	5.6

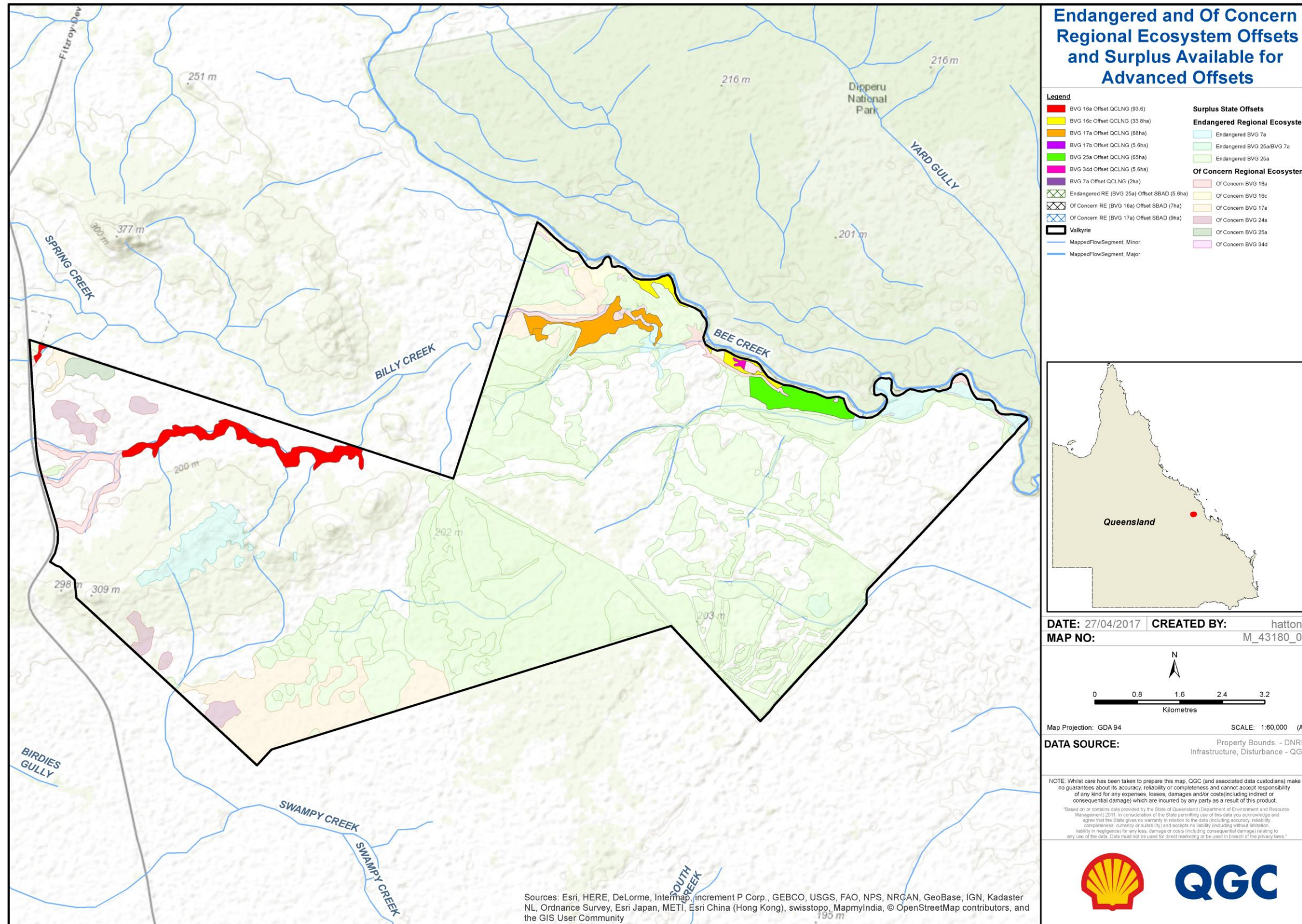


Figure 3-9
ENDANGERED AND OF CONCERN REGIONAL ECOSYSTEM OFFSETS AND SURPLUS AVAILABLE FOR ADVANCED OFFSETS

3.5.2 Threatened species habitat offsets

Another key objective of the State offsets for the QCLNG and SBAD projects is to offset the residual impacts to threatened fauna species and their habitats resulting from each project.

Under the provisions of the NC Act, threatened fauna species are recognised as being threatened in the wild and if not appropriately protected and conserved, may be placed at risk of extinction. Threatened fauna species may be listed under Schedules 1–5 of the *Nature Conservation (Wildlife) Regulation 2006* in any one of the categories: extinct in the wild, endangered, vulnerable and near threatened. Many of the threatened fauna species listed under the NC Act are also listed under the EPBC Act.

Glossy Black-cockatoo (*Calyptorhynchus lathami lathami*)

The ground-truthing of regional ecosystems within Valkyrie has confirmed the availability of 1,872 ha of Glossy Black-cockatoo habitat that can be used for offsets.

The Glossy Black-cockatoo (northern sub species) prefers woodland areas dominated by she-oak *Allocasuarina* species, as well as woodlands dominated by *Eucalyptus*, *Corymbia* and *Angophora* species with a sub-canopy of *Allocasuarina*, and open sclerophyll forests (DSITIA, 2014). It is also known to occupy mixed woodland containing assemblages of *Allocasuarina*, *Casuarina*, Cypress and Brigalow.

The species is known to feed almost exclusively on seeds from *Allocasuarina*, and *Casuarina* species within its range, however feeding is often limited to a small number of species. Individuals are also known to favour specific feed trees, which they regularly forage upon (DSITIA, 2014).

Glossy Black-cockatoos nest in large hollow trees or stags (usually eucalypts) with nest sites generally situated between 10 m and 20 m above the ground. Breeding pairs are known to utilise nesting sites for multiple breeding seasons, which are generally within close proximity to the nest sites of other breeding pairs (DSITIA, 2014).

The habitat available for Glossy Black-cockatoo offsets is in the form of woodlands and open forests, riparian forests and woodlands, that contain *Allocasuarina* and *Casuarina* species as a foraging resource and large hollow bearing Eucalypt trees that provide nesting opportunities.

The condition and quality of the Glossy Black-cockatoo habitat within Valkyrie is variable due to past agricultural land use disturbances. The majority of this habitat is associated with remnant vegetation, which is in good condition and is of high habitat value for the species, due to being infrequently used by grazing livestock.

Of the 1,872 ha of Glossy Black-cockatoo habitat available for offset, 21 ha has been allocated to satisfy the State offset requirement for SBAD project, as shown on Figure 3-10.

The remaining 1,851 ha of Glossy Black-cockatoo habitat within Valkyrie is surplus that will be retained for advanced offsets, as shown on Figure 3-10. The allocation of Glossy Black-cockatoo habitat is detailed in Table 3-13.

Table 3-13 Allocation of Glossy Black-cockatoo habitat as offsets and surplus for advanced offsets

Glossy Black-cockatoo habitat allocation	Area (ha)
SBAD Glossy Black-cockatoo habitat offset	21
Surplus Glossy Black-cockatoo habitat for State advanced offset purposes	1,851
Total Glossy Black-cockatoo habitat on Valkyrie	1,872

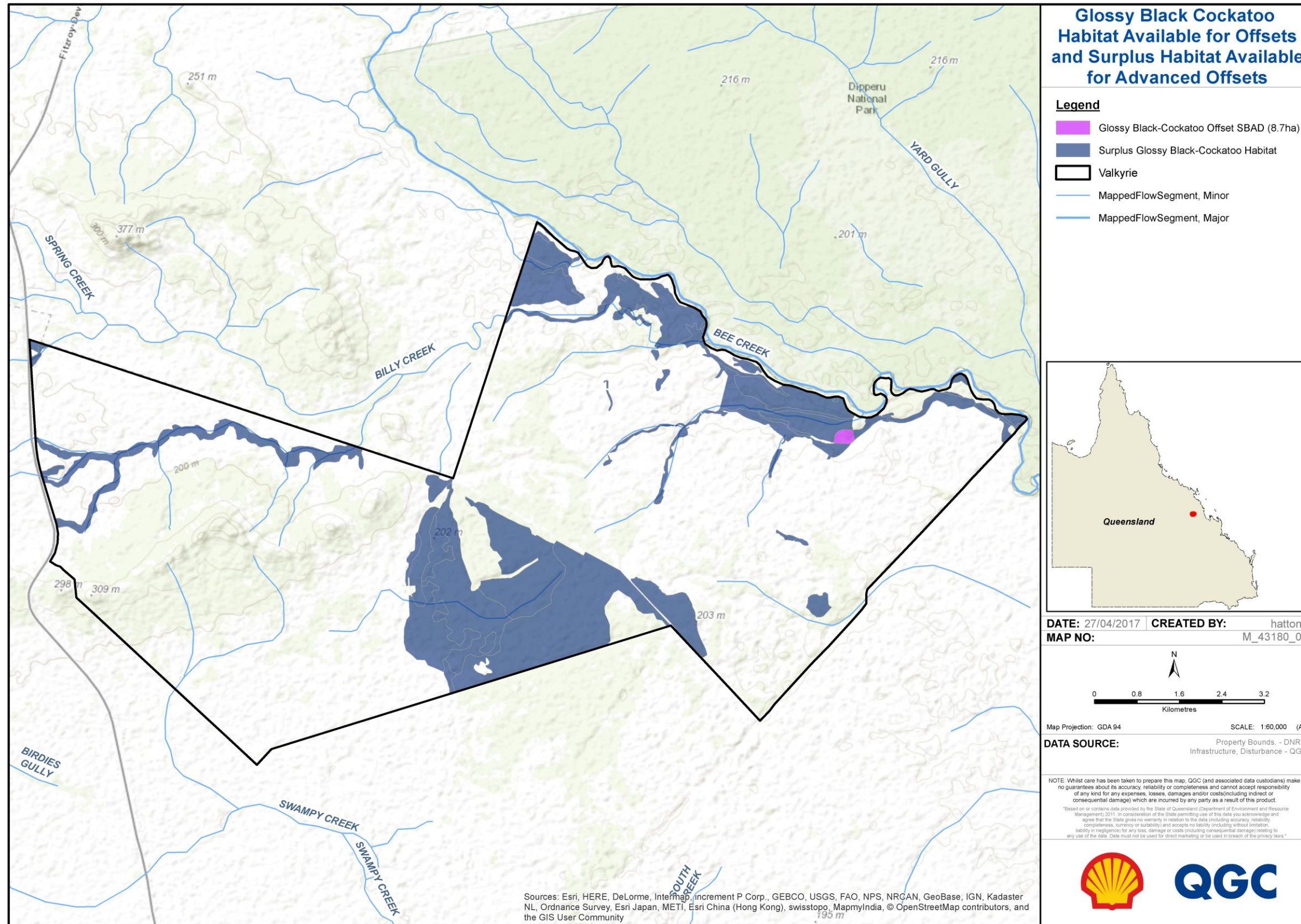


Figure 3-10
GLOSSY BLACK-COCKATOO HABITAT AVAILABLE FOR OFFSETS AND SURPLUS HABITAT AVAILABLE FOR ADVANCED OFFSETS

Pale Imperial Hairstreak (*Jalmenus eubulus*)

The ground-truthing of regional ecosystems within Valkyrie has confirmed the availability of 1,725 ha of Pale Imperial Hairstreak habitat that can be used for offsets.

The Pale Imperial Hairstreak is only known to breed in old-growth forest or woodland and does not appear to colonise regrowth habitats following clearing or other major disturbances. Preferential habitat is on flat to gently undulating plains on clay soils which are dominated by Brigalow and Belah vegetation communities. These areas are usually scattered with emergent eucalypts such as Poplar Box (OEH, 2015).

The habitat available for Pale Imperial Hairstreak offsets is in the form of remnant woodlands dominated by Brigalow and/or Belah. The condition and quality of the Pale Imperial Hairstreak habitat within Valkyrie is in good condition and is of high habitat value for the species, due to being infrequently used by grazing livestock.

Of the 1,725 ha of Pale Imperial Hairstreak habitat available for offset, 9 ha has been allocated to satisfy the State offset requirement for SBAD project, as shown on Figure 3-11.

The remaining 1,716 ha of Pale Imperial Hairstreak habitat within Valkyrie is surplus that will be retained for advanced offsets, as shown on Figure 3.11. The allocation of Pale Imperial Hairstreak habitat is detailed in Table 3-14.

Table 3-14 Allocation of Pale Imperial Hairstreak habitat as offsets and surplus for advanced offsets

Pale Imperial Hairstreak habitat allocation	Area (ha)
SBAD Pale Imperial Hairstreak habitat offset	9
Surplus Pale Imperial Hairstreak habitat for State advanced offset purposes	1,716
Total Pale Imperial Hairstreak habitat on Valkyrie	1,725

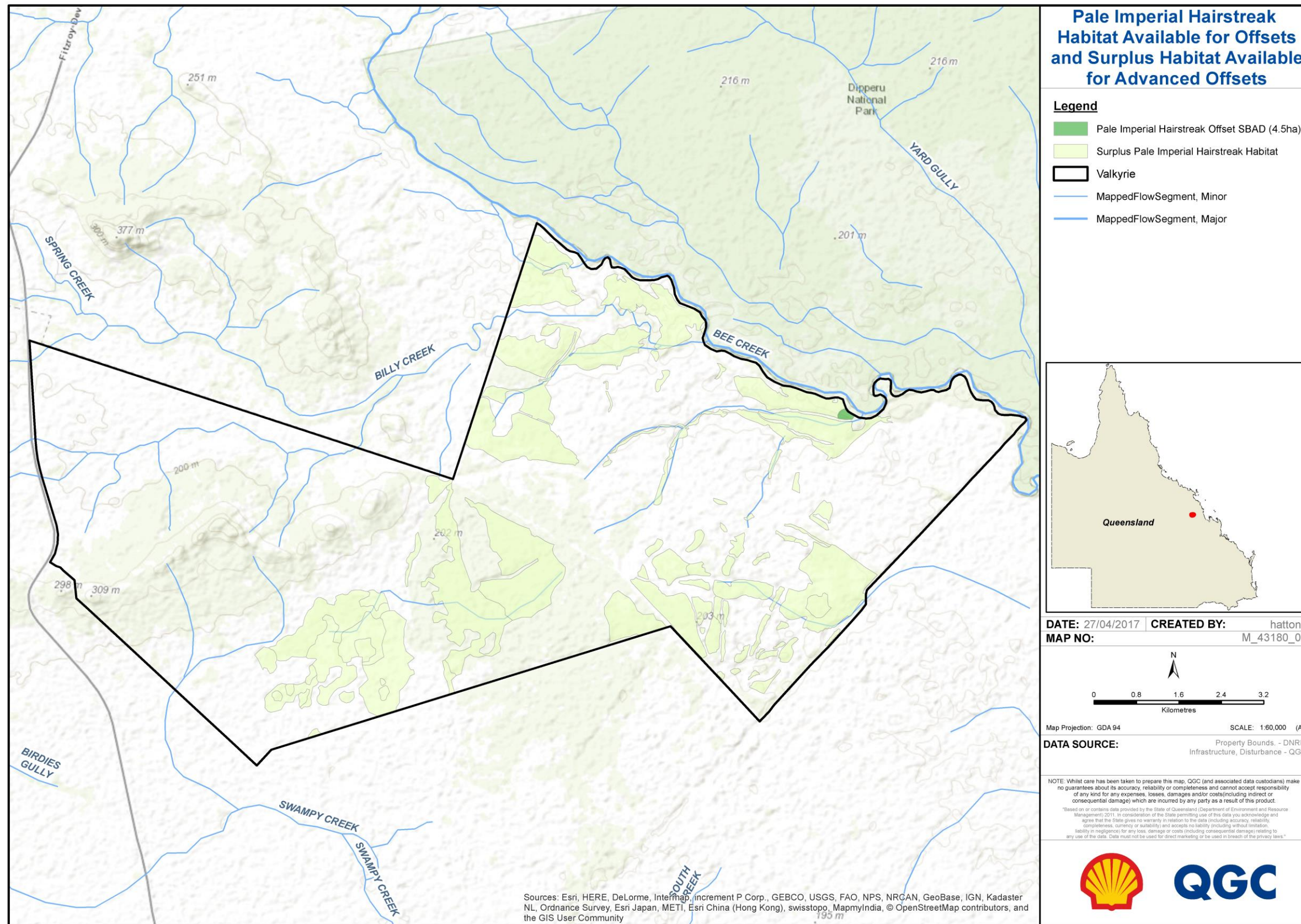


Figure 3-11
PALE IMPERIAL HAIRSTREAK HABITAT AVAILABLE FOR OFFSETS AND SURPLUS HABITAT AVAILABLE FOR ADVANCED OFFSETS

4 Threats to biodiversity values

4.1 RECOGNISED KEY THREATENING PROCESSES

The Commonwealth's EPBC Act provides for the identification and listing of key threatening processes.

The key threatening processes listed under the EPBC Act associated with the nominated offset areas include:

- predation by feral dogs
- fire
- weed infestation/competition
- land clearance
- predation by feral cats
- predation, habitat degradation, competition and disease transmission by feral pigs
- biological effects, including lethal toxic ingestion, caused by Cane Toads (*Bufo marinus*).

In addition, the threatening processes that are recognised by the Queensland Department of Environment and Heritage Protection (EHP) are generally consistent with those listed by the Commonwealth. The relevant State listed threatening processes include:

- Land clearing: Loss of natural habitat through land clearing for pastoral purposes, urban development and agriculture can threaten native wildlife and their habitat (EHP, 2015).
- Inappropriate grazing and fire regimes: Grazing pressure from domestic stock and introduced animals can have a negative impact on habitat of native animals. Changes in the frequency and intensity of fire can cause wildlife populations to decline. Some species depend on a suitable fire regime for successful regeneration and survival (EHP, 2015).
- Invasive animals: Introduced pest animals place considerable pressure on native plants and animals. While some impacts have been well documented, the true impact of pest animals on Queensland's environment is unknown and difficult to quantify. Foxes and feral cats, which prey on native fauna, have been implicated in the decline or extinction of at least 17 native species (EHP, 2015).
- Invasive plants: Weeds can degrade native vegetation and have a detrimental impact on biodiversity (EHP, 2015).

Further to the above listed key threatening processes recognised under the EPBC Act, the Species Profile and Threats Database (SPRAT) provides discussion of the recognised threats that are specific to threatened or migratory species and threatened

ecological communities listed under the EPBC Act. The recognised threats that are specific to the threatened or migratory species and threatened ecological communities that occur in the Valkyrie Property and are the focus of this OAMP, are presented below in the relevant sections.

4.1.1 Key threatening processes for threatened ecological communities

Generally, the greatest threats to the flora and ecological communities of the region remain livestock grazing, land clearing and the invasion by exotic weed species, particularly following fire or over grazing. Australia’s most invasive exotic grass, Buffel Grass (*Pennisetum ciliaris*), dominates the ground layer of many areas of remnant native vegetation on Valkyrie. Rubber Vine (*Cryptostegia grandiflora*) is currently present in small numbers but has the potential to result in significant impacts to the identified TECs.

Brigalow

Brigalow ecological communities are threatened by activities that further reduce their extent, cause a decline in the condition of the vegetation, or impede its recovery (DoE, 2015e). The recognised threats to the nominated Brigalow offset areas are vegetation clearing, fire, pest plants and pest animals. These threats and their relevance to the Brigalow are presented in Table 4-1.

Table 4-1 Listed key threatening processes for the Brigalow TEC

Threats	Description
Clearing	Clearing is the most significant threat to the Brigalow TEC. After clearing or other like disturbances, Brigalow develops regrowth from suckers. The majority of Brigalow in the Valkyrie Property, some of which is being used as offsets is regrowth that is actively regenerating from suckers. Brigalow regrowth can be killed if associated with programs of burning, spraying with chemicals and/or stock grazing (DoE, 2015e).
Fire	Brigalow and numerous associated plant species within Brigalow ecological communities resprout vegetatively after fire however recovery from root suckers can be a slow process. Intense fire events can alter the structure of Brigalow vegetation and are likely to adversely affect elements of faunal habitat such as litter, woody debris and large tree stems (DoE, 2015e). Fire is a major threat to the ecological community where exotic grasses such as Buffel Grass (previously known as <i>Cenchrus ciliaris</i>), Rhodes Grass (<i>Chloris gayana</i>) or Green Panic (<i>Megathyrus maximus</i> var. <i>pubiglumis</i>) have invaded Brigalow remnants or regrowth, or areas adjacent to them. Once such areas of Brigalow vegetation are burnt, Buffel Grass can grow back more vigorously and thus increase the chances of subsequent fires and increase the intensity of a wildfire (DoE, 2015e).
Pest plants	Pasture grasses such as Buffel Grass, are currently the most threatening pest plants in the Brigalow ecological community because they increase the risk of fire in the vegetation. Brigalow vegetation with a dense, healthy tree canopy is relatively resistant to weed invasion, especially by pasture grasses. As such, weed invasion generally only occurs if gaps in the tree canopy occur following disturbance or natural events such as floods, severe drought and fire (DoE, 2015e).

Threats	Description
Pest animals	Many of the vegetation species present in the Brigalow ecological community are eaten readily by domestic stock and native or feral herbivores. Trampling and grazing by large herbivores, such as cattle and horses, can reduce the amount of leaf litter and woody debris, and the density of herbs and shrubs in the understorey of Brigalow forests and thus adversely affect flora species and the habitats of fauna species that are components of the ecological community. Feral Cat and to a lesser degree Feral Pig is considered to be the most widespread and problematic pest animal in Brigalow country and have the potential to substantially degrade vegetation (DoE, 2015b).

Semi-evergreen Vine Thicket

The high level of fragmentation and lack of connectivity between fragments of Semi-evergreen Vine Thicket (SEVT), continued clearing, inappropriate fire regimes, invasion by introduced pasture species, and increased grazing by domestic stock and native animals are all considered to be general threats to SEVT remnants (DoE, 2015f). These threats and their relevance to the SEVT within the Valkyrie Property are presented in Table 4-2.

Table 4-2 Key threatening processes for the SEVT

Threats	Description
Clearing	Clearing for the construction of roads, fence lines and firebreaks, as well as clearing for mining may result in further loss and/or fragmentation of remnant patches of listed SEVT ecological communities. Clearing increases the susceptibility of invasion by shrubs and grasses which in turn increase the risk of fire damage (DoE, 2015f). The provision of access tracks, new fences and fuel breaks within the Valkyrie Property need to be carefully planned in consideration of being recognised threats to SEVT.
Fire	Fire is considered a general threat however studies over a wide geographic area have found little evidence of fire damage within undisturbed SEVT communities. This is due to them being located in areas protected from fire by the topography and/or substrate or because their sparse ground layer and relatively moist microclimate are thought to preclude entry of wildfire into the vegetation. However, fire is considered to be a high threat where fuel characteristics have been changed, e.g. by the presence of introduced grass pasture species, such as Buffel Grass (DoE, 2015f).
Grazing – domestic livestock and feral pigs	Cattle grazing can open up the understorey layer which can lead to trampling damage and associated invasion by pasture grasses, such as Buffel Grass. Feral pigs can damage SEVT communities as a result of digging, which can expose and sever tree roots. As a result, the canopy layer becomes more open (DoE, 2015f).
Disturbance and weeds	SEVT communities are susceptible to invasion by weeds when disturbed. Common forms of disturbance include trampling by cattle, and death of canopy trees from fire, both promoted invasion by introduced pasture grass species. Feral pigs are also a major threat and contribute to weed invasion due to damage to the canopy layer from tree deaths caused by pigs (DoE, 2015f). The major weed species considered to pose a threat to SEVT because they facilitate the incursion of fire into SEVT, are the pasture species Buffel Grass and Green Panic and the pasture weed Parthenium Weed (<i>Parthenium hysterophorus</i>). Other introduced species such as the shrubs Lantana (<i>Lantana camara</i>) and Velvety Tree Pear (<i>Opuntia tomentosa</i>), vines Rubber Vine and Brazilian Nightshade (<i>Solanum seafortianum</i>) and herb Coral Berry (<i>Rivina humilis</i>) have also been recorded in vine thickets in Queensland. The Velvety Tree Pear is the most widespread introduced species in the listed SEVT ecological community in Queensland (DoE, 2015f).

4.1.2 Key threatening processes for threatened fauna species

The primary threat to fauna species across the region is the clearing and fragmentation of habitats. Habitat clearing, reduction in patch size and increasing fragmentation are key threats for a variety of species of conservation significance, which are known and/or are likely to occur in the locality. Predation by pest animals such as the Feral Cat, Feral Dog and Feral Pig, also poses a significant threat to fauna species of conservation significance.

Yakka Skink

Habitat reduction and degradation due to agriculture and urban development is the primary threat to the Yakka Skink. The removal of micro habitats in already disturbed areas further adds to Yakka Skink population pressures (DoE, 2105a). Other threats occur as a result of predations by feral animals such as foxes and cats. The biological characteristics of the Yakka Skink can further impact populations due to the species having a high site-fidelity and low reproduction rates, which can contribute to population crashes and localised extinction following major environmental disturbances (DoE, 2105a).

Brigalow Scaly-foot

Threats to Brigalow Scaly-foot populations are primarily related to land clearing, habitat degradation and fragmentation. Pressures on the species can be correlated with agriculture, urban and mining developments which contribute to the reduction of suitable vegetation communities known to support Brigalow Scaly-foot populations (DoE, 2105b).

South-eastern Long-eared Bat

Clear determination of the threats to South-eastern Long-eared Bat populations is difficult due to the lack of available population data. Despite this, the primary causes of population decline are attributable to habitat loss and degradation resulting from land clearing for agriculture purposes, open-cut mining and gas developments (DoE, 2105d). The South-eastern Long-eared Bat is found exclusively in Mallee and woodland habitats and as such large scale land clearing and habitat fragmentation in these regional ecosystems is very detrimental to species populations. Fire is also considered to be a major threat through animal mortality and habitat destruction (DoE, 2015d).

South-eastern Long-eared Bats are thought to forage low to the ground and amongst shrubs and as a result they are susceptible to habitat degradation from over grazing and feral animals (e.g. pigs and rabbits). Feral bird species' are also thought to contribute to competition for roosting sites with known occurrences of bats being evicted from tree hollows by species such as the Common Starling (DoE, 2015d).

Koala

Anthropogenic factors contributing to habitat loss and fragmentation are the main threats to the Koala. Other key anthropogenic related threats include vehicle strike and predation by dogs (domestic and feral). Extreme weather events such as drought and heatwaves can also contribute to Koala mortality and elevate stressors caused by other threatening factors (DoE, 2015c).

Koalas are also threatened by several debilitating diseases which is a growing concern for populations. Chlamydiosis is currently contributing to localised population declines and extinctions due to increasing female infertility. Koala Retrovirus is another disease which has ‘endogenised’ in koala populations. Disease is thought to contribute to approximately 20% of total koala mortality however the combination of disease and other threats (e.g. vehicle strikes or dog attacks) is considered to be attributable to approximately 60% of total Koala mortality (DoE, 2015c).

5 Overview of management approach and requirements

This section describes the management requirements necessary to meet the identified objectives of the nominated offset areas and Brigalow Rehabilitation Area.

The management approach is designed to minimise the risks associated with key threatening processes and more specifically the recognised threats to threatened species and ecological communities that are of relevance to the nominated offset areas and Brigalow Rehabilitation Area.

Although the management measures have been developed to achieve the required offset outcomes as a priority, it has also been established that they will bring about an overall improvement in the condition and quality of a wide range of habitats present within the nominated offset areas and Brigalow Rehabilitation Area.

5.1 COMMONWEALTH OBJECTIVES AND OUTCOMES FOR THE OFFSET AREA

In accordance with the EPBC decision of approval for the QCLNG (EPBC 2008/4399 and EPBC 2008/4398) and SBAD (2013/7047) the requirement for offsets is to offset the residual impacts upon SEVT and Brigalow TECs, as well as threatened fauna habitat for:

- Yakka Skink (*Egernia rugosa*) habitat
- Brigalow Scaly-foot (*Paradelma orientalis*) habitat
- Koala (*Phascolarctos cinereus*) habitat
- South-eastern Long-eared Bat (*Nyctophilus corbeni*) habitat

This will involve the protection and enhancement of the ecological communities' as well as viable habitat for the above mentioned fauna species whose habitats are supported therein.

The management objectives and outcomes for the nominated offset areas include:

- encourage the natural regeneration and maintenance of native flora species that are representative of SEVT and Brigalow ecological communities
- improve the quality of threatened fauna habitat within the offset area
- protect the offset area from threats, such as wildfire, inappropriate fire management, livestock grazing, exotic plant invasion and other factors that can lead to land degradation

- monitor and control declared plants and WoNS within SEVT and Brigalow ecological communities and threatened species habitats to assist the natural regenerative processes of these ecological communities
- monitor and manage edge effects to facilitate the recruitment of native flora species characteristic of SEVT and Brigalow around the outer perimeters of the offset area
- undertake erosion and sediment control measures and as necessary remedial actions in any areas where soil is currently exposed or will be exposed for the establishment and/or maintenance of fuel breaks and access tracks
- monitor and control pest animals to reduce their impact upon SEVT and Brigalow ecological communities, and native fauna species and their habitats
- increase the overall biodiversity value and ecological function of the offset area for native flora and fauna
- identify and effectively manage risks to the offset area and implement management practices and corrective actions to remediate any adverse effects.

5.2 STATE OBJECTIVES AND OUTCOMES FOR THE OFFSET AREA

The offsetable State values for the QCLNG and SBAD projects are in the final stages of being quantified. Once quantified, field surveys will be undertaken to determine the required offset for each offsetable value that is available on Valkyrie on a like-for-like or ecological equivalence basis.

The required offset values for the QCLNG and SBAD projects that are to be provided by the Valkyrie property are those outlined above in Section 3.5.

5.3 BIOSECURITY MATTERS

In Queensland, the *Biosecurity Act 2014 (QLD)* is the relevant legislation regarding animal pests. The *Biosecurity Act 2014* and the *Biosecurity Regulation 2016* provide legislative measures to manage invasive plants and animals, and address the impacts they have on the economy, the environment and society. Department of Agriculture, Fisheries and Forestry (DAFF) administers the provisions of the Act and its regulation.

Under the Local Law provisions of the *Biosecurity Act 2014*, a local government must ensure that any invasive biosecurity matter is managed with the local Government's area in compliance with the Act.

The *Biosecurity Act 2014* outlines the General Biosecurity Obligation (GBO) as described in Chapter 2. The GBO places a responsibility on Landowners to take reasonable steps to minimise the risks associated with invasive plants and animals under their control. The matters identified as a priority for the Valkyrie offset property are detailed below.

5.3.1 Invasive Plant control

The control of weeds is fundamental to improving biodiversity and the ecological condition of the TECs and threatened species habitats within the nominated offset areas.

It is therefore essential to control populations of weed species and prevent them from spreading and re-establishing in the nominated offset areas.

As presented in Table 5-1, there are five restricted invasive plant species (weeds) listed under the *Biosecurity Act 2014 (QLD)* that have been recorded within Valkyrie and are likely to occur within the Brigalow Rehabilitation Area. Four of which are also listed as Weeds of National Significance (WoNS). The listing and prioritisation of WoNS is a joint initiative of the States, Territories and Australian Government and their long-term control is of national interest.

The commonly accepted control measures for these weed species that have the least impact on surrounding areas are presented in Table 5.1.

Table 5-1 Declared plant and WoNS species and control measures

Weed species name	Restricted invasive plant category	WoNS	Control method of least impact
Parthenium Weed (<i>Parthenium hysterophorus</i>)	Cat 3	Yes	Direct, controlled spraying with chemical herbicide. Reduced grazing is the most effective control for Parthenium (competition).
Mother of Millions (<i>Bryophyllum delagoense</i>)	Cat 3	No	Direct, controlled spraying with chemical herbicides or physical removal of all parts
Common Prickly Pear (<i>Opuntia stricta</i>)	Cat 3	Yes	Direct, controlled spraying with non-residual herbicide or physical removal of all parts
Velvety Tree Pear (<i>Opuntia tomentosa</i>)	Cat 3	Yes	Direct, controlled spraying with non-residual herbicide or physical removal of all parts
Parkinsonia (<i>Parkinsonia aculeate</i>)	Cat 3	Yes	Direct, controlled spraying with chemical herbicides or physical removal of all parts
Bellyache bush (<i>Jatropha gossipifolia</i>)	Cat 3	Yes	Direct, controlled spraying with chemical herbicides or physical removal of all parts
Lantana (<i>Lantana camara</i>)	Cat 3	Yes	Direct, controlled spraying with non-residual herbicide
Rubber Vine (<i>Cryptostegia grandiflora</i>)	Cat 3	Yes	Direct, controlled spraying (foliar, aerial or basal bark) with chemical herbicide.

Restricted invasive plants and/or WoNS will be controlled within the nominated offset areas and Brigalow Rehabilitation Area through the application of chemical herbicides and ‘as necessary’ hand removal. The aim is to continually reduce the extent of weeds within the rehabilitation area, as well as prevent them from re-establishing in areas where control has occurred.

Fire and mechanical control are also commonly accepted and viable methods for the control of certain weed species. However, both methods can cause impacts to native vegetation if not correctly implemented. In the interest in protecting the offset values, control methods with the least impact on surrounding vegetation have been chosen.

Ideally selective herbicides designed for specific weed species shall be used in preference to non-selective herbicides (e.g. Glyphosate) to ensure that non-target native species are not inadvertently poisoned. However, Roundup Bioactive or products with a similar or better performance shall be used in place of other chemicals within 10 m of springs, wetlands, dams, streams and wet Gilgai. Control of weeds is expected to contribute significantly to the management of edge effects around patches of Brigalow, and along access tracks and fuel breaks.

The effectiveness of weed control will be evaluated through undertaking rehabilitation monitoring surveys. If the monitoring surveys indicate that no improvements are resulting from weed control, adaptive management practices and corrective remedial actions will be implemented.

Weed control measures

Weed controls include one or more of the following:

- Registered herbicides (as per DAF fact sheets) shall be used where available for the target species.
- Selective herbicides shall be used where available for the target species.
- Care will be applied to avoid spraying non-target native species.
- Applications will need to cover as a much of the active green growing foliage as possible.
- A dye shall be used to track where the herbicide has been applied.
- Herbicide applications will target weed infestations around the edges of offset vegetation.
- Control of least infested areas will be prioritised over more infested areas.
- Heavier infestations within open areas (e.g. Parthenium Weed), a boom spray may be an appropriate application method. In more closed situations handheld equipment (handgun and hose or knapsack) will be more appropriate to avoid spraying native plants.
- Annual monitoring (or seasonally appropriate for specific weed species such as Parthenium) of targeted areas at a time of year that is at least 6 weeks after the final application of herbicide to the final target species This can be undertaken in parallel to other management actions.
- Weed control will be undertaken in accordance with the specific measures for each weed species, as outlined in Appendix A.

The control and prevention of pest plant and WoNS incursions will be undertaken in accordance with the relevant legislation and may include the introduction of an approved biological control agent, subject to relevant legislation.

The effectiveness of the specified weed control measures will be evaluated through vegetation monitoring surveys. If monitoring surveys indicate that no improvements are resulting from the management actions, adaptive management practices and corrective actions will be implemented.

Managing edge effects

The management of edge effects along fenced boundaries, access tracks, and fuel breaks will be essential to reducing the threatening processes of weeds. Managing edge effects will enable the recruitment of endemic native plant species that are characteristic of the TEC and threatened species habitat offsets.

Over the longer-term, the re-establishment of native species in place of weeds should result in greater integrity to the vegetation's structural layers along edges and reduce the potential for weed reinvasion. This process will also benefit edge specialist fauna species through increased habitat values and protection provided by improved vegetation structure along edges.

5.4 INVASIVE ANIMAL CONTROL

Invasive animals recorded in the locality, which are known to occur or are highly likely to occur within habitats supported by the nominated offset areas include:

- Feral cat (*Felis catus*)
- Feral pig (*Sus scrofa*)
- Feral dog (*Canis familiaris*)
- Feral cattle (*Bos taurus*)
- Feral horse (*Equus ferus caballus*)
- Rabbit (*Oryctolagus cuniculus*)

Of these, feral cats, pigs, dogs and rabbits are identified as restricted invasive animals under the Regulations of the *Biosecurity Act 2014 (QLD)*. Collectively, the presence of these pest animal species poses a constraint risk to achieving and maintaining the nominated Offset areas' habitat values for species and communities of conservation significance.

The main pest animal to be targeted for control is the feral cat, as it is known to predate nearly all small fauna species.

5.4.1 Pest animal management in the nominated offset areas

Management measures for the species identified above will be undertaken as specified in the relevant DAF guidelines.

The general management actions to control pest animals across the nominated offset areas include, but may not be limited to:

- Invasive animal control will be undertaken in accordance with the specific measures for each animal species, as outlined in Appendix B.
- Traditional ground or aerial baiting for feral dogs and pigs. Dogs will be baited using 1080 poison.
- Spotlight and diurnal hunting (shooting) opportunistically for all species.
- Pig traps with baits used as attractants in traps (NSW DPI, 2012).
- Cat traps with baits.

- Humane killing methods for Cane Toads (RSPCA, 2012) include:
 - Hopstop® – an aerosol spray designed for killing Cane Toads.
 - Stunning of Cane Toads followed by decapitation, but only by personnel who have been appropriately trained.
- Feral stock mustering and removal.
- Fence line repair and replacement along boundary with Dipperu National Park.
- Visually monitor for the evidence of invasive animals will commence at the start of year 6 following the first 5 years of annual pest animal control. Results will be presented in the annual compliance report.

The control and prevention of invasive animal incursions must be undertaken by the landholder or invited commercial agents in accordance with the relevant legislation.

Note: Invasive animal control must be undertaken in a humane manner.

Invasive animal management in the Brigalow Rehabilitation Area

The only invasive animals being targeted for control in the Brigalow Rehabilitation Area are feral pigs and feral rabbits. The control of feral pigs and feral rabbits within the rehabilitation area will include the following control measures:

- Spotlight and diurnal hunting (shooting) for pigs and rabbits.
- Pig traps with baits used as attractants in traps (NSW DPI, 2012).
- Visual monitoring for evidence of invasive animals will commence at the start of year 6 following the first 5 years of annual pest animal control. Results will be presented in the annual compliance report.
- The control of invasive animal species will be undertaken in accordance with the measures outlined below for each pest animal species.

Invasive Restricted animal presence/absence will be regularly monitored within favourable habitats for each species across the nominated offset areas, to determine the success of the management actions and as to whether corrective actions are required.

Feral stock mustering

Feral cattle and horses have been observed across Valkyrie and are known to be accessing the property from Dipperu National Park. The movement and grazing of feral cattle and horses throughout the nominated offset areas is trampling and damaging TECs and threatened species habitats. Mustering will be conducted to remove the threat of feral cattle and horses. This will be done at year 1 and again at year 5 if monitoring demonstrates the need. Thereafter it will be undertaken as required where breaches to fences occur from neighbouring properties.

Feral stock presence/absence and evidence of damage will be part of the monitoring of the nominated offset areas, to determine the success of feral stock mustering and as to whether corrective actions are required.

5.4.2 Invasive pest animal management summary

Management Objective: A cooperative, adaptive and collaborative approach to management with Dipperu National Park neighbours and other stakeholders. Ensure that pests are managed to preserve and improve the ecological values of the area.

The management measures listed in the Table 5-2 below are to be applied to nominated offset areas and Brigalow rehabilitation areas described in section 3.4 and 3.5. These measures are aligned with the content from the QPWS Pest Management Strategy for the Mackay Highlands applicable to the Dipperu National Park.

Table 5-2: Invasive pest animal management summary

Invasive Animal Species	Aim	Control measure	Control frequency	Performance indicator	Corrective action
Feral cat (<i>Felis catus</i>)	To control the feral cat population	Targeted trapping and baiting in year 1 to 5.	Annually in years 1-5 and then as deemed necessary where presence is recorded in previous control events from year 6 onwards.		
		Include feral cats in shooting activities and record sightings and cull numbers.	Twice per year for Years 2-5 and annually beyond year 5 or as deemed necessary	Achievement of performance criteria for habitat quality improvement as defined in section 7 and 9.	Where adverse impacts to ecological values due to feral cats are recorded (such as native fauna deaths) additional trapping and baiting of cats will be implemented.
Feral dog (<i>Canis familiaris</i>)	To control the feral dog population	Targeted trapping and baiting in year 1 to 5.	Annually in years 1-5 and then as deemed necessary where presence is recorded in previous control events from year 6 onwards.		

Invasive Animal Species	Aim	Control measure	Control frequency	Performance indicator	Corrective action
		Include feral dogs in shooting activities and record sightings and cull numbers.	Twice per year for Years 2–5 and annually beyond year 5 or as deemed necessary by previous control events.	Achievement of performance criteria for habitat quality improvement as defined in section 7 and 9.	Where adverse impacts to ecological values due to feral dogs (such as native fauna deaths) are recorded additional trapping and baiting of dogs will be implemented.
Feral pig <i>Sus scrofa</i>	To control the feral pig population	Targeted trapping and baiting in year 1 to 5.	Annually in years 1-5 and then as deemed necessary where presence is recorded in previous control events from year 6 onwards.		
		Include feral pigs in shooting activities and record sightings and cull numbers.	Twice per year for Years 2–5 and annually beyond year 5 or as deemed necessary by previous control events.	Achievement of performance criteria for habitat quality improvement as defined in section 7 and 9.	Where adverse impacts to ecological values are recorded due to feral pig activity, additional trapping or baiting of feral pigs will be implemented. Ongoing participation in coordinated controlled baiting and trapping programs with neighbours such as Isaac Regional Council baiting and trapping program and QPWS initiatives on Dipperu national park.
Cattle <i>Bos spp.</i> and Horses <i>Equus</i>	Work with neighbours to maintain stock proof boundary fences.	Inspect fences.	Year 1.		Where breaches to boundary fences occur repairs and maintenance will be conducted.

Invasive Animal Species	Aim	Control measure	Control frequency	Performance indicator	Corrective action
		Muster for wild cattle and horses	Year 2 and then as deemed necessary through indications such as broken fences.	Achievement of performance criteria for habitat quality improvement as defined in section 7 and 9.	Where adverse impacts to ecological values are recorded due to feral cattle and horses additional mustering activities will be required.

5.5 FIRE MANAGEMENT

The fire danger season in Central Queensland is typically between September and November, with a peak danger period occurring in October and November.

Effective and well planned fire management strategies are essential to protecting the rehabilitation area from potential wildfire risks and adverse impacts. Fuel break establishment and maintenance are the only fire management actions applicable to the rehabilitation area. Planned burns will be administered in open woodland and woodland vegetation across the Valkyrie property to maintain or reduce fuel loads in these fire tolerant vegetation types.

The Regional Ecosystem Description Database Version 9.0 (REDD) provides fire management strategies and issues for all regional ecosystems.

It is essential that the fire management strategies and issues specific to each regional ecosystem are carefully considered when establishing fuel breaks and when undertaking planned burns within areas that are adjacent to the rehabilitation area. For example, as per the REED version 9.0, deliberate burning for RE 11:4:8 which occurs throughout the offset areas is not recommended. Protection from fire is necessary for RE 11:4:8 and relies on broad-scale management of surrounding country to keep fuel loads low. Where fuel load monitoring of the surrounding country adjacent to of the offset area indicates high fuel loads, small frequent fires or reduction in fuel loads via grazing will be required. The fire management strategies and issues for the regional ecosystems contained in the nominated offset areas are presented in Table C.1 in Appendix C.

The prescribed fire mitigation measures are designed to limit the potential impacts of a wildfire upon the nominated offset areas. However, in the event a wildfire enters Valkyrie from an external source, and adversely impacts upon the nominated offset areas, corrective actions will be implemented as soon as practicable.

Appendix C provides further guidance on the fire mitigation that is required for the nominated Offset areas.

5.6 GENERAL LAND MANAGEMENT

General land management includes restricting access into the nominated offset areas, and managing soil erosion risks.

5.6.1 Fencing and access tracks

Additional fencing may be required across the nominated offset areas to enable better control over pest animals. Fencing construction will be undertaken in a manner that avoids or minimises impacts to native vegetation and avoids fencing vertically up steep slopes to avoid erosional point sources. Fencing will be conducted to separate the offset areas from Dipperu National Park. Internal fencing will be utilised to separate discrete offset areas from open grassland zones as presented in Access track establishment, rehabilitation and maintenance.

There is a network of access tracks on Valkyrie, which provide adequate access to parts of the nominated offset areas. However, there are some parts of the nominated offset

areas that are isolated from existing access tracks. In this regard it will be beneficial to establish new access tracks to enable safer and quicker access for managing these more isolated areas.

Some of the existing tracks through the Valkyrie and the nominated offset areas may require rehabilitation where soil erosion has occurred. Any eroded tracks will require rehabilitation and will be subject to ongoing annual monitoring. The monitoring will also identify priority areas for maintenance that is to occur annually or biannually.

5.6.2 Authorised personnel

Restricted access will be essential to prevent the spread of weeds, cattle access, reduce erosion risks and damage to the nominated offset areas. Access will be restricted to the following QGC staff and contractors:

- QGC Environment staff: co-ordinating or undertaking offset area maintenance (including weed and pest animal management), monitoring and all conservation activities within the nominated offset areas.
- Botanist and Ecologist contractors: professional services in accordance with their qualifications.
- Weed control contractors: professional services in accordance with their qualifications.
- Pest animal contractors: as required to participate in feral animal control (under direction of the Offset Area Manager).
- Machinery contractors for access track and fuel break establishment and maintenance contractors: as required to participate in maintenance activities (under direction of the Offset Area Manager).
- Fire management contractors: as required to participate in fire prevention and management activities (under direction of the Offset Area Manager).
- Emergency response personnel: as required in an emergency situation to provide rescue services (under direction of the Offset Area Manager).
- Queensland Parks and Wildlife Service (QPWS), as required to participate in weed control, pest animal control, feral stock mustering, and planned burning and wildfire response (under direction of the Offset Area Manager).
- Queensland Fire and Rescue Service (QFES), as required to participate in planned burning and wildfire response (under direction of the Offset Area Manager).

Locked gates, signage, livestock fencing and notification procedures prior to access are essential management measures to restrict access to Valkyrie and the nominated offset areas. All of these measures will be inspected regularly when undertaking other management actions. Contractors will also be encouraged to report any identified access issues or evidence of unauthorised access.

5.6.3 Erosion and sediment control

Uncontrolled soil erosion poses a risk to the biodiversity values contained in the nominated offset areas. Access tracks, bare earth fuel breaks, overgrazing and vehicle

movements during periods of wet weather can lead to the creation of soil erosion risks. Management actions to minimise these risks are primarily focused on the following:

- minimising soil disturbance
- maintaining soil erosion control measures (e.g. whoa-boys)
- restricting or limiting access during wet periods
- restricting earthworks to the dry season
- periodic monitoring of areas of soil disturbance.

6 Management actions for nominated offset areas

The following section describes the restrictions to be imposed and the management actions to be implemented within the nominated offset areas in order to meet the objectives outlined in Sections 5.1 and 5.2. Figure 6-2 represents the areas to which this section relates.

6.1 RESTRICTIONS IMPOSED ON THE NOMINATED OFFSET AREAS

The restrictions outlined in Table 6-1 will be implemented within the nominated offset areas to minimise impacts upon the ecological values that are to be protected and enhanced within the nominated offset areas.

Table 6-1 Restrictions imposed on the nominated Offset areas

Restrictions	Details
Vegetation clearing	<p>Vegetation clearing within the nominated offset areas will be restricted to:</p> <ul style="list-style-type: none"> • The establishment of fuel breaks to protect vegetation of conservation significance. • Maintenance of existing access tracks up to 5 m width, including the provision of whoa boys and catch drains for sediment and erosion control purposes. • Clearing that is necessary for the removal of weeds, which shall be restricted to pruning only, root masses shall be left in place. • The physical removal of weeds shall be restricted to the use of hand held machinery e.g. chainsaws and brush cutters or small Bob Cat only. No heavy machinery is permitted for weed removal. • No machinery for access track or fuel break maintenance purposes will be allowed in the nominated offset areas after heavy and/or prolonged periods of rainfall and will only be allowable once the nominated offset areas is dry enough to allow vehicle movements without causing unnecessary damage.
Weeds and introduced flora species	<p>To prevent the introduction of new weed species into the nominated offset areas and to prevent any re-infestations, the following restrictions will apply:</p> <ul style="list-style-type: none"> • All persons and vehicles entering the nominated offset areas must be inspected to ensure they are free of weed propagules. • All vehicles and machinery that are required to enter the nominated offset areas must first be washed down at a dedicated wash down facility prior to entering the nominated offset areas. • Appropriate weed inspection forms/ checklist to be filled out and kept on record.

Restrictions	Details
Pest animal control	<p>Pest animal control within the nominated offset areas shall only be undertaken by appropriately qualified contractors or site personnel.</p> <p>Excavating rabbit burrows and warrens is not permissible within the nominated offset areas.</p> <p>The establishment of permanent pig traps is permissible within the nominated offset areas, but should be inspected daily during a pest animal control event.</p>
Fauna breeding places	It is not permissible to damage, destroy, move, excavate or otherwise interfere with active animal breeding places, such as nests, burrows, caves, roost sites, or other structures used by native fauna species.
Planned burning	Fire is a key threat to SEVT communities and to a lesser degree Brigalow communities. Accordingly, any planned burns to manage fuel loads within Valkyrie, especially in areas adjacent to the nominated offset areas, will only be conducted in accordance with the measures outlined in the Valkyrie Fire Management Plan.
Agricultural activities	No commercial grazing or cropping is to occur within the nominated offset areas.
Unauthorised access	Only vehicles or individuals who have obtained official permission from the land owners, QGC or Queensland Parks and Wildlife Service (QPWS), are allowed to access the nominated offset areas.
Wet weather	No access permitted during wet weather or immediately after a high rainfall event
Resource extraction	None permissible within the nominated offset areas.

6.2 MANAGEMENT ACTIONS FOR THE NOMINATED OFFSET AREAS

6.2.1 Invasive plant control

The control and prevention of invasive plant incursions will be undertaken in accordance with relevant legislation. This may also include the introduction of an approved biological control agent, subject to relevant legislation.

Invasive plant control will focus on the control of restricted weeds and/or WoNS listed in Table 5-1. Control will be undertaken annually for each species in accordance with optimum times of control for the species and the requirements outlined in Section 5.3.1 and in Appendix A.

6.2.2 Invasive animal control

The control and prevention of invasive animal incursions must be undertaken in accordance with the relevant legislation and will be conducted by the landholder or invited commercial agents.

Invasive animal populations known to occur within Valkyrie and the nominated offset areas will be controlled through the control measures outlined in Section 5.4.1 and in Appendix B. All invasive animal control must be undertaken in a humane manner.

Feral stock mustering

Mustering of feral cattle and brumbies shall only be undertaken by suitably qualified stockmen and will involve the following:

- Mustering shall only occur during the dry season to lessen the impact of running livestock on soft wet ground.
- Mustering shall be undertaken on horseback and/or with the aid of a helicopter.
- All livestock must be handled with care in handling yards that are fit for purpose.
- Any seriously injured or sick feral stock will need to be euthanized humanely and quickly.
- Untagged feral stock can be either sold to a local abattoir or through a local or regional livestock sale yard.
- Tagged feral stock will be returned to the owner at their expense.

6.2.3 Fire mitigation and management

Fuel breaks will be established in open areas around the nominated offset areas. In instances where the offset is associated with contiguous vegetation or other offset vegetation, the fuel break must be positioned at the nearest suitable area, such as along a boundary fence line, access track or open paddock. All fuel breaks will be inspected annually and maintained to ensure their effectiveness as a fire mitigation measure.

Appendix C provides further guidance on the fire mitigation and management that is required for the nominated offset areas.

6.2.4 General land management

Fencing

Construction of fencing may only be performed to aid in the management of pest animals and feral stock (i.e. to exclude them from nominated offset areas), and clearing associated with this fencing is to be kept to a minimum. Areas of existing and proposed fencing are shown in Figure 6-1.

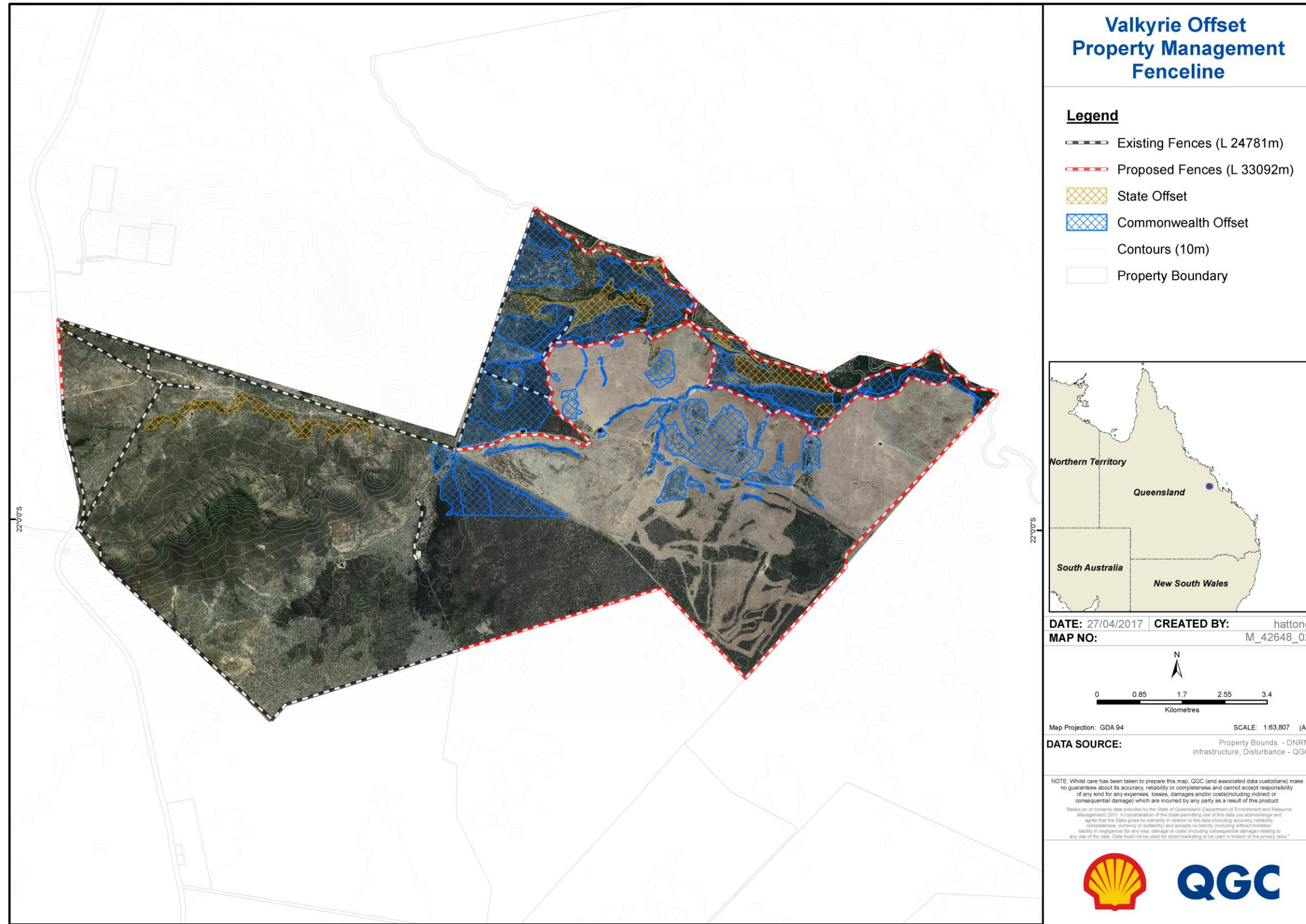
The measures for establishing new fencing include:

- Fencing maintenance and construction will occur during the dry season.
- Fence lines must avoid TEC and threatened species habitat offsets by placing the fence line beyond the outer edge of these offsetable values.
- Establish access tracks along fence lines for maintenance purposes.
- The condition of fence lines shall be monitored annually for damage; any identified damage shall be remediated as soon as possible.
- No fencing vertically up steep slopes.
- Where fencing is in disrepair and allowing breaches of pest animals, repairs will occur within 30 days of actioning a response, subject to weather and accessibility.

Restricted access

Access into Valkyrie and the nominated offset areas is restricted and QGC access procedures and protocols will prevent any unauthorised access. However, regular monitoring will be required periodically and will involve the following:

- Inspecting gates and boundary fences for signs of damage to determine if any illegal access has been obtained.
- Inspecting restricted access signage and the replacement of any damaged, lost or sun faded signs.
- Inspecting boundary fences for signs of livestock incursion or evidence of damage where livestock have attempted to breach fences (i.e. unstrained or broken wires, hair/fur on barbs).



**Figure 6-1
EXISTING AND PROPOSED FENCING**

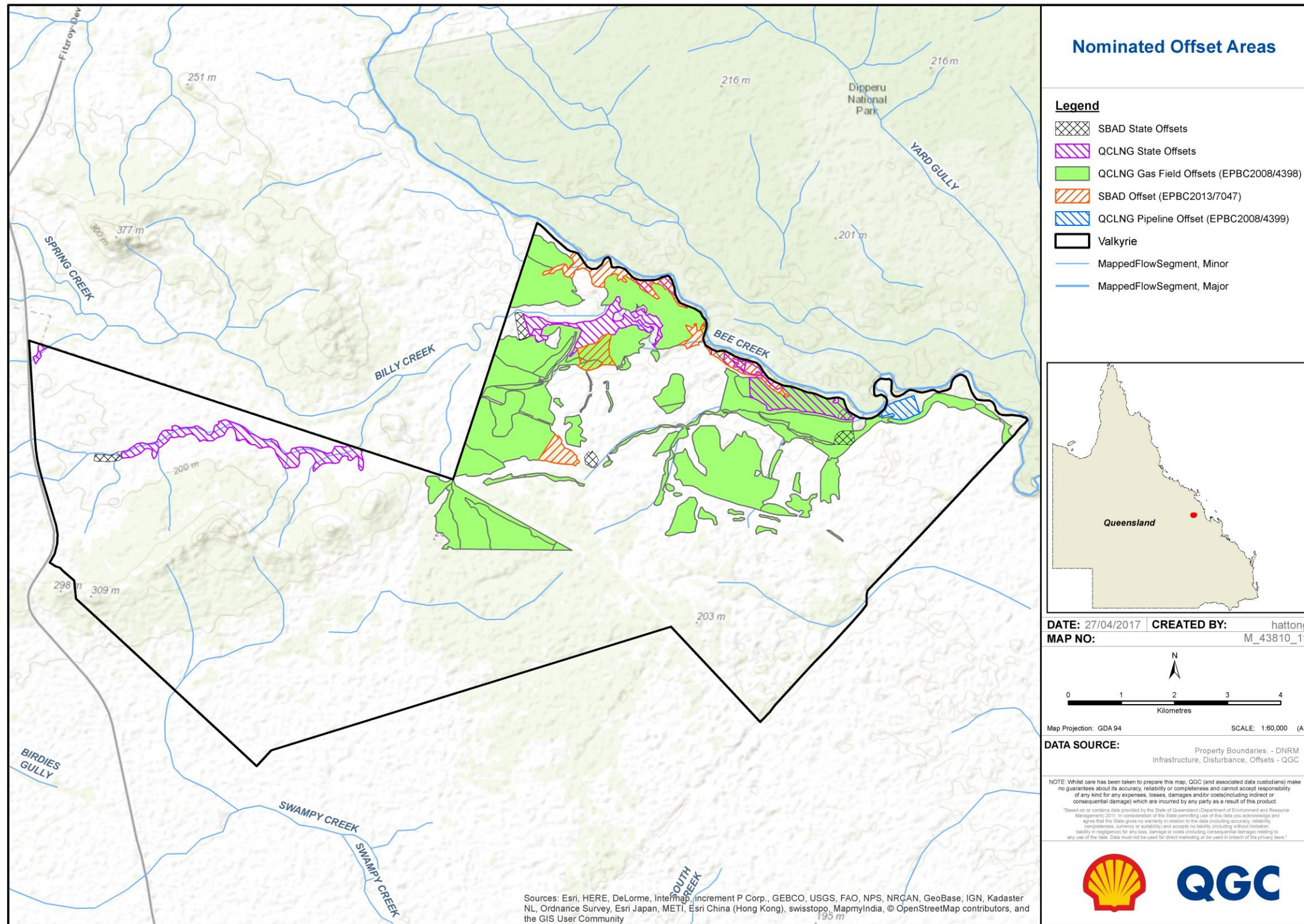


Figure 6-2
NOMINATED OFFSET AREAS

Access track establishment, rehabilitation and maintenance

There is a network of access tracks on Valkyrie, which provide adequate access to parts of the nominated offset areas. However, there are some parts of the nominated offset areas that are isolated from existing access tracks and new access tracks will need to be established.

The management measures for establishing new access track or rehabilitating and maintaining existing access tracks include:

- Following the contour where possible.
- Clearing for the track must not exceed 3 m width, along with the additional areas required for the provision of whoa boys and catch drains for sediment and erosion control purposes.
- Where possible new access tracks will be through roads (i.e. no cul -de-sacs or dead ends) that connect to another access track to provide safe access and egress in two directions during wildfire emergencies.
- Where new access tracks are in close proximity to TECs and threatened species habitat offsets, temporary exclusion fencing or flagging will be required to prevent any unnecessary access and damage.
- Access track establishment shall only occur after the wet season.
- Access track establishment shall be completed in Years 1 (2017) and 2 (2018) only.

Some of the existing tracks require rehabilitation or upgrading where soil erosion has occurred. These tracks and any new tracks will be monitored annually for signs of erosion and for track rehabilitation and maintenance including:

- Access tracks in and adjacent to the nominated offset areas will be monitored annually following the the wet season to inform any maintenance requirements.
- Where required, access track rehabilitation or maintenance shall only occur following the wet season and prior to the subsequent wet season.
- Access track rehabilitation shall be undertaken in Year 1 (2017) and annually as required in subsequent years.
- Access track maintenance shall be undertaken as necessary in response to seasonal rainfall events causing damage.

Erosion and sediment control

Erosion and sediment control measures shall be applied to any areas where soil is exposed or will be exposed for the establishment of fuel breaks, fuel break buffers and access tracks. The erosion and sediment control management measures, include:

- Ensuring the disturbance footprint for fuel breaks, fuel break buffers or access tracks is within the minimum specifications detailed in this OAMP.
- Any disturbances to the soil's physical properties will be avoided or at best minimised.

- Signs of potential soil erosion will be identified as part of fuel break and access track monitoring.
- Identified erosion hazards will be remediated as soon as possible when weather permits following the completion of the wet season. Remedial works must not exacerbate existing, or create additional, soil erosion risks.

Cultural Heritage considerations

All land management tasks will be undertaken with consideration to the current cultural heritage protection measures detailed within QGC's Cultural Heritage Management Plan.

6.3 CONSIDERATION OF MNES CONSERVATION ADVICE, RECOVERY AND THREAT ABATEMENT PLANS

Consideration of any relevant conservation advice, recovery plan or threat abatement plan for MNES has been undertaken and a summary of the alignment with measures included in the OAMP is included in Table 6-2 below.

Table 6-2: Offset Area Management Alignment to relevant conservation advice, recovery plan or threat abatement plan

MNES	Relevant conservation advice, recovery plan and threat abatement plan	Conservation advice, recovery plan and threat abatement plan measures	Alignment of proposed measures to relevant conservation advice, recovery plan and threat abatement plan
<i>Acacia harpophylla</i> dominant and codominant) threatened ecological community	<p>Conservation advice. http://www.environment.gov.au/biodiversity/threatened/communities/pubs/028-conservation-advice.pdf</p> <p>Threat abatement plan - Cane Toads http://www.environment.gov.au/system/files/resources/2dab3eb9-8b44-45e5-b249-651096ce31f4/files/tap-cane-toads.pdf</p>	<p>No recovery or threat abatement plan exists.</p> <p>Conservation advice</p> <p>Brigalow TEC is listed as endangered due to a severe decline in extent following its clearance in both Queensland and New South Wales for agricultural use.</p> <p>Threat abatement plan for Cane Toads.</p> <p>The Cane Toad TAP is implemented by the Australian Government. The TAP acknowledges that eradication of cane toads is not currently possible. The current listing advice for Brigalow TEC does not list cane toads as a threat and Brigalow TEC has no recovery plan. Actions listed in the TAP are</p>	<p>Conservation advice</p> <p>Section 4 and table 4.1 of this OAMP acknowledges clearing and other threats to Brigalow TEC. Section 8.2 and table 8.2 list measures to compensate for regeneration of previously cleared Brigalow community in offset areas on Valkyrie.</p> <p>Threat abatement plan for Cane Toads.</p> <p>Any future successful Government initiatives towards biological control will be considered by QGC.</p>

MNES	Relevant conservation advice, recovery plan and threat abatement plan	Conservation advice, recovery plan and threat abatement plan measures	Alignment of proposed measures to relevant conservation advice, recovery plan and threat abatement plan
		Government focused in collaboration with State and Territory Governments.	
Semi-evergreen vine thickets of the Brigalow Belt and Nandewar Bioregions (SEVT) TEC	<p>Endangered due to a severe decline in extent following its clearance in both Queensland and New South Wales for agricultural land uses.</p> <p>Recovery Plan Available from: http://www.environment.gov.au/biodiversity/threatened/publications/recovery/semi-evergreen-vine-thickets.html</p> <p>Threat abatement plan - Cane Toads http://www.environment.gov.au/system/files/resources/2dab3eb9-8b44-45e5-b249-651096ce31f4/files/tap-cane-toads.pdf</p>	<p>Recovery Plan Threats to SEVT listed in the recovery plan are :</p> <ul style="list-style-type: none"> • clearing; • fire; • weeds; • grazing; • vertebrate pests; and • coastal development. <p>Summary of Recovery Plan actions The following actions are recommended:</p> <p>A. Complete and refine mapping of remnant SEVT EC. B. Determine the extent and condition of areas of the SEVT EC affected by invasive plant species, particularly weeds of national significance (WONS), e.g. rubber vine and lantana. C. Survey poorly known species, especially fungi, herpetofauna and invertebrates. D. Monitor selected populations of the EPBC Act-listed species across their distribution within the EC. E. Identify key areas of the SEVT EC for addition to the Queensland and NSW conservation reserve systems. F. Encourage landholders to enter into conservation agreements over semi-evergreen vine thickets.</p>	<p>These threats to SEVT are described in Table 4.2 of this OAMP.</p> <p>Alignment of actions in the OAMP corresponding to the actions of the recovery plan are as follows:</p> <p>A. Detailed mapping on SEVT complete (See fig 3.4) B.- as described in Table 4.2. D. as described in section 7.1 of the OAMP. E,F & J. achieved through provision of the Valkyrie offset G. As described in section 5.5. H. As described in section 4.1, 5.6.1 and 6.2.4 I. As described in section 5.4 and 6.2.2</p> <p>Threat abatement plan for Cane Toads.</p>

MNES	Relevant conservation advice, recovery plan and threat abatement plan	Conservation advice, recovery plan and threat abatement plan measures	Alignment of proposed measures to relevant conservation advice, recovery plan and threat abatement plan
		<p>G. Liaise with landholders to develop appropriate burning practices and other procedures to minimize fire damage to remnant areas of SEVT on private and public lands.</p> <p>H. Determine the impact of grazing animals, both domestic and native, on remnant areas of SEVT. Develop guidelines and recommendations for fencing.</p> <p>I. Develop and implement a pest management program to control or manage feral animals and native animals in SEVT remnants.</p> <p>J. Encourage landholders through appropriate incentive programs to protect and foster regrowth SEVT and associated vegetation in buffer areas.</p> <p>The Cane Toad TAP is implemented by the Australian Government. The TAP acknowledges that eradication of cane toads is not currently possible.</p> <p>Actions listed in the TAP are Government focused in collaboration with State and Territory Governments.</p>	<p>Any future successful Government initiatives towards biological control will be considered by QGC.</p>
Yakka Skink (<i>Egernia rugosa</i>) habitat	<p>There is no recovery or threat abatement plan for the Yakka Skink.</p> <p>Conservation advice</p>	<p>Conservation advice</p> <p>The main identified threat to the Yakka Skink is a continued legacy of past broad scale land clearing and habitat degradation.</p>	<p>The offset areas identified include habitat previously unprotected from clearing.</p> <p>The fire management proposed for Valkyrie also accords with recommendation in the conservation</p>

MNES	Relevant conservation advice, recovery plan and threat abatement plan	Conservation advice, recovery plan and threat abatement plan measures	Alignment of proposed measures to relevant conservation advice, recovery plan and threat abatement plan
	http://www.environment.gov.au/biodiversity/threatened/species/pubs/1420-conservation-advice.pdf		advice for regional and local priorities to promote recovery of the Yakka Skink.
Brigalow Scaly-foot (<i>Paradelma orientalis</i>), which includes microhabitat for the species	There is no conservation advice, recovery or threat abatement plan for the Brigalow Scaly Foot.	NA.	NA.
Koala (<i>Phascolarctos cinereus</i>)	There is no recovery or threat abatement plan for the Koala. Conservation advice http://www.environment.gov.au/biodiversity/threatened/species/pubs/197-conservation-advice.pdf	<p>Conservation advice</p> <p>The main identified threats to this species are loss and fragmentation of habitat, vehicle strike, disease, and predation by dogs.</p> <p>Priority management actions listed in the conservation advice which are considered relevant to a local property scale are summarized below.</p> <p>Priority Management Actions</p> <p><i>Habitat Loss, Disturbance and Modification</i></p> <p>a) Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.</p>	<p>Alignment of actions in the OAMP corresponding to the priority management actions in the conservation actions are as follows:</p> <ul style="list-style-type: none"> a) Monitoring of Koala offset areas are described in section 7 of the OAMP. b) The primary purpose of the Valkyrie offset area is to establish a protected area estate on privately owned land as described in section 2.2. c) The Koala offset areas established on Valkyrie are adjacent to the Dipperu National Park which is also known to contain Koala habitat. Protection and ongoing management of the Valkyrie area

MNES	Relevant conservation advice, recovery plan and threat abatement plan	Conservation advice, recovery plan and threat abatement plan measures	Alignment of proposed measures to relevant conservation advice, recovery plan and threat abatement plan
		<p>b) Investigate formal conservation arrangements, management agreements and covenants on private land, and for Crown and private land investigate and/or secure inclusion in reserve tenure if possible.</p> <p>c) Develop and implement options of vegetation recovery and re-connection in regions containing fragmented koala populations, including inland regions in which koala populations were diminished by drought and coastal regions where development pressures have isolated koala populations.</p> <p><i>Animal Predation</i></p> <p>d) Develop and implement a management plan to control the adverse impacts of predation on koalas by dogs in urban, peri-urban and rural environments.</p> <p><i>Conservation Information</i></p> <p>e) Engage with private landholders and land managers responsible for the land on which populations occur and encourage these key stakeholders to contribute to the implementation of conservation management actions.</p>	<p>will increase the connectivity of Koala habitat in the local area.</p> <p>d) Pest management actions assigned to the offset areas are described in section 5.4 which includes monitoring and control activities for wild dogs.</p> <p>e) Valkyrie will be managed for conservation actions described in the OAMP.</p>
<p>South Eastern Long Eared Bats (<i>Nyctophilus corbeni</i>)</p>	<p>There is no recovery or threat abatement plan for the South Eastern Long Eared Bat (SELB).</p> <p>Conservation advice</p>	<p>Conservation advice</p> <p>Habitat loss and fragmentation is a known threat to the species.</p>	

MNES	Relevant conservation advice, recovery plan and threat abatement plan	Conservation advice, recovery plan and threat abatement plan measures	Alignment of proposed measures to relevant conservation advice, recovery plan and threat abatement plan
	<p>http://www.environment.gov.au/biodiversity/threatened/species/pubs/83395-conservation_advice-01102015.pdf</p>	<p>Conservation and management actions listed in the conservation advice which are considered relevant to a local property scale are summarized below.</p> <p><i>Habitat loss disturbance and modifications</i></p> <ul style="list-style-type: none"> a) Protect known and potential habitat of key populations, including within conservation reserves, from habitat loss and fragmentation. b) Where feasible, undertake habitat renewal actions to link habitat supporting known populations or potential habitat. Retain hollow-bearing trees and provide for hollow tree recruitment where possible. <p><i>Stakeholder Engagement</i></p> <ul style="list-style-type: none"> c) Encourage landholders on private property or leaseholders on crown land supporting key populations to minimize habitat loss and fragmentation, and enhance habitat values by participating in voluntary conservation and incentive programs 	<p>Alignment of actions in the OAMP corresponding to the conservation and management actions in the conservation actions are as follows:</p> <ul style="list-style-type: none"> a) and b) <ul style="list-style-type: none"> The SELB offset area established on Valkyrie is adjacent to the Dipperu National Park. Protection and ongoing management of the Valkyrie area will increase the connectivity and quality of SELB habitat in the local area. C) The primary purpose of the Valkyrie offset area is to establish a protected area estate on privately owned land as described in section 2.2.

6.4 MEETING THE OBJECTIVES OF THE NOMINATED OFFSET AREAS

As described in Sections 5.1 and 5.2 the priority objectives for the nominated offset areas are to encourage the natural regeneration and maintenance of ecological values within the nominated Offset areas. A discussion regarding how each of these objectives will be met is described below.

6.4.1 Commonwealth offset objectives for QCLNG

Encourage the natural regeneration of Brigalow regrowth

The regeneration of Brigalow regrowth is specifically focussed on improving its overall ecological condition and habitat value to provide an ecological gain. Rehabilitation of the Brigalow regrowth and Brigalow remnant will be facilitated through weed control, pest animal control and livestock exclusion.

The Brigalow that is contained within the QCLNG offset area will be monitored annually.

The progression of the natural regenerative processes ‘rehabilitation’ of Brigalow regrowth will be primarily informed by five ecological condition indicators that will be monitored annually. These five indicators are fundamentally linked to natural regenerative processes, including:

1. Native plant species richness
 - trees
 - shrubs
 - grasses
 - forbs
2. Tree canopy height
3. Tree canopy cover
4. Native perennial grass cover
5. Weed cover.

Indicator 2 ‘tree canopy height’ and Indicator 3 ‘tree canopy cover’ are the two indicators that are essential for measuring when the regrowth vegetation that is composed of species characteristic of the regional ecosystem, has reached remnant status, being 50% cover and 70% height of the remnant benchmark or remnant reference site (DSITIA, 2012).

If after the first five years of annual monitoring the regrowth of Brigalow indicates a lack of natural regeneration and/or growth (the indicators listed above), adaptive management practices and corrective actions will be applied in accordance with section 6.6. Management measures will be applied to regrowth areas (511ha of Brigalow) until

habitat is established or improved for listed species and revegetation areas meet and maintain the criteria for remnant status for the threatened ecological community.

Upon reaching remnant status application will be made to have the revegetation areas reclassified as remnant vegetation in accordance with the relevant Queensland legislation. The application will be made within 30 days of completed monitoring and reporting where remnant status is achieved. Management measures will continue until remnant vegetation status is achieved in accordance with the relevant Queensland legislation.

Improving the ecological condition and habitat value of Brigalow remnant and SEVT

Improvements to the ecological condition and habitat value of Brigalow remnant and SEVT will be informed by five ecological condition indicators, to be monitored annually. These five indicators are fundamentally linked to improvements of ecological condition and habitat value, including:

1. Native plant species richness
 - trees
 - shrubs
 - grasses
 - forbs
2. Shrub canopy cover
3. Organic litter cover
4. Coarse woody debris
5. Weed cover.

If after the first five years of annual monitoring the Brigalow remnant and SEVT indicates a lack of ecological condition and habitat value improvement (the indicators listed above), adaptive management practices and corrective actions will be implemented. Where drought or unintended wildfires are deemed by the offset area manager as causal factors in a lack of ecological condition and habitat value improvement remedial actions may not apply.

Enhancement of Yakka Skink and Brigalow Scaly-foot habitat

The control of pests and weeds across the QCLNG offset area will enhance Yakka Skink and Brigalow Scaly-foot habitat values within the habitat offset through including but not limited to;

- Increased ground vegetation and organic litter;
- Increased coarse woody debris and hollow logs;
- Decline in the evidence of pest animal activity particularly feral pigs, cattle and feral horses

The success of the weed and pest control will inform success of Yakka Skink and Brigalow Scaly-foot habitat enhancement.

6.4.2 State Offset for QCLNG

Endangered and of concern regional ecosystems

As for the Brigalow and SEVT Commonwealth offsets, improvements to the ecological condition and habitat value of endangered and of concern regional ecosystem State offsets will be informed by five ecological condition indicators that will be monitored annually. These five indicators are fundamentally linked to improvements of ecological condition and habitat value, including:

1. Native plant species richness
 - trees
 - shrubs
 - grasses
 - forbs
2. Shrub canopy cover
3. Organic litter cover
4. Coarse woody debris
5. Weed cover.

If after the first five years of annual monitoring the endangered and of concern regional ecosystems indicates a lack of ecological condition and habitat value improvement (the indicators listed above), corrective actions will be applied. Where drought or unintended wildfires are deemed as causal factors in a lack of ecological condition and habitat value improvement remedial actions may not apply.

Enhancement of Yakka Skink and Brigalow Scaly-foot habitat

As outlined above for the QCLNG Commonwealth Yakka Skink and Brigalow Scaly-foot offset, the control of pests and weeds across the QCLNG offset area will enhance Yakka Skink and Brigalow Scaly-foot habitat values within the habitat offset. The success of the weed and pest control will inform success of Yakka Skink and Brigalow Scaly-foot habitat enhancement.

6.4.3 Commonwealth Offset for the SBAD

Brigalow

Improvements to Brigalow offset will be facilitated holistically through the integration of weed and pest animal control and fire mitigation and management.

The Brigalow offset will be monitored annually using a Secondary level flora survey methodology in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland Version 3.2* (DSITIA, 2012).

The secondary level survey was used to determine the quality of the impact Brigalow within the impact area and accordingly was also applied to the Brigalow in the nominated Offset areas to facilitate the use of the *EPBC Act Offsets Assessment* guide calculator that is used to inform the required offset. The secondary level survey data in the Brigalow offset establishes the baseline for future monitoring of the Brigalow toward an ecological gain.

The progression of the natural regenerative processes of Brigalow will be primarily informed by five ecological condition indicators that will be monitored annually. These five indicators are fundamentally linked to improvements of ecological condition of remnant Brigalow, including:

1. Native plant species richness
 - trees
 - shrubs
 - grasses
 - forbs
2. Shrub canopy cover
3. Organic litter cover
4. Coarse woody debris
5. Invasive plant cover.

If after every five years of monitoring the Brigalow regrowth and/or remnant vegetation, indicate a lack of natural regeneration (the indicators listed above), corrective actions will be implemented until such time that remnant Brigalow status is achieved. Where drought or unintended wildfires are deemed as causal factors in a lack of ecological condition and habitat value improvement remedial actions may not apply.

Enhancement of Yakka Skink Habitat

The control of pests and weeds across the Surat Basin offset area will enhance Yakka Skink habitat values including but not limited to;

- Increased ground vegetation and organic litter;
- Increased coarse woody debris and hollow logs;
- Decline in the evidence of pest animal activity particularly feral pigs, cattle and feral horses

The success of the weed and pest control will inform success of Yakka Skink habitat enhancement.

Enhancement of Koala habitat

The control of pests and weeds across the Surat Basin offset area will enhance Koala habitat values through parameters expected to contribute positively to the overall quality of the Koala habitat including but not limited to:

- an increase in availability of food and quality of foraging habitat;
- increased tree canopy cover, required for roosting and shelter;
- an increase in the number of tree species present, with a potential increase the number of koala food tree species present;
- increased native grass cover, which suppresses weeds and thereby encourages recruitment of juvenile eucalypt feed trees;
- increased organic litter cover, which is important for surface soil moisture retention, cycling of nutrients and providing interstitial spaces to enhance native shrub and tree seed germination and growth of canopy species including koala feed species;
- an increase in the number of ecologically dominant layer (EDL) species and koala food trees recruiting; and
- reduced threats to koalas by predation – e.g. control to reduce feral animal incursion, particularly wild dogs.

The success of the pest control will inform success of Koala habitat enhancement.

Enhancement of South-eastern Long-eared Bat habitat

The control of pests across the Surat Basin offset area will enhance South-eastern Long-eared Bat habitat values including but not limited to;

- regeneration of the understorey layer as an important feature of suitable SELB habitat;
- an increase in availability and quality of foraging habitat; and
- increased tree canopy cover, and potential hollows adjacent to waterways required for roosting and shelter.

The success of the pest control will inform success of South-eastern Long-eared Bat habitat enhancement.

6.4.4 State Offset for the SBAD

Endangered and of concern regional ecosystems

The endangered and of concern offsets for the SBAD will be monitored annually using the EEM.

Improvements to the endangered and of concern regional ecosystem offsets will be informed by 10 ecological condition indicators that will be monitored annually. These 10 indicators are fundamentally linked to improvements of ecological condition of remnant Brigalow, including:

1. Recruitment of woody perennial species
2. Native plant species richness
 - trees
 - shrubs

- grasses
 - forbs
3. Tree canopy height
 4. Tree canopy cover
 5. Shrub canopy cover
 6. Native perennial grass cover
 7. Organic litter cover
 8. Large trees per hectare
 9. Coarse woody debris per hectare
 10. Weed cover.

If after the first five years of annual monitoring the Brigalow regrowth and/or remnant vegetation, indicate a lack of natural regeneration and growth (the indicators listed above), corrective actions will be implemented. Where drought or unintended wildfires are deemed as casual factors in a lack of ecological condition and habitat value improvement remedial actions may not apply.

Enhancement of Glossy Black-cockatoo habitat

The control of pests across the Surat Basin offset area will enhance Glossy Black-cockatoo habitat values. The success of the pest control will inform success of Glossy Black-cockatoo habitat enhancement.

Enhancement of Pale Imperial Hairstreak habitat

The control of pests across the Surat Basin offset area will enhance Pale Imperial Hairstreak habitat values. The success of the pest control will inform success of Pale Imperial Hairstreak habitat enhancement.

6.5 RISK ANALYSIS AND REMEDIAL ACTIONS

In accordance with EPBC Approval Conditions (EPBC 2013/7047) a risk analysis which considers the risks of achieving the objectives and outcomes for the SBAD Offset is presented in Table 6-2. The level of risk and required level of remedial action include:

- Low risk: requires ongoing routine remedial action.
- Moderate risk: requires moderate remedial action to take place within 1 month.
- High risk: requires priority remedial action to take place within 2 weeks.
- Extreme risk: requires immediate remedial action to take place within 1 week.

The risk analysis identifies key risks of plan failure, relative risk, related management measures and remedial actions if the risks are realised.. Moreover, it also includes an adaptive management process of reviewing and auditing management actions in response to significant risks eventuating, such as wildfire or drought, or unanticipated vegetation responses.

Unanticipated vegetation responses may include an overall decline or stasis of ecological condition of the Brigalow instead of showing signs of enhancement (i.e. height or cover).

It will be necessary to review the risk analysis and remedial actions throughout the 20 year management timeframe for the nominated offset areas, particularly if any unforeseen risks emerge or any negative outcomes identified are greater than expected.

6.6 ADAPTIVE MANAGEMENT

Adaptive management intends to provide managers of offsets with a level of flexibility to implement significant changes to management that adapts to site conditions, either in response to planned site management achieving unexpected site responses or through climatic factors such as drought, fire and flood.

Adaptive management will apply to the entire OAMP. An adaptive implementation program will be used to ensure uncertainty is reduced over time, and that performance indicators and completion criteria are achieved. As more information becomes available following ongoing compliance monitoring, the management and monitoring regime will be reviewed and revised to maximise the likelihood of attaining and maintaining the outcomes to be achieved by implementing the plan.

Table 6-3 Risk analysis of achieving the objectives and outcomes for the SBAD offset, and remedial actions

Item	Risk	Relevant factors	Level of risk (extreme, high, moderate or low)	Management actions designed to minimise risk	Remedial actions
1	Restricted invasive plant and/or WoNS infestations inhibiting the improvement of ecological condition of Brigalow.	<p>Invasive plants are present within Brigalow TEC.</p> <p>Invasive plants around the outer perimeter of the Brigalow offset, facilitated by edge effects.</p>	<p>Low</p> <p>Moderate for Rubber Vine</p>	<p>The control of Restricted Invasive plants and/or WoNS, as listed in Appendix A, through the use of selective herbicides to reduce the infestations and assist the recruitment of native grass, shrub and tree species.</p> <p>Refer Appendix A for further guidance.</p>	<p>Investigate cause of Restricted invasive plant and/or WoNS infestation. Remedial action will include revising the control measures detailed in Appendix A.</p>
2	Ecological condition scoring of Brigalow remnant is not increasing.	<p>Facilitating an ecological gain or increase in quality (ecological condition) is a requirement of the Commonwealth offset policy.</p> <p>Increase the scores for the seven ecological condition indicators, which are fundamentally linked to improving the ecological condition of the Brigalow:</p> <ol style="list-style-type: none"> 1. Native plant species richness: <ul style="list-style-type: none"> – trees – shrubs – grasses – forbs 2. Tree canopy height 3. Tree canopy cover 4. Shrub canopy height 5. Shrub canopy cover 6. Native ground cover 7. Weed cover. <p>Low scores for these indicators will most likely be due to weed</p>	Moderate	<p>Invasive plants control facilitating an overall increase to the ecological condition score for the Brigalow. Invasive plants management (Appendix A) and Invasive animal management (Appendix B) and fire management (Appendix C).</p>	<p>If the Brigalow remnant vegetation indicates that ecological condition is not increasing at the first monitoring and scoring event (year 5), the following remedial action will be required:</p> <ul style="list-style-type: none"> • Investigate to determine cause of no ecological gain or condition improvement. • Revise timing and frequency of management actions. • Revise frequency and intensity of pest animal management. • Revise frequency and intensity of weed management.

Item	Risk	Relevant factors	Level of risk (extreme, high, moderate or low)	Management actions designed to minimise risk	Remedial actions
		competition, or pest animal impacts.			
3	Ecological condition scoring of endangered and of concern regional ecosystems is not increasing.	<p>Facilitating an increase in quality (ecological condition) is a requirement of the State offset policies.</p> <p>Increase the scores for the 10 ecological condition indicators, which are fundamentally linked to improving the ecological condition of the endangered and of concern regional ecosystems:</p> <ol style="list-style-type: none"> 1. Recruitment of woody perennial species 2. Native plant species richness <ul style="list-style-type: none"> – trees – shrubs – grasses – forbs 3. Tree canopy height 4. Tree canopy cover 5. Shrub canopy cover 6. Native perennial grass cover 7. Organic litter cover 8. Large trees per hectare 9. Coarse woody debris per hectare 10. Weed cover. <p>Low scores for these indicators will most likely be due to weed</p>	Moderate	Invasive plants control facilitating an overall increase to the ecological condition score for the regional ecosystems. Invasive plants management (Appendix A) and invasive animal management (Appendix B) and fire management (Appendix C).	<p>If the endangered and of concern remnant vegetation indicates that ecological condition is not increasing at the first monitoring and scoring event (year 5), the following remedial action will be required:</p> <p>:</p> <ul style="list-style-type: none"> • Investigate to determine cause of no ecological gain or condition improvement. • Revise timing and frequency of management actions. • Revise frequency and intensity of pest animal management. • Revise frequency and intensity of weed management.

Item	Risk	Relevant factors	Level of risk (extreme, high, moderate or low)	Management actions designed to minimise risk	Remedial actions
		competition, or pest animal impacts.			
4	Invasive animals	<p>Feral pigs digging up the roots of Brigalow trees species, leading to dieback.</p> <p>Predation of native fauna by feral cats, dogs and pigs.</p> <p>Rabbit burrows and warrens potentially creating soil erosion.</p>	<p>Low</p> <p>Moderate for cats</p>	<p>The required level of monitoring and the increased frequency of human intervention within the nominated offset areas increase the possibility of identifying and controlling invasive animals.</p> <p>Refer Appendix B for further guidance.</p>	<p>Investigate cause of increased invasive animal populations and if necessary increase the intensity and frequency of the invasive animal control measures detailed in Appendix B.</p> <p>Review and audit the invasive animal control measures to evaluate their effectiveness and revise the measures accordingly.</p>
5	Adverse effects from wildfire or inappropriate planned burning	<p>Landscape wildfires are a threat to Brigalow vegetation and threatened species habitat.</p> <p>Inappropriate planned burns becoming wildfires are also a threat to Brigalow vegetation and threatened species habitat.</p> <p>Weed accumulation resulting in high fuel loads and wildfire intensity is a threat to Brigalow vegetation.</p>	Moderate	<p><u>No</u> unplanned burns are permissible within the nominated offset areas.</p> <p>The fire management measures associated with fuel break establishment, fuel break maintenance, fuel load reduction, as detailed in Appendix C, operate collectively together to reduce the risks and potential adverse effects associated with wildfires or inappropriate planned burns.</p> <p>Appendix C also documents the above measures and a strategic approach for preventing wildfire impacts upon the nominated offset areas.</p>	<p>In the event a wildfire adversely impacts the Brigalow and threatened species habitat offsets within the nominated offset areas. The fire management measures detailed in Appendix C will need to be reviewed and audited to identify any inefficiencies and the need for additional fire management actions or wildfire prevention measures.</p> <p>This review will need to be undertaken by QGC in close consultation with all stakeholders, including QFES Central Region and QPWS.</p> <p>In addition areas adversely impacted by wildfires will be assessed to determine if areas are suitable for native seeds to be distributed.</p>
6	Drought	<p>Drought may limit the recruitment of native species within Brigalow communities.</p> <p>Drought may increase the intensity of wildfires, especially if the wet season is late.</p> <p>Prolonged drought may create large areas of bare ground which</p>	Low	<p>Reassess all fuel breaks and fuel break buffer (underground mine flares) provisions, and increase the frequency of monitoring and maintenance. Refer Appendix C.</p>	<p>The management timeframe for the nominated offset areas may need to be revised in consultation with all stakeholders QGC, QPWS, DoEE and DEHP.</p> <p>Consultation with QFES Central Region will be required when reassessing fuel breaks and fuel break buffers.</p>

Item	Risk	Relevant factors	Level of risk (extreme, high, moderate or low)	Management actions designed to minimise risk	Remedial actions
		then become an erosion risk once the drought breaks.			
7	Vegetation clearing	<p>The establishment or maintenance of fuel breaks, fuel break buffers, fence lines and access tracks, and fuel load reduction.</p> <p>Upgrading degraded access tracks that pose an erosion risk.</p> <p>Rehabilitating degraded access tracks that are currently an erosion risk.</p> <p>All of the above require varying degrees of vegetation clearing.</p>	Low	<p>The fuel break establishment and maintenance measures, and the controlling measures for establishing and maintaining fuel breaks minimise the risk of clearing vegetation of conservation significance.</p> <p>Fuel load reduction measures reduce the risk of slashing native shrub and tree species associated with vegetation of conservation significance.</p> <p>The measures for fence line establishment measures minimise the risk of clearing vegetation of conservation significance.</p> <p>The measures for access track establishment, rehabilitation and maintenance are designed to avoid the clearing vegetation of conservation significance.</p>	If additional vegetation clearing to what is specified in the respective management actions is required approvals for such clearing will be sought from DoE and/or DEHP by QGC.
8	Unauthorised access	Risk of unauthorised access by members of the public, e.g. recreational hunters, trail bike riders, horse riders, bushwalkers, etc.	Low	The restricted access measures are intended to prevent any unauthorised access.	<p>If unauthorised access is obtained it may be necessary to increase the numbers of signs, frequency of monitoring and increase the level of security.</p> <p>If unauthorised vehicle access has resulted in damage to Brigalow vegetation or threatened species habitat, rehabilitation will be required.</p>
9	Soil erosion	There is a risk that unforeseen high rainfall or flood events may create or exacerbate existing areas of erosion.	Moderate	The erosion and sediment control measures will reduce the erosion resulting from high rainfall or flood events.	Undertake inspections of access tracks, creek line crossings, fuel breaks and fuel break buffers, as soon as possible following the high rainfall or flood events.

* Corrective actions for offset areas are detailed in section 7 of the OAMP.

6.7 SUMMARY OF MANAGEMENT ACTIONS WITHIN THE NOMINATED OFFSET AREAS

The following section provides a summary of management actions to be undertaken across the nominated Offset areas and related monitoring activities.

Table 6-4 describes the management actions which will be applied to the nominated Offset areas until ecological gain has been attained. These actions will form the basis of actions to maintain ecological gains once achieved. Table 6-4 Summary of management actions and monitoring frequencies for the nominated Offset areas

Management Action	Frequency and Timing of action(s)	Monitoring	Responsible person(s) for activity
Invasive plant and animal control			
Invasive plant control	Control will be undertaken annually for each weed in accordance with optimum times of control for the species.	Annual weed monitoring specific to species growth cycles with follow up monitoring to occur at least 6 weeks after application of herbicides.	Weed control contractor and/or QPWS Rangers, as directed by offset area manager
Invasive animal control	As required. To be undertaken anytime of the year for eradicating Feral Pig, Feral Dog, Feral Cat and the Rabbit.	Annually beyond year 5 or as deemed necessary by previous monitoring events.	Pest animal control contractor and/or QPWS Rangers, as directed by offset area manager
Feral stock mustering	As required. To be undertaken anytime of the year to remove feral cattle and brumbies.	As deemed necessary through indications such as broken fences. Annually beyond year 5 or as deemed necessary by previous monitoring events.	Stockmen contractor as directed by offset area manager
Fire Management			
Fuel break establishment	Once only around areas containing Brigalow and SEVT, and property boundaries with adjacent landholders. Fuel break establishment shall only occur from June–August.	One during establishment.	Earth moving contractor as directed by offset area manager
Fuel break maintenance	Annually, between June and August for slashing grass fuel breaks. As required, between June and August for re-grading property boundary fuel breaks.	Annually in early spring prior to the start of the fire season.	Earth moving contractor as directed by offset area manager

Management Action	Frequency and Timing of action(s)	Monitoring	Responsible person(s) for activity
Planned Burns	As required from May–August, in reference to Fire Management Plan burn frequencies for vegetation types.	As required.	Queensland Fire and Emergency Services (QFES) and/or QPWS Rangers, as directed by offset area manager
General land management			
Boundary fencing	Fencing maintenance and construction will occur during the dry season.	Monitor annually for damage with damage remediated as soon as possible.	Fencing contractor as directed by offset area manager
Restricted Access	As required.	Annual inspection of gates and signage.	Offset area manager
Access track establishment, rehabilitation and maintenance	<p>Track establishment, track rehabilitation and track maintenance shall only occur after the wet season.</p> <p>New track establishment shall be undertaken in Years 1 and 2 only.</p> <p>During the first 5 five years the need to establish new tracks may be identified, to improve access or to avoid areas of significant erosion.</p> <p>Track rehabilitation shall be undertaken in Year 1 and annually only as required in subsequent years.</p> <p>Track maintenance to be undertaken as necessary in response to seasonal rainfall events causing damage.</p>	Tracks and new tracks will need to be monitored annually for signs of erosion.	Earth moving contractor or QGC environment staff
Erosion and sediment control	As required by the relevant management actions.	Annually following the wet season.	Earth moving contractor as directed by offset area manager

7 Monitoring program for nominated offset areas

The following monitoring program describes the monitoring activities that are to occur within the nominated Offset areas. This monitoring approach has been developed to assess success of the management measures to improve the overall biodiversity and habitat values of the nominated Offset areas. The monitoring shall only be undertaken by a suitably qualified ecologist.

The following monitoring methodologies have been designed to measure the effectiveness of the management actions and the effectiveness of the protection measures (e.g. fire mitigation and feral stock mustering).

7.1 MONITORING THREATENED ECOLOGICAL COMMUNITIES AND REGIONAL ECOSYSTEMS

7.1.1 Monitoring requirements for the QCLNG offset area

Permanent monitoring transects for TECs

Permanent monitoring transects have been in the TEC offsets established across selected parts of the QCLNG offset area within the following:

- Threatened ecological communities:
 - two sites within regrowth Brigalow
 - two within remnant Brigalow
 - one within remnant SEVT.

The monitoring methodology for Brigalow regrowth and remnant vegetation varies due to each having different objectives and outcomes. Therefore, the ecological condition indicators that have been selected for monitoring the regrowth and Brigalow remnant reflect the different objectives of each. The ecological condition indicators for tracking the progress of the Brigalow regrowth and remnant vegetation have been adopted from the *EEM Guideline (EHP, 2014)*; however secondary flora surveys will be used to collect the data. The secondary flora surveys will be undertaken in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland Version 3.2 (DSITIA, 2012)*.

The survey data obtained from these transects will form the baseline for ongoing monitoring of the progress of offset area management. The monitoring and compliance reporting will occur annually and monitoring will occur at approximately the same time of year each year.

As part of the work undertaken to validate the offset values on Valkyrie and obtain baseline quality scores for the TECs, permanent monitoring transects (100 x 20 m), were established within the QCLNG offset area.

The waypoints for each TEC monitoring transect have been captured using GDA94 coordinate system Zone 55. The location of each TEC monitoring transect is shown on Figure 7-1. The coordinates for each TEC monitoring transect are listed in Table 7-1.

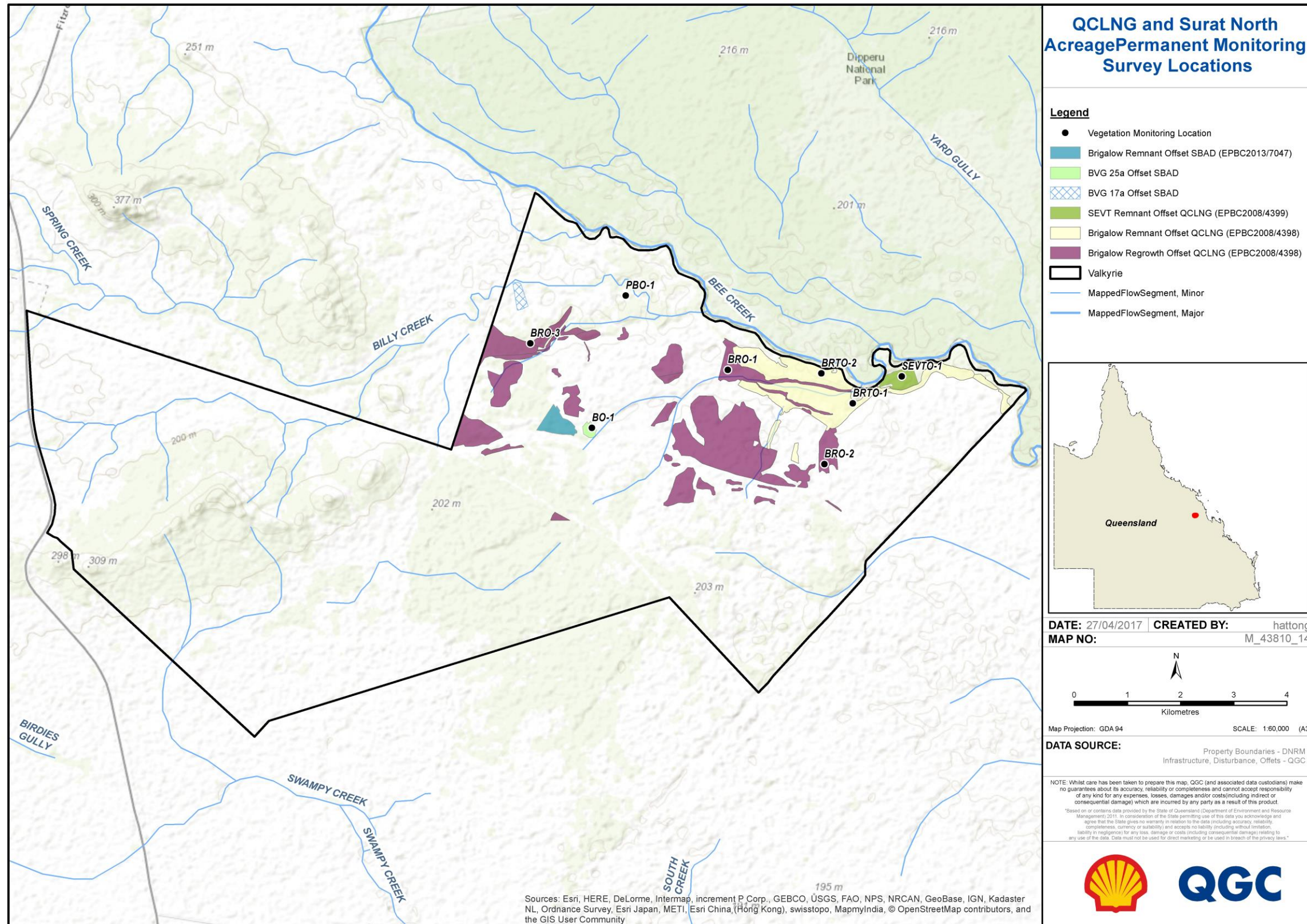
Table 7-1 Coordinates for each TEC monitoring transect

ID	Type	Coordinates (GDA94 Zone55)	
		Transect start (0m)	Transect centre (50M)
BRO-1	Brigalow regrowth (RE 11.4.8)	E: 673825.20 N: 7569253.82	E: 673849.42 N: 7569295.26
BRO-2	Brigalow regrowth (RE 11.4.8)	E: 675645.19 N: 7567480.95	E: 675651.28 N: 7567533.12
BRO-3	Brigalow regrowth (RE 11.4.8)	TBD	E: 670111.66 N: 7569701.14
BRTO-1	Brigalow remnant (RE 11.4.3)	E: 676175.69 N: 7568623.74	E: 676190.59 N: 7568586.66
BRTO-2	Brigalow remnant (RE 11.4.3)	E: 675585.85 N: 7569188.22	E: 675576.00 N: 7569139.05
SEVTO-1	SEVT remnant (RE 11.3.11)	E: 677098.18 N: 7569130.93	E: 677074.92 N: 7569082.83

Brigalow regrowth monitoring

The five ecological condition field-based indicators to be monitored annually for Brigalow regrowth are measurable over time to track the effectiveness and success of management actions being applied to the Brigalow regrowth within the QCLNG offset area. These five indicators include:

1. Native plant species richness
 - trees
 - shrubs
 - grasses
 - forbs
2. Tree canopy height
3. Tree canopy cover
4. Native perennial grass cover
5. Invasive plant cover.



**Figure 7-1
QCLNG AND SURAT BASIN ACREAGE PERMANENT MONITORING SURVEY LOCATIONS**

Each monitoring survey event will involve the collection of field data for the five ecological condition indicators at each monitoring transect. All collated data will be scored using excel spreadsheets and compared against baseline data to track the success of the management actions and the progress of the Brigalow regrowth toward remnant status. Consideration of meteorological cycles will also occur when assessing results and reporting outcomes.

Brigalow remnant and SEVT remnant monitoring

Five field-based ecological condition indicators will be monitored annually for Brigalow remnant and SEVT and are measurable over time to track the effectiveness and success of management actions being applied to Brigalow remnant and SEVT within the QCLNG offset area. These five indicators include:

1. Native plant species richness
 - trees
 - shrubs
 - grasses
 - forbs
2. Shrub canopy cover
3. Organic litter cover
4. Coarse woody debris
5. Invasive plant cover.

Each monitoring survey event will involve the collection of field data for the five ecological condition indicators at each monitoring transect. All collated data will be scored using excel spreadsheets and compared against baseline data to track the success of the management actions and the progress of the Brigalow and SEVT toward an ecological gain. As above, consideration of meteorological cycles will also occur when assessing results and reporting outcomes.

Permanent monitoring transects for endangered and of concern regional ecosystems

Permanent monitoring transects are yet to be established in the endangered and of concern BVG offsets within the QCLNG offset area, however these will be established as part of the first monitoring event and will include:

- Endangered and of concern regional ecosystems:
 - Endangered RE 11.4.9 (BVG 25a)
 - Of concern RE 11.3.2 (BVG 17a), allocated for deficit of endangered BVG 17a
 - Of concern RE 11.3.25 (BVG 16a)
 - Of concern RE 11.3.4 (BVG 16c)
 - Of concern RE 11.3.2 (BVG 17a)

- Of concern RE 11.3.2 (BVG 17a), allocated for deficit of BVG 17b
- Of concern RE 11.3.27i (BVG 34d)

Note: At the time of establishing the monitoring transects, the endangered and of concern regional ecosystem offsets for the QCLNG project had not been finalised. Therefore, monitoring transects for these offset values have not yet been established. Once established they will be presented in another table below.

7.1.2 Monitoring requirements for the SBAD offset areas

The ecological condition indicators to be assessed at the monitoring transect have been adopted from the methodology set out in the ‘*BioCondition Assessment Manual and BioCondition benchmarks*’ (Eyre *et al.* 2011), based on their known or perceived surrogacy for biodiversity values and representation of ecological processes relative to the composition, structure and function of vegetation communities, and are in effect measurable over time. Secondary flora surveys were used to collect the original data in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland Version 3.2* for secondary level flora surveys. This methodology will continue to be utilised to obtain the field information for the field indicators. Permanent transects for SBAD monitoring locations will be established in year one of the monitoring program.

Future monitoring of the proposed offset areas will be conducted through the use of the methodology in ‘*The guide to determining terrestrial habitat quality*’ (DEHP 2014). The guide is based on the methodology set out in the ‘*BioCondition Assessment Manual and BioCondition benchmarks*’ (Eyre *et al.* 2011), as developed by the Queensland Herbarium. ‘*Habitat quality*’ is the currency for measuring these values based on three key indicators, site condition, site context and species habitat index. Inputs to the species habitat index are tailored to be specific to the relevant species and their habitat requirements. The key indicators for determining habitat quality of a land based impact site or an offset site are:

- site condition: a general assessment of vegetation condition compared to a benchmark
- site context: an analysis of the site in relation to the surrounding environment
- species habitat index: the ability of the site to support a species.

This methodology aligns with the Commonwealth Government’s Environment Protection and Biodiversity Conservation Act 1999 (EPBCA) Environmental Offsets Policy measure of ‘habitat quality’ including site condition, site context, and species stocking rates. Further description of the relevant characteristics to be used in determining future habitat quality for relevant TEC and fauna species which may require offsets under the SBAD approval are included below.

Ecosystem monitoring

Five field-based ecological condition indicators will be monitored annually and measured over time to track the effectiveness and success of management actions being applied to the SBAD offset areas. Each monitoring survey event will involve the collection of field data for the five ecological condition indicators at each monitoring

transect. All collated data will be scored using excel spreadsheets and compared against baseline data to track the success of the management actions and the progress of the SBAD offset areas toward an ecological gain. Consideration of meteorological cycles will also occur when assessing results and reporting outcomes.

These five indicators include:

1. Native plant species richness
 - trees
 - shrubs
 - grasses
 - forbs
2. Shrub canopy cover
3. Organic litter cover
4. Coarse woody debris
5. Invasive plant cover.

Habitat quality monitoring

At year five and every 5 years thereafter, a habitat quality monitoring assessment, including koala specific habitat attributes, will be conducted in accordance with the published methodology (DEHP 2014).

Thirteen field-based ecological condition indicators will be monitored to track the effectiveness and success of the management plan for the SBAD offset areas, including:

1. Recruitment of woody perennial species-
2. Native plant species richness- as an indicator of ecological succession and regeneration progress after mitigating ecosystem threats.
3. Tree canopy height- indicates progress towards ecological maturity and increases habitat availability.
4. Tree canopy cover- indicates progress towards ecological maturity and increases habitat availability.
5. Shrub canopy cover - indicates progress towards ecological maturity and increases habitat availability.
6. Native perennial grass cover -which suppresses weeds and thereby encourages recruitment of juvenile trees.
7. Organic litter cover - important for surface soil moisture retention, cycling of nutrients and providing interstitial spaces to enhance tree seed germination and growth and recruitment of understory and canopy species.
8. Large trees per hectare – important in the production of seeds for recruitment.

9. Coarse woody debris per hectare.
10. Invasive plant cover – which can compete with native plants for light, moisture and nutrients, especially recruiting understory and tree canopy species. Invasive plants can increase the fuel load leading to a changed fire regime and susceptibility to wildfire.

Species habitat index parameters

11. Quality and availability of food and foraging
12. Quality and availability of shelter.
13. Threats to species.

Brigalow Threatened Ecological Community

Many of the vegetation species present in the Brigalow ecological community are eaten readily by domestic stock and native or feral herbivores. Trampling and grazing by large herbivores, such as cattle and horses, can reduce the amount of leaf litter and woody debris, and the density of herbs and shrubs in the understorey of Brigalow forests and thus adversely affect flora species and the habitats of fauna species that are components of the ecological community.

Fire is a major threat to the ecological community where exotic grasses such as Buffel Grass (previously known as *Cenchrus ciliaris*), Rhodes Grass (*Chloris gayana*) or Green Panic (*Megathyrus maximus var. pubiglumis*) have invaded Brigalow remnants or regrowth, or areas adjacent to them. Once such areas of Brigalow vegetation are burnt, Buffel Grass can grow back more vigorously and thus increase the chances of subsequent fires and increase the intensity of a wildfire (DoE, 2015e). Brigalow vegetation with a dense, healthy tree canopy is relatively resistant to weed invasion, especially by pasture grasses.

The future habitat quality for the proposed Brigalow TEC offset area without the offset was estimated to be a score of 6. This potential decline in habitat quality (from 7 to 6) was based on the previous land use where woodland areas were subject to extensive grazing by over 1000 head of breeder cattle. Cattle grazing is known to reduce the recovery of native woodlands by impeding recruitment of native shrubs and trees (Butler 2007). Grazing during prolonged dry periods can reduce ground cover and promote infestation of weeds and erosion on areas of bare ground which also increase the risk of intense bushfires which may alter the vegetation structure and promote further invasion by exotic species.

The time until ecological benefit is estimated to be twenty years at which time the Brigalow Habitat quality at the offset area is predicted to increase to a score of 8 out of 10. Parameters expected to contribute positively to the overall quality of the Brigalow habitat over the twenty-year management period include but are not limited to:

- increased tree canopy cover and increased native grass cover, which suppresses weeds and thereby reduces the risk of intense wildfires known to be a key threat Brigalow TEC ;

- increased organic litter cover, which is important for surface soil moisture retention, cycling of nutrients and providing interstitial spaces to enhance native shrub and tree seed germination and growth of canopy species; and
- an increase in the number of ecologically dominant layer (EDL) species recruiting; and
- reduced grazing pressure from cattle and feral horses which can introduce weed propagules and trample native understory vegetation.

Koala offset area monitoring

The future habitat quality for the proposed Koala (*Phascolarctos cinereus*) offset area without the offset was estimated to be a score of 6. This potential decline in habitat quality (from 7 to 6) was based on the previous land use where woodland areas were subject to extensive grazing, which is known to limit recruitment of tree canopy species essential for Koala habitat improvement.

The time until ecological benefit is estimated to be twenty years at which time the koala habitat quality at the offset area is predicted to increase to a score of 8 out of 10. A moderate increase over twenty years in the parameters assessed in the habitat quality score assessment method would advance the overall habitat quality score by one unit to 8. Parameters expected to contribute positively to the overall quality of the Koala habitat over the twenty year management period include but are not limited to:

- an increase in availability of food and quality of foraging habitat;
- increased tree canopy cover, required for roosting and shelter;
- an increase in the number of tree species present, with a potential increase the number of koala food tree species present;
- increased native grass cover, which suppresses weeds and thereby encourages recruitment of juvenile eucalypt feed trees;
- increased organic litter cover, which is important for surface soil moisture retention, cycling of nutrients and providing interstitial spaces to enhance native shrub and tree seed germination and growth of canopy species including koala feed species;
- an increase in the number of ecologically dominant layer (EDL) species and koala food trees recruiting; and
- reduced threats to koalas by predation – e.g. control to reduce feral animal incursion, particularly wild dogs.

South Eastern Long Eared Bat offset area monitoring

South-eastern Long-eared Bats (*Nyctophilus corbeni*) (SELB) can be found in a variety of inland woodland habitats where there is access to nearby water. Inland Queensland habitats are reported to be dominated by assorted eucalypt and bloodwood species, and various types of tree mallee, with populations being most abundant in vegetated areas containing a dense shrub layer and distinct canopy (DoE, 2015d). The species has also been found to be much more abundant in habitats that have a distinct tree canopy and a dense, cluttered understorey layer (Turbill and Ellis 2006). South-eastern Long-eared

Bats are thought to forage low to the ground and amongst shrubs and as a result they are susceptible to habitat degradation from over grazing and feral animals (e.g. pigs and rabbits) through the removal of shrubs and by limiting regeneration, as well as potentially causing significant changes to the structure and diversity of such habitats (Schulz and Lumsden 2010).

Studies have found that the south-eastern long-eared bat roosts solitarily, mainly in dead trees or dead spouts of live trees including:

- The presence of large hollow bearing trees that provide sheltering habitat and potential maternity breeding sites.
- Proximity of large hollow bearing tree habitats to waterways and foraging habitats.

The future habitat quality for the proposed SELB offset area without the offset was estimated to be a score of 6. This potential decline in habitat quality (from 7 to 6) was based on the previous land use where woodland areas were subject to extensive grazing. Grazing in the habitat of the south-eastern long-eared bat is a suspected threat in the uncleared areas of habitat (Duncan et al., 1999) as it may reduce foraging habitat.

Bushfires are suspected to be a threat in the remaining uncleared areas of the south-eastern long-eared bat's habitat (Duncan et al., 1999). Consistent maintenance of fire breaks and monitoring of fuel loads in areas surrounding the proposed SELB offset area will reduce the threat of bushfire that may threaten SELB populations.

The time until ecological benefit is estimated to be twenty years at which time the SELB habitat quality at the offset area is predicted to increase to a score of 8 out of 10. Parameters expected to contribute positively to the overall quality of the SELB habitat over the twenty-year management period include but are not limited to:

- regeneration of the understorey layer as an important feature of suitable SELB habitat;
- an increase in availability and quality of foraging habitat; and
- increased tree canopy cover, and potential hollows adjacent to waterways required for roosting and shelter;

Yakka Skink offset area monitoring

The distribution of the Yakka Skink (*Egernia rugose*) is associated with the “Brigalow (*Acacia harpophylla* dominant and co-dominant)” EPBC Act-listed threatened ecological community. The Yakka Skink will often use burrows as shelter that are dug under rocks, logs (especially very large logs, if available), old root tracts, bases of large trees or stumps, stick-raked piles and dense covering vegetation. They may also utilise old rabbit warrens, deep gullies and tunnel erosion and sinkholes (QMDC 2008). Feral animal impacts include predation by Foxes (*Vulpes vulpes*) and Feral Cats (*Felis catus*). Inappropriate fire regimes and trampling of burrow systems by stock and feral pigs are also known to have adverse impacts

The future habitat quality for the proposed Yakka skink offset area without the offset was estimated to be a score of 6. This potential decline in habitat quality (from 7 to 6) was based on the previous land use where woodland areas were subject to extensive grazing which may threaten burrow systems of the Yakka Skink.

The time until ecological benefit is estimated to be twenty years at which time the Yakka Skink habitat quality at the offset area is predicted to increase to a score of 8 out of 10. Parameters expected to contribute positively to the overall quality of the Yakka skink habitat over the twenty-year management period include but are not limited to;

- Increased ground vegetation and organic litter;
- Increased coarse woody debris and hollow logs;
- Decline in the evidence of pest animal activity particularly feral pigs, cattle and feral horses

7.1.3 Timing and frequency of monitoring

Monitoring at each of the permanent transects will occur annually during the wet season between December and May when vegetation is actively growing. However, if this is not the case due to a significantly wet season, monitoring will occur annually around the same time of year as the baseline monitoring survey.

7.1.4 Photo point monitoring

Photo point monitoring will occur during all TEC and regional ecosystem monitoring surveys at the centre point of each of the permanent monitoring transects. The purpose of photo point monitoring is to use and compare photographic records with previous records to gauge changes over time.

Star pickets have been located at the centre point of each monitoring transect within that were established when undertaking baseline surveys. The co-ordinates of each photo monitoring point have been captured using a handheld Global Positioning System (GPS) and will assist to locate the centre of the monitoring transect when undertaking subsequent monitoring. Ideally photo point monitoring is to be undertaken annually at the same time of year.

The photos provide the baseline imagery to compare future photo point monitoring, to track the progress and success of rehabilitation management.

A record of the photos will be maintained which includes:

- GPS co-ordinates of the photo point
- date, time and number of each photo
- direction in which the photo was taken in the order of north, east, south and west
- height above the ground at which the photos were taken, (i.e. 6 foot tall photographer is 1.8 m).

After each photo monitoring event, the photos must be compared with photos taken during previous monitoring events. The following elements shall be noted:

- natural regeneration of native understorey and overstorey species
- the occurrence of habitat complexity (e.g. logs, litter)
- native plant establishment and growth

- the status of weeds.

Taking directional photos

Directional photos shall be taken from the transect centre point in all directions north, east, south and west with the aid of a compass. The aim is to capture a photo in each compass direction for the purposes of monitoring vegetation change.

They shall be taken of features in the intermediate distance to provide an overview of the entire site and its surrounds. They illustrate the general condition of the site, showing changes in tree, shrub and groundcover layers over time. These site specific directional photos can also be used to record particular disturbance events such as the impacts of a wildfire events or feral pig disturbances that can result in vegetation damage.

These photos are taken by holding the camera so that the image is taken with a 'landscape' perspective, i.e. the picture is wider than it is high. To take the photo, stand next to the transect centre point (star picket), and position the horizon so it cuts the photos frame in half, half above the horizon and half below, as shown in Figure 7-2.

Take the photos focusing on infinity. It is recommended that copies of the last photo events be taken and referred to prior to taking a photo, as this will make lining up and framing the next directional photos easier. Alternatively, taking a series of landscape photos at the transect centre, allows the field investigator to pick up more of the variation across the site and is easy to replicate next time an assessment is done.



Figure 7-2
EXAMPLE OF A DIRECTIONAL LANDSCAPE PHOTO

For each photo, record photo number, monitoring transect ID (e.g. RA 1-2), date photo was taken, and the direction the photo was taken (N/S/E/W). The date stamp feature on a digital camera (a common feature typically bottom left or right corner of photo), will be useful as long as it does not obscure important components of the captured image.

Photos shall be downloaded as soon as possible and stored in a photo point monitoring database and then printed and kept on file with the monitoring records for use as a reference for the next photo point monitoring event or for auditing purposes.

Photo tips

It is recommended that only a digital camera be used to take the monitoring point photos. Digital cameras are ideal, allowing instant review of an image for clarity and colour. This will ensure that there will always be a good photo recorded for future monitoring purposes.

The best photos are generally taken on a clear day between 9 am and 3 pm. Before 9 am and after 3 pm will generally result in more shadowing and different colour cast, which may conceal some important features, such as the shrub layer amongst trees. Overcast days are great for photos in closed communities such as thickets, as the even light removes much of the shadowing.

Better photos are always captured by having the sun behind the photographer with the sunlight shining on the landscape. However with taking directional photos (N/E/S/W) there will typically always be one direction facing into the sun. Ideally photos will be taken around the middle of the day when the sun is at its highest point, but this is not always practical.

7.1.5 Performance criteria for QCLNG TEC and regional ecosystem offsets

The performance criteria, which are based upon specific ecological condition indicators, differ between the Brigalow regrowth, the Brigalow and SEVT remnant, and the endangered and of concern regional ecosystems. Therefore, the ecological condition indicators¹ are the performance criteria for measuring when the offset commitment for each has been fulfilled, and the objective and outcomes have been obtained.

Brigalow Regrowth

Progress towards remnant status will be gauged by Indicator 2 ‘tree canopy height’ and Indicator 3 ‘tree canopy cover’. The target for remnant status is 50% cover and 70% height of the remnant benchmark or remnant reference site.

Brigalow remnant and SEVT, and endangered and of concern regional ecosystems

Improvements to the ecological condition and habitat value of the Brigalow remnant and SEVT TECs, and endangered and of concern regional ecosystems will be gauged by all five indicators as a way to demonstrate over time that an ecological benefit or gain has been achieved through management. The targets for each indicator are as follows:

- An increase in the total native plant species richness.
- An increase of 5% canopy cover of the ecologically dominant layer.
- An increase of 10% of organic leaf litter cover.

¹ Or equivalent to the bio condition benchmark value.

- No decline in coarse woody debris.
- Total invasive plant cover <30%.

7.1.6 Performance criteria for Surat Basin TEC and regional ecosystem offsets

The performance criteria, which are based upon specific ecological condition indicators, differ between the Brigalow TEC and endangered and of concern regional ecosystems. Therefore, the ecological condition indicators² are the performance criteria for measuring when the offset commitment for each has been fulfilled, and the objective and outcomes have been obtained.

Brigalow TEC

Improvements to the ecological condition and habitat value of the Brigalow TEC will be gauged by four of the seven indicators as a way to demonstrate over time that an ecological benefit or gain has been achieved through management. The targets for each indicator are as follows:

- An increase in the total native plant species richness.
- An increase of 5% canopy cover of the ecologically dominant layer.
- An increase of 10% of native ground cover.
- Total invasive plant cover <30%.

Changes in tree canopy height and cover and shrub canopy height in remnant vegetation are unlikely to be detected over the 20 year management period of the offset and have therefore not been included above.

Endangered and of concern regional ecosystems

In accordance with the *EEM Guideline*, improvements to the ecological condition and habitat value of the endangered and of concern regional ecosystems will be gauged by all 10 ecological condition indicators using the EEM as a way to demonstrate over time that an ecological benefit or gain has been achieved through management. However, five specific targets have been assigned to track the progress of the regional ecosystem offsets and the effectiveness of management actions:

- An increase in the total native plant species richness.
- An increase of 5% canopy cover of the ecologically dominant layer.
- An increase of 10% of organic leaf litter cover.
- No decline in coarse woody debris.
- Total invasive plant cover <30%.

² Or equivalent to the bio condition benchmark value.

7.1.7 Corrective actions

In the event that progression towards the performance criteria identified in Sections 7.1.5 and 7.1.6 are not met following monitoring at 5 yearly intervals, the following corrective actions may need to be implemented:

- Investigate to determine cause of no ecological gain. Where droughts or unintended fires occur during the monitoring interval, any negative impacts to ecological gain attributable to fire or low water availability will be noted.
- Where the lack of ecological gain is directed related to invasive weeds, revise the weed control measures outlined in Section 5.3.1 and Appendix A.
- Where the lack of ecological gain is directly related to pest animal damage. The corrective actions may include, but may not be limited to the following:
 - revise the pest animal control measures outlined in Section 5.4.
 - increase the intensity of pest animal control for the target pest animal species in Appendix B.

7.1.8 Review of aerial imagery

A review of aerial imagery shall occur once every three years to assess the progress of the nominated offset areas and the improvements to the TECs, in particular the Brigalow regrowth, as a result of the management actions. Recent aerial imagery will be required initially and new aerial imagery will be collected every three years during the spring season to best capture the progress of the vegetation. Aerial information for Valkyrie was last collected in May/June 2015, and is therefore due for collection again in spring 2018.

The aerial imagery assessment may also be useful to evaluate potential disturbances resulting from wildfire events, severe storms or even floods.

7.2 FAUNA OF CONSERVATION SIGNIFICANCE MONITORING

The monitoring of threatened fauna habitat offsets for the QCLNG and SBAD projects will occur simultaneously.

7.2.1 Fauna habitat monitoring requirements

Broader general observational data of threatened fauna habitats will be recorded across the nominated offset areas and photos taken, primarily to satisfy Commonwealth offset requirements.

At present the data required focuses on the required threatened fauna habitat offsets, all of which will be recorded in the field on a proforma. This data will include:

- Hollow bearing trees in South-eastern Long-eared Bat habitat:
 - Type classification: hollow bearing tree (live) stag (dead).
 - Size classification: (small 10–20 cm DBH) (medium >20–50 cm DBH) (large >50 cm DBH).

- Presence of Koala feed tree and shelter species and average condition in Koala habitat.
- Presence and abundance of fallen woody debris, loose surface rock as sheltering habitat for Yakka Skink and Brigalow Scaly-foot in Yakka Skink and Brigalow Scaly-foot habitat.
- One night Anabat survey at three survey locations across the nominated offset areas, targeting areas with a good density of hollow trees and/or along creeks/riparian corridors. The surveys will move location each year to spread the survey effort spatially over the years, as a means to record as many bat species as possible.

7.2.2 Timing and frequency of monitoring

Habitat assessments will occur during the vegetation monitoring of the permanent transects. This is to be undertaken by a suitably qualified ecologist and will occur annually prior to the start of the wet season when the vegetation species are actively producing seed.

7.2.3 Performance criteria

The results of the monitoring will be used to determine if the following performance criteria have been met. These criteria provide an indication of the success of the management measures being implemented for threatened fauna habitat offsets, and serve as trigger values where failure to achieve would result in the implementation of the corrective actions. The performance criteria include:

- Achieve the target quality score increases for the SBAD respective threatened fauna habitat offsets, as determined through using the EPBC Act Offsets Assessment Guide calculator, over the required management timeframe. An increase in the fauna habitat quality score will be measured at the monitoring locations and averaged to determine an indicative score for the whole habitat offset.
- Decline in presence of invasive plant and environmental weeds within the habitat offsets. A decline will be determined if at the end of five years of monitoring, the data indicates a >10% decrease of weed cover within habitat areas.
- No pest animal damage.

7.2.4 Corrective actions

In the event that progress towards the performance criteria identified in Section 7.2.3 are not met after the year 5 monitoring event the following corrective actions will be implemented.

- Investigate cause of no habitat value gain.
- Pest animal damage, the corrective actions will include, but should not be limited to the following:
 - revise the pest animal control measures outlined in Section 5.4.1
 - increase the intensity of pest animal control for the target pest animal species in Appendix B.

7.3 INVASIVE PLANT AND ANIMAL MONITORING

Invasive plant and animal monitoring will be undertaken at the same time and will occur annually during late autumn. Monitoring will target identified areas of weed infestation and areas where there is known records of invasive animal presence within the nominated offset areas.

Due to the amount of effort required to manage invasive plants within and along the edges of the nominated offset areas, monitoring will be necessary to determine the success of controlling actions and the subsequent benefit to the nominated offset areas. Invasive plant monitoring will also occur in the permanent monitoring transects.

7.3.1 Monitoring Requirements

Edge effects monitoring

The outer perimeter of the nominated offset areas adjacent to open spaces (non-remnant areas), fuel breaks or access tracks will be monitored annually. The monitoring of edge effects can be undertaken anytime between mid to late autumn following completion of the wet season and following the peak period of plant growth.

The following procedures must be followed to establish monitoring transects and collect baseline data and undertake annual monitoring events:

- Identify where edge effects are substantially restricting the establishment or growth of native Brigalow and SEVT species for ongoing monitoring purposes.
- Select a point along the edge, take a GPS waypoint and mark with a star picket.
- At the star picket take photos using a digital camera in either direction along the edge to establish baseline data and for ongoing monitoring purposes.
- On a field proforma detail the time of year of the monitoring event, photo numbers, direction of photos and list the observed weed species present, and take notes of any notable positive and/or negative changes in weed densities.
- Take the previous year's monitoring proforma and printed copies of previous years photos for the purpose of noting positive and/or negative changes in weed densities.
- Collate all data in excel spreadsheets and save all digital photos to file for ongoing monitoring purposes.

Invasive animal monitoring

Visual monitoring for invasive animals will involve the following:

- undertake random meander transects through the nominated offset areas, take a different route for each monitoring event
- take notes of any observations on an invasive animal monitoring proforma
- take a waypoint using a handheld GPS when an invasive animal is recorded, dead or alive
- visually identifying relevant invasive animals (i.e. feral pigs, cats, dogs, rabbits, cattle, brumbies and Cane Toads)

- searching for evidence of feral pigs digging or wallowing and recording GPS locations
- identifying rabbit warrens and diggings and recording GPS locations
-
- identifying and recording the location of deceased invasive animals
- recording predatory animal scats (pigs, dogs and cats).

7.3.2 Timing and frequency of monitoring

Visual monitoring for invasive plants and animals will be undertaken annually between mid to late autumn following completion of the wet season and following the peak period of plant growth.

7.3.3 Performance criteria

The results of the monitoring described in Section 7.3.1 will be used to determine if the following performance criteria have been met over 5 year monitoring periods. These criteria provide an indication of the success of the management measures being implemented for invasive plants and animals, and serve as trigger values which if not achieved trigger corrective actions described in Section 9.2.4 and include:

- Decline in presence of restricted invasive plants and WoNS along the edges of the Brigalow Rehabilitation Area. A decline will be determined if at the end of five years of monitoring, the data indicates a >10% decrease in restricted invasive plant cover within the rehabilitation area.
- No pest animal damage.

7.3.4 Corrective actions

In the event that the performance criteria identified in Section 7.3.3 are not met after 5 years of monitoring the following corrective actions will be implemented:

- Investigate cause of i invasive plant and animal populations/presence.
- Review and audit implementation of the invasive plant and animal control measures to evaluate their effectiveness and revise the measures accordingly.
- Increase the intensity and frequency of the invasive plant and animal control measures detailed in Section 5.3.1 and Appendix A for invasive plants, and Section 5.4.1 and Appendix B for invasive animals.

7.4 FUELBREAK MONITORING

7.4.1 Monitoring requirements

Fuel breaks shall be visually inspected prior to the start of the fire season and following the completion of the wet season to identify any signs of weed infestation and fuel load accumulation. Any weed infestations or fuel load accumulation will be GPS located and photographically documented for treatment/control.

7.4.2 Timing and frequency of monitoring

Visual monitoring of fuel breaks shall occur prior to the start of the fire season and following the completion of the wet season.

7.4.3 Performance criteria

The results of the monitoring described in Section 7.4.1 will be used to determine if the following performance criteria have been met. These criteria provide an indication of the success of the management measures being implemented to maintain fuel breaks and protect the nominated offset areas from planned burns or wildfire, and serves as trigger values which when exceeded would result in the implementation of the corrective actions described in Section 7.4.4. These include:

- No increase in fuel load accumulation. An increase of fuel load accumulation will be determined if the fuel load along fuel breaks increases by >10% from the previous year's monitoring results of woody vegetation and density of grass cover.

7.4.4 Corrective actions

In the event that the performance criteria identified in Section 7.4.3 are not met following the first five years of annual monitoring the following corrective action will be implemented:

- Undertake targeted weed control and fuel load maintenance prior to the next fire season.

7.5 FENCELINE CONDITION MONITORING

7.5.1 Monitoring Requirements

Undertake visual condition monitoring of boundary fence lines. Monitoring can be undertaken in the most part from a vehicle. Any signs of damage shall be GPS located and photos taken. Any fence repairs will be scheduled to occur as soon as is possible (no greater than 3 months) to prevent unauthorised livestock access.

7.5.2 Timing and frequency of monitoring

Visual monitoring of boundary fence lines shall occur annually prior to the start of the wet season.

7.5.3 Performance criteria

The results of the monitoring described in Section 7.5.1 will be used to determine if the following performance criteria have been met. These criteria provide an indication of the success of the management measures being implemented for fence line maintenance, and include:

- Minor fence line damage noted.
- Any damaged fence lines are repaired quickly.
- Unauthorised stock access.

7.5.4 Corrective actions

In the event that the performance criteria identified in Section 7.5.3 are not met over the first 5 years the following corrective actions will be implemented:

- Undertake fence repairs as soon as possible.

7.6 ACCESS TRACK MONITORING

7.6.1 Monitoring Requirements

Access track monitoring within and around the nominated offset areas will be necessary to ensure that ongoing access and management can continue across this nominated Offset areas. The identification of erosion hazards and areas where tracks need repairing will be the focus. Creek crossings and crossing through Gilgai are high risk areas where significant track damage can occur, thus preventing effective access to allow for offset area management activities.

Any identified erosion risks and track damage must be GPS located and photos taken. Repairs will be scheduled to occur as soon as is possible to reinstate effective access.

7.6.2 Timing and frequency of monitoring

Monitoring is to be undertaken annually following the wet season.

7.6.3 Performance criteria

The results of the monitoring described in Section 7.6.1 will be used to determine if the following performance criteria have been met. These criteria provide an indication of the success of the management measures being implemented for fence line maintenance, and include:

- minimal access track erosion

7.6.4 Corrective actions

In the event that the performance criteria identified in Section 7.6.3 are not met over the first 5 years the following corrective actions will be implemented:

- Undertake access track maintenance as soon as possible.

8 Management of the Brigalow rehabilitation area

8.1 COMMONWEALTH OBJECTIVES AND OUTCOMES FOR THE BRIGALOW REHABILITATION AREA

The RAMP has been developed in accordance with the EPBC approval (EPBC 2008/4398) Conditions 34 - 41. A number of these conditions guide the objectives and outcomes for the Brigalow Rehabilitation Area, as presented below.

Condition 38 of EPBC 2008/4398 specifies that the RAMP must:

'provide for commitments and actions to lead to the increase in the spatial extent and improvement in the condition of existing remnants, and for the establishment of new self-sustaining, functional 'remnant vegetation' communities, consistent with that which existed prior to clearing and with the capacity to provide habitat for the species identified in Condition 25 as unavoidably impacted by the action.'

Condition 39 of EPBC 2008/4398 specifies that the RAMP must include:

- a. *'details of the area to be rehabilitated including location and maps*
- b. *documentation including mapping of current environmental values relevant to MNES of the area*
- c. *where revegetation through planting seedlings and/or seeds is intended details of appropriate species and ratios of species relevant to historically occurring listed migratory and threatened species' habitat and the Brigalow (Acacia harpophylla dominant and co-dominant) ecological community*
- d. *the source and provenance of the seed and/or seedlings which will be used*
- e. *measures to address threats to MNES including but not limited to grazing pressure and damage by livestock and adverse impacts from feral animals and weeds*
- f. *measures to provide fire management regimes appropriate for the MNES*
- g. *monitoring measures including ecological surveys to measure the establishment and ongoing success of the revegetation based on a comparison with high quality habitat for listed migratory and threatened species and ecological community reference sites*
- h. *performance measures and reporting requirements against identified objectives, including trigger levels for corrective actions and the actions to be taken to ensure performance measures and objectives are met.'*

Condition 41 of EPBC 2008/4398 specifies the need to ensure the long term protection of the Brigalow Rehabilitation Area and that the proponent must:

- a. *'manage the Rehabilitation Area to a stage where it meets the criteria for 'remnant vegetation' for the Brigalow (Acacia harpophylla dominant and co- dominant) ecological community*
- b. *when areas of revegetation meet criteria applicable at the time for 'remnant vegetation' ensure application is made to have the revegetation areas remapped and reclassified as 'remnant vegetation' in accordance with the relevant Queensland legislation. The management measures must continue to be implemented in areas not meeting the criteria for 'remnant status' until this has been achieved (or until approval to cease the management regime is provided by the Minister in writing)*
- c. *define corrective actions which will be undertaken if performance measures and reporting indicate that successful rehabilitation has not been achieved*
- d. *identify persons responsible and arrangements for implementing the Rehabilitation Area Plan and for reporting on performance*
- e. *notify the Department in writing of the reclassification of areas within the Rehabilitation Area as 'remnant vegetation' within 30 business days of the reclassification occurring.'*

This RAMP has been prepared to address the above conditions. However, the conditions that relate directly to revegetation activities are not of relevance to the rehabilitation area, as the rehabilitation area is solely comprised of Brigalow remnant and regrowth vegetation. As a result the need to undertake revegetation activities has been avoided, thus reducing management and the risk of potentially losing the revegetation through threatening processes.

Therefore, the objectives and outcomes presented in the RAMP are specifically focused on two aspects of rehabilitation:

1. The rehabilitation of Brigalow regrowth to remnant status.
2. The rehabilitation of Brigalow remnant for the purpose of improving the overall biodiversity and habitat values of the rehabilitation area for other MNES, such as, the Brigalow Scaly-foot, Yakka Skink and Ornamental Snake.

8.2 RESTRICTIONS IMPOSED ON THE REHABILITATION AREA

The restrictions outlined in Table 8-1 will be implemented within the Brigalow Rehabilitation Area to minimise impacts upon the rehabilitating Brigalow vegetation and maximise opportunities for regeneration.

Table 8-1 Restrictions imposed on the Brigalow Rehabilitation Area

Restrictions	Details
Vegetation clearing	<p>Vegetation clearing within the rehabilitation area will be restricted to:</p> <ul style="list-style-type: none"> • The establishment of fuel breaks to protect rehabilitating Brigalow. • Maintenance of existing access tracks up to 5 m width, including the provision of whoa boys and catch drains for sediment and erosion control purposes. • Clearing that is necessary for the removal of weeds, which shall be restricted to pruning only, root masses shall be left in place. • The physical removal of weeds shall be restricted to the use of hand held machinery e.g. chainsaws and brush cutters only. No heavy machinery is permitted for weed removal, unless identified as management corrective measures. • No machinery for access track or fuel break maintenance purposes will be allowed in the rehabilitation area after heavy and/or prolonged periods of rainfall and will only be allowable once the rehabilitation area is dry enough to allow vehicle movements without causing unnecessary damage.
Weeds and introduced flora species	<p>To prevent the introduction of new weed species into the rehabilitation area and to prevent any re-infestations, the following restrictions will apply:</p> <ul style="list-style-type: none"> • All persons and vehicles entering the rehabilitation area must be inspected to ensure they are free of weed propagules. • All vehicles and machinery that are required to enter the rehabilitation area must first be washed down at a dedicated wash down facility prior to entering the rehabilitation area. • Appropriate weed inspection forms/ checklist to be completed and retained by the offset manager.
Pest animal control	<p>Pest animal control within the rehabilitation area shall only be undertaken by appropriately qualified contractors or site personnel.</p> <p>Excavating rabbit burrows and warrens is not permissible within the rehabilitation area.</p> <p>It is not permissible to establishment permanent pig traps within the rehabilitation area.</p>
Fauna breeding places	<p>It is not permissible to damage, destroy, move, excavate or otherwise interfere with active animal breeding places, such as nests, burrows, caves, roost sites, or other structures used by native fauna species.</p>
Planned burning	<p>Fire is a threat to Brigalow communities. Accordingly, any planned burns to manage fuel loads within Valkyrie, especially in areas adjacent to the rehabilitation area, will only be conducted in accordance with the measures outlined in the Valkyrie Fire Management Plan.</p>
Agricultural activities	<p>No commercial grazing or cropping is to occur within the rehabilitation area.</p>
Unauthorised access	<p>Only vehicles or individuals who have obtained official permission from QGC are allowed to access the rehabilitation area.</p>
Wet weather	<p>No access permitted during wet weather or immediately after a high rainfall event</p>
Resource extraction	<p>No exploratory drilling, gas extraction, fossicking or other form of mining is permissible within the nominated offset areas.</p>

8.3 OVERVIEW OF REHABILITATION APPROACH AND MANAGEMENT REQUIREMENTS

The following section provides an overview of the management actions to be implemented within the Brigalow Rehabilitation Area in order to meet the objectives outlined in Section 8.1.

Where Brigalow regrowth reaches remnant status an application will be made to have the rehabilitation area reclassified as remnant vegetation in accordance with the relevant Queensland legislation. The application will be made within 30 days of completed monitoring and reporting where remnant status is achieved. Management measures will continue until remnant vegetation status is achieved in accordance with the relevant Queensland legislation.

Figure 8-1 presents the extent of the Brigalow Rehabilitation Area.

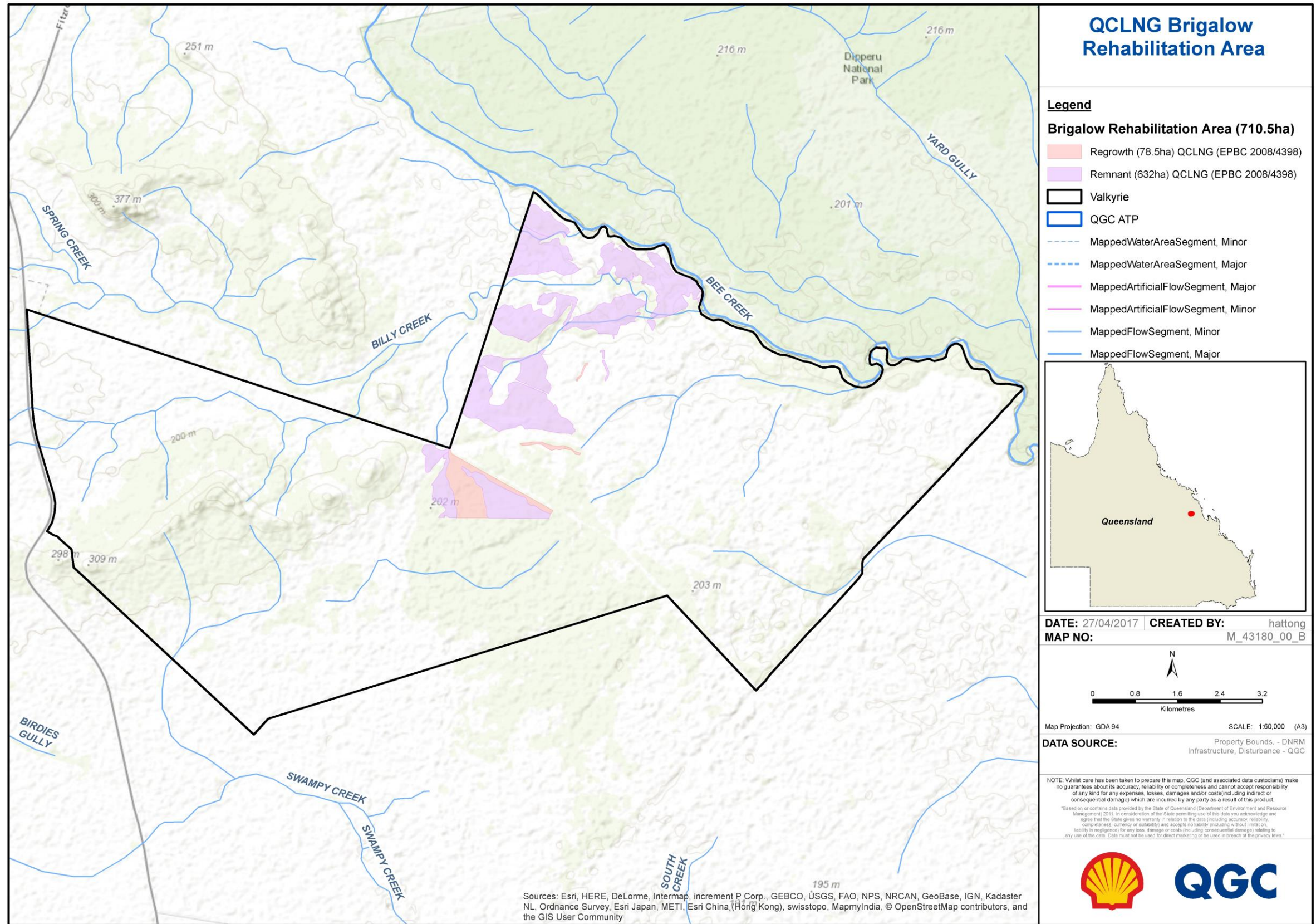


Figure 8-1
QCLNG BRIGALOW REHABILITATION AREA

8.3.1 Facilitate natural regeneration

Facilitating the natural regeneration of Brigalow regrowth is a fundamental part of rehabilitating the various stages of regrowth and levels of degradation to a desired condition e.g. to achieve remnant status. The facilitation of natural regeneration will be achieved through the integrated application of the following management actions:

- Invasive plant suppression and removal
- Invasive animal eradication
- Feral stock removal
- Fire prevention.

8.3.2 Invasive plant control

The control of invasive plants is fundamental to rehabilitating the Brigalow regrowth and degraded Brigalow remnant. It is therefore essential to control populations of invasive plant species and prevent them from re-establishing in the Brigalow Rehabilitation Area.

Section 5.3.1 and Appendix A provide further detail on the control of invasive plants across Valkyrie, including the Brigalow Rehabilitation Area.

The effectiveness of invasive plant control will be evaluated through undertaking vegetation monitoring surveys. If the monitoring surveys indicate that no improvements are resulting from the management actions, remedial actions will be implemented.

Managing edge effects

The management of edge effects around patches of Brigalow, and along access tracks and fuel breaks within the rehabilitation area will be essential to reducing the threatening processes of restricted invasive plants and WoNS.

The ongoing management of edge effects will assist the spread of Brigalow regrowth and degraded Brigalow remnant that occurs in patches within the rehabilitation area. Managing edge effects will also enable the recruitment of endemic native plant species that are characteristic of the Brigalow TEC and corresponding regional ecosystems.

Over the longer-term, the re-establishment of native species in place of invasive plants should result in greater integrity to the structural layers of Brigalow along edges and reduce the potential for invasive plant recruitment. This natural regenerative process will also benefit edge specialist fauna species that should benefit from the increased habitat values and protection provided by improved vegetation structure along edges.

8.3.3 Invasive animal control

The invasive animals that are known to occur on Valkyrie and, which are likely to prejudice the Brigalow rehabilitation include:

- Feral pig (*Sus scrofa*)
- Feral cattle (*Bos taurus*)

- Feral horse ‘Brumbies’ (*Equus ferus caballus*)
- Feral rabbit (*Oryctolagus cuniculus*)

Of these, feral pigs and rabbits are identified as restricted matter under the Regulations of the *Biosecurity Act 2016*. Chapter 2 of the *Biosecurity Act 2016* outlines the *General Biosecurity Obligation* (GBO) of each owner of land to take reasonable and practical steps manage the risks associated with biosecurity matters on their land. Collectively, the presence of these invasive animal species poses a constraint and risk to the rehabilitation of Brigalow within the rehabilitation area.

Section 5.4.1 and Appendix B provide further detail on the control of invasive animals across Valkyrie, including the Brigalow Rehabilitation Area.

Potential damage to habitat from invasive animals will be regularly monitored within favourable habitats across the Brigalow Rehabilitation Area, to determine the success of controlling actions and whether corrective actions are required.

8.3.4 Feral stock mustering

Feral cattle and horses have been observed across Valkyrie and are known to be accessing the property from Dipperu National Park. The movement and grazing of feral cattle and horses throughout the rehabilitation area would result in the trampling and damage regenerating Brigalow regrowth. The mustering and removal of feral cattle and horses will reduce this threatening process.

The evidence of habitat damage from feral cattle and horses will be part of the monitoring of the Brigalow Rehabilitation Area, to determine the success of feral stock mustering and whether corrective actions are required.

8.3.5 Fire mitigation

The fire danger season in Central Queensland is typically between September and November, with a peak danger period occurring in October and November.

Effective and well planned fire management strategies are essential to protecting the rehabilitation area from potential wildfire risks and adverse impacts. Fuel break establishment and maintenance are the only fire management actions applicable to the rehabilitation area. Planned burns will be administered in open woodland and woodland vegetation across the Valkyrie property to maintain or reduce fuel loads in these fire tolerant vegetation types.

The regional ecosystem description database (REDD) (EHP, 2013) provides fire management strategies and issues for all regional ecosystems. The fire management strategies and issues for the Brigalow regional ecosystems (11.4.8 and 11.4.9) contained in the rehabilitation area are presented in Table C.1 in Appendix C.

It is essential that the fire management strategies and issues specific to each regional ecosystem are carefully considered when establishing fuel breaks and when undertaking planned burns within areas that are adjacent to the rehabilitation area.

The prescribed fire mitigation measures are designed to limit the potential impacts of a wildfire upon the Brigalow Rehabilitation Area. However, in the event a wildfire enters Valkyrie from an external source, and adversely impacts upon Brigalow Rehabilitation

Area, corrective actions will be implemented as soon as practicable. An incident investigation will be undertaken and incident report made available upon request to the administering authority.

Appendix C provides further guidance on the fire mitigation that is required for the Brigalow Rehabilitation Area.

8.4 GENERAL LAND MANAGEMENT

General land management includes restricting access into the Brigalow Rehabilitation Area, and managing soil erosion risks.

8.4.1 Authorised personnel

Restricted access will be essential to prevent the spread of weeds, cattle access, reduce erosion risks and damage to the Brigalow Rehabilitation Area. Access will be restricted to QGC staff and the following contractors. Prior approval from the Offset Area Manager is required:

- Botanist and Ecologist contractors: professional services in accordance with their qualifications.
- Bushland regeneration contractors: professional services in accordance with their qualifications.
- Invasive plant control contractors: professional services in accordance with their qualifications.
- Invasive animal control contractors: as required to participate in feral animal control (under direction of the Offset Area Manager).
- Machinery contractors for access track and fuel break establishment and maintenance contractors: as required to participate in maintenance activities (under direction of the Offset Area Manager).
- Fire management contractors: as required to participate in fire prevention and management activities (under direction of the Offset Area Manager).
- Emergency response personnel: as required in an emergency situation to provide rescue services (under direction of the Offset Area Manager).
- Queensland Parks and Wildlife Service (QPWS), as required to participate in weed control, pest animal control, feral stock mustering, and planned burning and wildfire response (under direction of the Offset Area Manager).
- Queensland Fire and Rescue Service (QFES), as required to participate in planned burning and wildfire response (under direction of the Offset Area Manager).
- Other visitors who obtain official approval from QGC, e.g. researchers, regulators, industry groups etc.

Locked gates, signage, livestock fencing and notification procedures prior to access are essential management measures to restrict access into the Brigalow Rehabilitation Area. All of these measures will be inspected regularly when undertaking other management actions. Contractors will also be encouraged to report any identified access issues or evidence of unauthorised access.

8.4.2 Erosion and sediment control

Uncontrolled soil erosion poses a risk to the effective rehabilitation of the Brigalow Rehabilitation Area. Access tracks, bare earth fuel breaks and vehicle movements during periods of wet weather can lead to the creation of soil erosion risks. Management actions to minimise these risks are primarily focused on the following:

- minimising soil disturbance
- maintaining soil erosion control measures (e.g. whoa-boys)
- preventing or limiting access during wet periods
- restricting earthworks to the dry season
- periodic monitoring of areas of soil disturbance.

8.5 REHABILITATION MANAGEMENT ACTIONS

The rehabilitation of Brigalow regrowth to remnant status and the rehabilitation of Brigalow remnant to improve the overall biodiversity and habitat values of the rehabilitation area for other MNES is the overarching objective for the management actions outlined below. It is also important to ensure the protection of the rehabilitation area from potentially damaging factors, such as feral stock grazing, planned burns and wildfire, as well as unauthorised activities and access.

The overall intensity and frequency of management actions will be greater in areas of Brigalow regrowth than in areas of Brigalow remnant. The active rehabilitation of Brigalow remnant (invasive plant and animal control) will cease to be required well before that of the Brigalow regrowth.

8.5.1 Invasive plant control

The control and prevention of invasive plant incursions will be undertaken in accordance with relevant legislation. This may also include the introduction of an approved biological control agent, subject to relevant legislation.

Invasive plant control will focus on the control of restricted invasive plants and/or WoNS listed in Table 5-1. Control will be undertaken annually for each weed species in accordance with optimum times of control for the species and the requirements outlined in Appendix A.

8.5.2 Invasive animal control

The control and prevention of invasive animal incursions will be undertaken in accordance with the relevant legislation and conducted by the landholder or invited commercial agents.

Invasive animal populations that will be subject to control within the rehabilitation area include the feral pig and feral rabbit. Other invasive animal species, such as feral cats, feral dogs and the Cane Toad, will be controlled through the invasive animal control measures outlined Section 5.4 and in Appendix B. All invasive animal control must be undertaken in a humane manner.

8.5.3 Feral stock mustering

Mustering of feral cattle and brumbies shall only be undertaken by suitably qualified stockmen and will involve the following:

- Mustering shall only occur during the dry season to lessen the impact of running livestock on soft wet ground.
- Mustering shall be undertaken on horseback or vehicles with minimal disturbance footprint and/or with the aid of a helicopter.
- All livestock must be handled with care in handling yards that are fit for purpose.
- Any seriously injured or sick feral stock will need to be put down humanely and quickly with a high powered rifle by a person who holds a current Queensland firearms licence of the right classification.
- Feral stock can be either sold to a local abattoir or through a local or regional livestock sale yard.

8.5.4 Fire mitigation

Fuel breaks will be established in open areas around patches of Brigalow that are being rehabilitated. In instances where the rehabilitated Brigalow is associated with contiguous non-rehabilitation vegetation or other offset vegetation, the fuel break must be positioned at the nearest suitable area, such as along a boundary fence line, access track or open paddock. All fuel breaks will need to undergo annual inspections and maintenance to ensure their effectiveness as a fire mitigation measure.

Appendix C provides further guidance on the fire mitigation that is required for the Brigalow Rehabilitation Area.

8.5.5 General land management

Restricted access

Access into the Brigalow Rehabilitation Area is restricted and procedures are in place to prevent any unauthorised access. However, regular monitoring will be required periodically and will involve the following:

- inspecting restricted access signage and the replacement of any damaged, lost or sun faded signs
- inspecting the rehabilitation area for signs of livestock incursion or evidence of damage where feral or stray livestock have accessed the rehabilitation area.

Erosion and sediment control

Erosion and sediment control measures shall be applied to any areas where soil is currently exposed or will be exposed for the establishment of fuel breaks. The erosion and sediment control management measures, include:

- Ensuring the disturbance footprint for fuel breaks is kept to the minimum extents/widths, as specified in Appendix C.

- Any disturbances to the soil's physical properties will be avoided or at best minimised.
- Signs of soil erosion will be identified as part of fuel break monitoring, refer Sections 9.3.
- Identified erosion hazards will be remediated as soon as possible when weather permits following the completion of the wet season. Remedial works must not exacerbate or create additional soil erosion risks.

8.6 SUMMARY OF MANAGEMENT ACTIONS WITHIN THE BRIGALOW REHABILITATION AREA

Table 8-2 provides a summary of management actions which will be applied to the Brigalow Rehabilitation Area until Brigalow remnant has attained an ecological gain or until Brigalow regrowth has attained remnant status. It also describes the monitoring requirements and responsible persons for the management actions.

Table 8-2 Summary of management actions and monitoring frequencies for the nominated Offset areas

Management Action	Frequency and Timing of action(s)	Monitoring	Responsible person(s) for activity
Invasive Plant and Animal Control			
Invasive plant control	Control will be undertaken annually for each invasive plant in accordance with optimum times of control for the species (refer Appendix A)	Annual invasive plant monitoring specific to species growth cycles with follow up monitoring to occur at least 6 weeks after application of herbicides.	invasive plant control contractor as directed by offset area manager
Invasive animal control	As required. To be undertaken anytime of the year for eradicating Feral Pig and Feral Rabbit.	Annually beyond year 5 or as deemed necessary by previous monitoring events.	Invasive animal control contractor as directed by offset area manager
Feral stock mustering	As required. To be undertaken anytime of the year to remove feral cattle and brumbies.	As deemed necessary through indications such as broken fences. Annually beyond year 5 or as deemed necessary by previous monitoring events.	Stockmen contractor as directed by offset area manager
Fire Management			
Fuel break establishment	Once only around areas containing Brigalow and SEVT, and property boundaries with adjacent landholders. Fuel break establishment shall only occur from June to August.	One during establishment.	Earth moving contractor as directed by offset area manager
Fuel break maintenance	Annually, between June and August for slashing grass fuel breaks. As required, between June and August for re-grading bare earth fuel breaks property boundary fuel breaks.	Annually in early spring prior to the start of the fire season.	Earth moving contractor as directed by offset area manager
General Land Management			

Management Action	Frequency and Timing of action(s)	Monitoring	Responsible person(s) for activity
Restricted Access	As required.	Annual inspection of gates and signage.	Offset area manager
Erosion and sediment control	As required by the relevant management actions.	Annually following the wet season.	Earth moving contractor as directed by offset area manager

8.7 MEETING THE OBJECTIVES OF THE REHABILITATION AREA

As discussed in Table 8-1, the objectives and outcomes of the Brigalow Rehabilitation Area are specifically focused on rehabilitating Brigalow regrowth to remnant status and rehabilitating Brigalow remnant to improve the overall biodiversity and habitat values of the rehabilitation area for other MNES.

The objective for the rehabilitation of Brigalow regrowth is focused on encouraging the natural regenerative processes of the regrowth vegetation to a point where it has reached remnant status. On the other hand, the objective for the rehabilitation of Brigalow remnant is specifically focussed on improving its overall ecological condition and habitat value for MNES to provide an ecological gain. The rehabilitation of Brigalow regrowth and Brigalow remnant will be facilitated through weed control, pest animal control and livestock exclusion.

The 78.5 ha of Brigalow regrowth and 632 ha Brigalow remnant that is contained within the Brigalow Rehabilitation Area will be monitored annually. However, the required level of monitoring for each varies due to the different objective for each.

The progression of the natural regenerative processes ‘rehabilitation’ of Brigalow regrowth will be primarily informed by five ecological condition indicators that will be monitored annually. These five indicators are fundamentally linked to natural regenerative processes, including:

1. Native plant species richness
 - trees
 - shrubs
 - grasses
 - forbs
2. Tree canopy height
3. Tree canopy cover
4. Native perennial grass cover
5. Invasive plant cover.

Indicator 2 ‘tree canopy height’ and Indicator 3 ‘tree canopy cover’ are the two indicators that are essential for measuring when the regrowth vegetation that is composed of species characteristic of the regional ecosystem, has reached remnant status, being 50% cover and 70% height of the remnant benchmark or remnant reference site (DSITIA, 2012).

If after the first five years of annual monitoring the Brigalow regrowth indicates a lack of natural regeneration and growth (the indicators listed above), corrective actions will be implemented.

Improvements to the ecological condition and habitat value of the Brigalow remnant will be informed by five ecological condition indicators that will be monitored annually. These five indicators are fundamentally linked to improvements of ecological condition and habitat value, including:

1. Native plant species richness
 - trees
 - shrubs
 - grasses
 - forbs
2. Shrub canopy cover
3. Organic litter cover
4. Coarse woody debris
5. Invasive plant cover.

If after the first five years of annual monitoring the Brigalow remnant indicates a lack of ecological condition and habitat value improvement (the indicators listed above), corrective actions will be required.

9 Monitoring program for the Brigalow rehabilitation area

The following monitoring program describes the monitoring activities that are to occur within the Brigalow Rehabilitation Area. This monitoring approach has been developed to assess success of the management measures to rehabilitate the Brigalow regrowth to remnant status and rehabilitate the Brigalow remnant for the purpose of improving the overall biodiversity and habitat values of the rehabilitation area for other MNES. The monitoring shall only be undertaken by a suitably qualified expert.

The following monitoring methodologies have been designed to measure the effectiveness of the rehabilitation management actions and the effectiveness of the protection measures (e.g. fire mitigation and feral stock mustering).

9.1 REHABILITATION MONITORING REQUIREMENTS

The regrowth and Brigalow remnant to be monitored is comprised of regional ecosystems 11.4.8 *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains and 11.4.9 *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains.

9.1.1 Permanent monitoring transects

As part of the work undertaken to validate the offset values on Valkyrie and obtain baseline quality scores for the values, permanent monitoring transects (100 x 20 m), were established within the Brigalow Rehabilitation Area. Data obtained from these transects will form the baseline for ongoing monitoring of the progress of rehabilitation activities. The monitoring and compliance reporting is to occur annually and ideally monitoring should occur at the same time of year each year.

The permanent monitoring transects have been located across selected parts of the Brigalow Rehabilitation Area within the following:

- two sites within regrowth Brigalow
- two within remnant Brigalow.

The waypoints for each Brigalow Rehabilitation Area monitoring transect have been captured using GDA94 coordinate system Zone 55. The location of each TEC monitoring transect is shown on Figure 9-1. The coordinates for each TEC monitoring transect are listed in Table 9-1.

Table 9-1 Coordinates for each Brigalow Rehabilitation Area monitoring transect

ID	Type	Coordinates (GDA94 Zone55)	
		Transect start (0m)	Transect centre (50M)
RAB-1	Brigalow remnant (RE 11.4.8)	E: 670403.49 N: 7565817.42	E: 670367.21 N: 7565852.32
RAB-2	Brigalow remnant (RE 11.4.8)	E: 670092.15 N: 7566550.87	E: 670044.63 N: 7566565.77
RABR-1	Brigalow regrowth (RE 11.4.9)	E: 668812.70 N: 7567147.60	E: 668819.25 N: 7567099.92
RABR-2	Brigalow regrowth (RE 11.4.9)	E: 671276.87 N: 7565639.09	E: 671293.75 N: 7565589.77

The monitoring methodology for Brigalow regrowth and remnant vegetation varies due to each having different objectives and outcomes. Therefore, the ecological condition indicators that have been selected for monitoring the regrowth and Brigalow remnant reflect the different objectives of each. The ecological condition indicators for tracking the progress of the Brigalow regrowth and remnant vegetation have been adopted from the *EEM Guideline*, whilst secondary flora surveys were used to collect the data. The secondary flora surveys were undertaken in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland Version 3.2*.

The survey data obtained from these transects will form the baseline for ongoing monitoring of the progress of offset area management. The monitoring and compliance reporting is to occur annually and ideally monitoring should occur at the same time of year each year.

Brigalow regrowth monitoring

The five ecological condition field-based indicators to be monitored annually for Brigalow regrowth are measurable over time to track the effectiveness and success of management actions being applied to this regrowth within the Brigalow Rehabilitation Area. These five indicators include:

1. Native plant species richness
 - trees
 - shrubs
 - grasses
 - forbs
2. Tree canopy height
3. Tree canopy cover
4. Native perennial grass cover
5. Invasive plant cover.

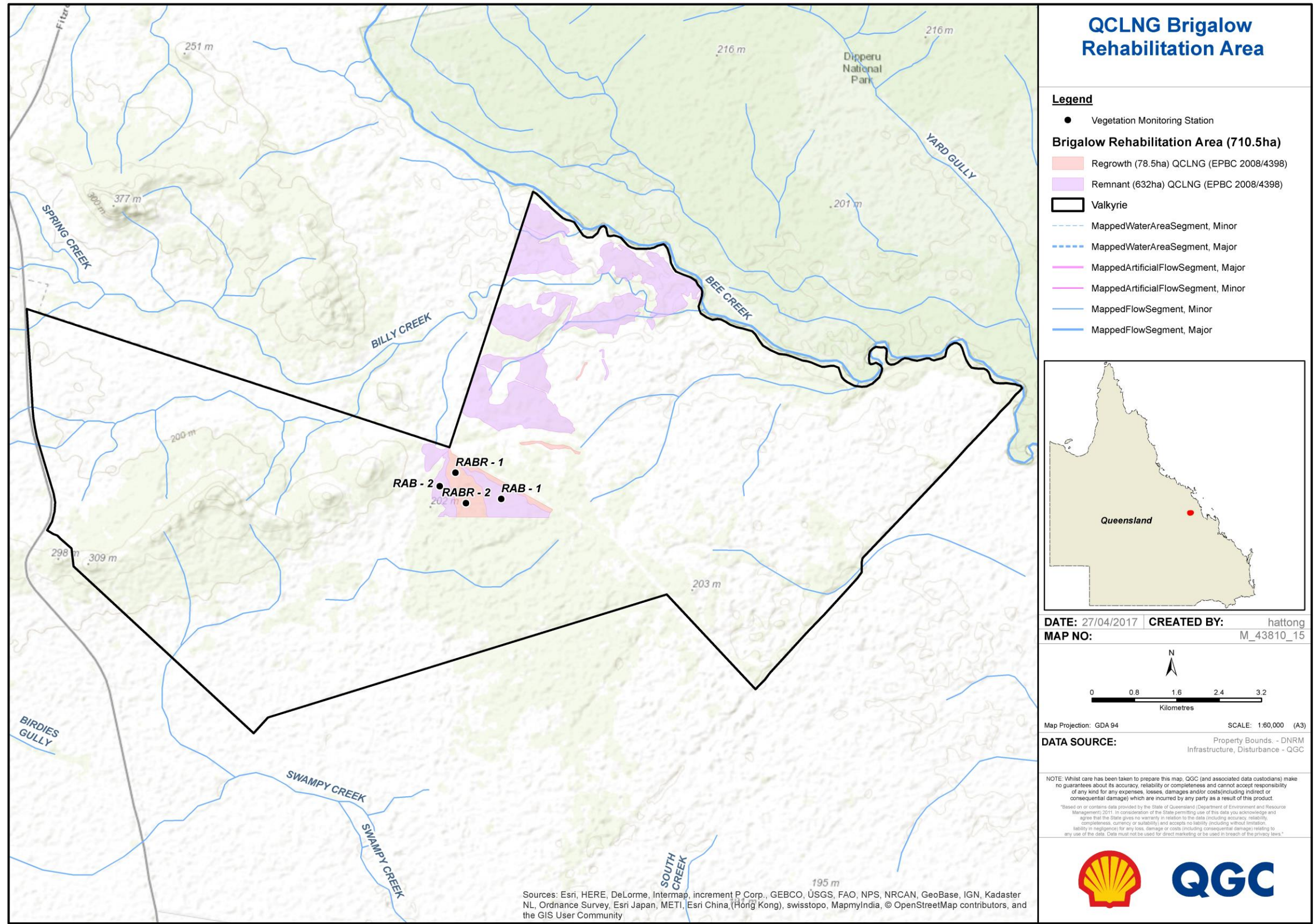


Figure 9-1
BRIGALOW REHABILITATION AREA PERMANENT MONITORING SURVEY LOCATIONS

Each monitoring survey event will involve the collection of field data for the five ecological condition indicators at each monitoring transect. All collated data will be scored using excel spreadsheets and compared against baseline data to track the success of the management actions and the progress of the Brigalow regrowth toward remnant status. Consideration of meteorological cycles and any occurrence of wildfire will be taken into account when assessing results and reporting outcomes.

Brigalow remnant monitoring

The five ecological condition field-based indicators to be monitored annually for Brigalow remnant are measurable over time to track the effectiveness and success of management actions being applied to Brigalow remnant within the Brigalow Rehabilitation Area. These five indicators include:

1. Native plant species richness
 - trees
 - shrubs
 - grasses
 - forbs
2. Shrub canopy cover
3. Organic litter cover
4. Coarse woody debris
5. Invasive plant cover.

Each monitoring survey event will involve the collection of field data for the five ecological condition indicators at each monitoring transect. All collated data will be scored using excel spreadsheets and compared against baseline data to track the success of the management actions and the progress of the Brigalow remnant toward an ecological gain. As above, consideration of meteorological cycles and any occurrence of wildfire will be taken into account when assessing results and reporting outcomes.

9.1.2 Photo point monitoring

Photo point monitoring will occur during the EEM surveys at the start and centre point of each of the permanent transects. The purpose of photo point monitoring is to use and compare photographic records with previous records to gauge changes over time.

Star pickets have been located at the centre point of each monitoring transect within the Brigalow Rehabilitation Area that were established when undertaking baseline surveys. The co-ordinates of each photo monitoring point have been captured using a handheld Global Positioning System (GPS) and will assist to locate the centre of the monitoring transect when undertaking subsequent monitoring. Ideally photo point monitoring is to be undertaken annually at the same time of year.

The photos that were taken at the photo monitoring point within each monitoring transect provide the baseline imagery to compare future photo point monitoring, so as to track the progress and success of rehabilitation management.

A record of the photos will be maintained which includes:

- GPS co-ordinates of the photo point
- date, time and number of each photo
- direction in which the photo was taken in the order of north, east, south and west
- height above the ground at which the photos were taken, (i.e. 6 foot tall photographer is 1.8 m).

After each photo monitoring event, the photos must be compared with photos taken during previous monitoring events. The following elements shall be noted:

- natural regeneration of native understorey and overstorey species
- the occurrence of habitat complexity (e.g. logs, litter)
- native plant establishment and growth
- the status of invasive plants.

Taking directional photos

Directional photos shall be taken from the transect centre point in all directions north, east, south and west with the aid of a compass. The aim is to capture a photo in each compass direction for the purposes of monitoring vegetation change.

They shall be taken of features in the intermediate distance to provide an overview of the entire site and its surrounds. They illustrate the general condition of the site, showing changes in tree, shrub and groundcover layers over time. These site specific directional photos can also be used to record particular disturbance events such as the impacts of a wildfire events or feral pig disturbances that can result in vegetation damage.

These photos are taken by holding the camera so that the image is taken with a 'landscape' perspective, i.e. the picture is wider than it is high. To take the photo, stand next to the transect centre point (star picket), and position the horizon so it cuts the photos frame in half, half above the horizon and half below, as shown in Figure 9-2.

Take the photos focusing on infinity. It is recommended that copies of the last photo events be taken and referred to prior to taking a photo, as this will make lining up and framing the next directional photos easier. Alternatively, taking a series of landscape photos at the transect centre, allows the field investigator to pick up more of the variation across the site and is easy to replicate next time an assessment is done.



Figure 9-2
EXAMPLE OF A DIRECTIONAL LANDSCAPE PHOTO

For each photo, record photo number, monitoring transect ID (e.g. RA 1-2), date photo was taken, and the direction the photo was taken (N/S/E/W). The date stamp feature on a digital camera (a common feature typically bottom left or right corner of photo); will be useful as long as it does not obscure important components of the captured image. Photos shall be downloaded as soon as possible and stored in a photo point monitoring database and then printed and kept on file with the monitoring records for use as a reference for the next photo point monitoring event or for auditing purposes.

Photo tips

It is recommended that only a digital camera be used to take the monitoring point photos. Digital cameras are ideal, allowing instant review of an image for clarity and colour. This will ensure that there will always be a good photo recorded for future monitoring purposes.

The best photos are generally taken on a clear day between 9 am and 3 pm. Before 9 am and after 3 pm will generally result in more shadowing and different colour cast, which may conceal some important features, such as the shrub layer amongst trees. Overcast days are great for photos in closed communities such as thickets, as the even light removes much of the shadowing.

Better photos are always captured by having the sun behind the photographer with the sunlight shining on the landscape. However with taking directional photos (N/E/S/W) there will typically always be one direction facing into the sun. Ideally photos should be taken around the middle of the day when the sun is at its highest point, but this is not always practical.

9.1.3 Timing and frequency of monitoring

Photo monitoring and ecological survey monitoring will occur at the same time each year between March – May in accordance with baseline survey timing.

9.1.4 Performance criteria

The objectives and outcomes for the Brigalow Rehabilitation Area as an offset are specifically focused on two aspects of rehabilitation:

1. The rehabilitation of Brigalow regrowth to remnant status.
2. The rehabilitation of Brigalow remnant for the purpose of improving the overall biodiversity and habitat values of the rehabilitation area for other MNES.

The performance criteria, which are based upon specific ecological condition indicators, differ between the Brigalow regrowth and the remnant Brigalow. Therefore, the ecological condition indicators are the performance criteria for measuring when the offset commitment for each aspect of the Brigalow Rehabilitation Area has been fulfilled, and the objective and outcomes for the Brigalow Rehabilitation Area have been obtained.

Regrowth Brigalow

Progress towards remnant status can be gauged by Indicator 2 ‘tree canopy height’ and Indicator 3 ‘tree canopy cover’. The target for remnant status is 50% cover and 70% height of the remnant benchmark or remnant reference site. As soon as the Brigalow regrowth has been documented as attaining remnant status and the State government has accepted this outcome and mapped it as such, this aspect of the Commonwealth commitment for the Brigalow Rehabilitation Area as an offset will be fulfilled.

Remnant Brigalow

The Brigalow remnant being used for rehabilitation is already in relatively good condition. The only signs of degradation relate to grazing and damage resulting from livestock movement, and weed invasion, and measurable improvements to the ecological condition and habitat value of the Brigalow remnant over time will be minor. Therefore, improvements to the ecological condition and habitat value of the Brigalow remnant will be gauged by all five indicators as a way to ascertain that an ecological benefit or gain has been achieved through rehabilitation management. The rehabilitation targets for each indicator are as follows:

- An increase in the total native plant species richness
- An increase of 5% of the total shrub canopy cover
- An increase of 10% of organic leaf litter cover
- No decline in coarse woody debris
- Total invasive plant cover <15%.

Once all of the above targets have been realised an ecological gain against impacts will have been achieved and the rehabilitation outcome for the Brigalow remnant will have

been achieved, and this aspect of the Commonwealth commitment for the Brigalow Rehabilitation Area as an offset will be fulfilled.

9.1.5 Corrective actions

In the event that monitoring over 5 year increments is not indicating progression toward the performance criteria identified in Section 9.1.4, the following corrective actions will be implemented.

- Investigate to determine cause of no progression toward ecological gain, taking into account meteorological cycles and the occurrence of any wildfire impacts.
- Review the intensity and/or frequency of invasive plant control.
- Invasive animal damage. The corrective actions may include, but should not be limited to the following:
 - revise the invasive animal control measures outlined in Section 5.3.1
 - increase the intensity of invasive animal control for the target animal species discussed in section 5.4.1 and Appendix B
 - revise the frequency of feral stock mustering as outlined in Section 5.4.

9.1.6 Review of aerial imagery

A review of aerial imagery shall occur once every three years to assess the progress of the Brigalow Rehabilitation Area and the improvements to the spread and cover of the Brigalow, in particular the regrowth Brigalow, as a result of the management actions. Recent aerial imagery will be required initially and new aerial imagery will be collected every three years during the spring season to best capture the progress of the vegetation. Aerial information for Valkyrie was last collected in May/June 2015, and is therefore due for collection again in spring 2018.

The aerial imagery assessment may also be useful to evaluate potential disturbances resulting from wildfire events, severe storms or even floods.

9.2 INVASIVE PLANT AND ANIMAL MONITORING

Invasive plant and animal monitoring will be undertaken in conjunction and will occur annually during late autumn. Monitoring will target identified areas of weed infestation and areas where there is known records of pest animal presence within the Brigalow Rehabilitation Area.

Due to the amount of effort required to manage invasive plants along the edges of the Brigalow Rehabilitation Area, monitoring will be necessary to determine the success of controlling actions and the subsequent benefit to the rehabilitation area. Invasive plant monitoring will also occur at the permanent monitoring transect sites.

9.2.1 Monitoring Requirements

Edge effects monitoring

The outer perimeter of the Brigalow Rehabilitation Area that is adjacent to open spaces (non-remnant areas), fuel breaks or access tracks will be monitored annually. The

monitoring of edge effects can be undertaken anytime between mid to late autumn following completion of the wet season and following the peak period of plant growth.

The following procedures must be followed to establishing monitoring transects to establish baseline data and to undertake the annual monitoring events:

- Identify for ongoing monitoring purposes where edge effects are substantially restricting the establishment or growth of native Brigalow species.
- Select a point along the edge, take a GPS waypoint and mark with a star picket.
- At the star picket take photos using a digital camera in either direction along the edge to establish baseline data and for ongoing monitoring purposes.
- On a field proforma detail the time of year of the monitoring event, photo numbers, direction of photos and list the observed weed species present, and take notes of any notable positive and/or negative changes in weed densities.
- Take the previous year's monitoring proforma and printed copies of previous years photos for the purpose of noting positive and/or negative changes in weed densities.
- Collate all data in excel spreadsheets and save all digital photos to file for ongoing monitoring purposes.

Invasive animal monitoring

Visual monitoring for invasive animals will involve the following:

- undertake random meander transects through the Brigalow Rehabilitation Area, take a different route for each monitoring event
- take notes of any observations on an invasive animal monitoring proforma
- take a waypoint using a handheld GPS when an invasive animal is recorded, dead or alive
- visually identifying relevant invasive animals (i.e. feral pigs, cats, dogs, rabbits, cattle, brumbies and Cane Toads)
- searching for evidence of feral pigs digging or wallowing
- identifying rabbit warrens and diggings
- identifying and recording the location of deceased invasive animals
- recording predatory animal scats (pigs, dogs and cats).

9.2.2 Timing and frequency of monitoring

Visual monitoring for invasive plants and animals will occur annually.

9.2.3 Performance criteria

The results of the monitoring described in Section 9.2.1 will be used to determine if the following performance criteria have been met. These criteria provide an indication of the success of the management measures being implemented for weed and pest animals, and serve as trigger values which if not achieved trigger corrective actions described in Section 9.2.4 and include:

- Decline in presence of restricted invasive plants and WoNS along the edges of the Brigalow Rehabilitation Area. A decline will be determined if at the end of five years of monitoring, the data indicates a >10% decrease of restricted invasive plant cover within the rehabilitation area.
- No pest animal damage.

9.2.4 Corrective actions

In the event that the performance criteria identified in Section 9.2.3 are not met over the first 5 years the following corrective actions will be implemented:

- Investigate cause of increased invasive plant and animal populations
- Review and audit the invasive plant and animal control measures to evaluate their effectiveness and revise the measures accordingly
- Increase the intensity and frequency of the invasive plant and animal control measures detailed in Section 5.3.1 and Appendix A for invasive plants, and Section 5.4.1 and Appendix B for invasive animals

9.3 FUELBREAK MONITORING

9.3.1 Monitoring requirements

Fuel breaks shall be monitored prior to the start of the fire season and following the completion of the wet season to identify any signs of invasive plant infestation and fuel load accumulation. Any noticeable invasive plant infestations or fuel load accumulation shall be GPS located and photos taken.

9.3.2 Timing and frequency of monitoring

Visual monitoring of fuel breaks shall occur prior to the start of the fire season and following the completion of the wet season.

9.3.3 Performance criteria

The results of the monitoring described in Section 9.3.1 will be used to determine if the following performance criteria have been met. These criteria provide an indication of the success of the management measures being implemented maintain fuel breaks and protect the Brigalow Rehabilitation Area from planned burns or wildfire, and serves as trigger values which when exceeded would result in the implementation of the corrective actions described in Section 9.3.4. These include:

- No significant increase in fuel load accumulation. An increase of fuel load accumulation will be determined if the fuel load along fuel breaks increases by >5% from the previous year's monitoring results.

9.3.4 Corrective actions

In the event that the performance criteria identified in Section 9.3.3 are not met over the first 5 years the following corrective action will be implemented:

- Undertake targeted invasive plant control and fuel load maintenance prior to the next fire season.

10 Annual compliance reporting

A Compliance Report will be prepared annually (period 1 July to 30 June) and submitted to the Commonwealth and State by 31 July. The report will document any incident reports of undesirable impacts upon the respective MNES, and any monitoring and management milestones achieved that occur during the previous 12 months.

The monitoring results of the first monitoring event will be presented in the first Compliance Report and subsequent reports. This will enable compliance officers to evaluate and track the success of the management measures outlined in this plan and related management plans.

As more information becomes available as a result of the ongoing compliance monitoring, amendments to the management and monitoring regime may need to be refined. In the event that amendments are proposed to the OAMP or RAMP, the amendments and justification for the change will be provided as part of the annual reporting.

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Appendix A

WEED MANAGEMENT

Appendix A
Weed management

1 Descriptions of declared plants and/or WoNS on Valkyrie

Parthenium hysterophorus



Plate 7: Parthenium

- Class 2 Declared weed species WoNs.
- Common to abundant in widespread areas of central and southern Queensland after introduction from North and South America.
- An annual herb with deeply lobed leaves, small white flowers and may reach two metres in height.
- Infests pastures and crops, and reduces the growth rate of other plants by both competition and through the production of a growth-inhibiting exudate from its roots.
- Propagation occurs from seeds with each plant capable of producing approximately fifteen thousand seeds that are viable for ten years.
- Seed is spread easily by water, farm and industrial machinery, feral animals, vehicles, stock fodder and movement of stock, grain and seed.
- Has been identified on Valkyrie.
- Refer to the DAF Parthenium fact sheet for control methods (Declared Plants of Queensland).

http://www.daff.qld.gov.au/data/assets/pdf_file/0004/68602/IPA-Parthenium-PP2.pdf

Mother of Millions (*Bryophyllum* spp.)



Plate 1: Mother of Millions

- Class 2 Declared weed species and WoNS.
- Occurs over substantial areas in Queensland after originating in Madagascar.
- Erect, smooth fleshy succulent weeds that are poisonous to stock if eaten.
- Propagation from seed and plantlets that grow along the edges of the leaves.
- Transportation via water movement.
- Has been identified on Valkyrie.
- Refer to DAF Mother of Millions fact sheet for prevention and control methods (Declared Plants of Queensland).

http://www.daff.qld.gov.au/_data/assets/pdf_file/0018/61461/IPA-Mother-Millions-PP33.pdf

Opuntia spp.



Plate 5: Prickly Pear

- Class 2 Declared weed species and WoNS.
- Naturalised in Queensland from the Americas.
- Erect, fleshy succulent weeds that have various forms of spikes.
- Propagation occurs from seed dispersed by native and introduced birds and animals.
- Prickly Pear and Velvety Tree Pear have been identified on Valkyrie.
- Refer to DAF Prickly Pear fact sheet for control methods (Declared Plants of Queensland).

http://www.daff.qld.gov.au/_data/assets/pdf_file/0007/76606/IPA-Prickly-Pear-Control-PP29.pdf

Lantana (*Lantana camara*)



- Class 3 Declared weed species and WoNS
- Native to tropical and subtropical regions of the Americas and now found throughout eastern Australia, growing in a wide variety of habitats.
- Heavily branched shrub with stems covered in small, recurved prickles. Poisonous to stock if eaten.
- Mainly spread by fruit-eating birds and mammals.
- Has been identified on Valkyrie.
- Refer to DAF Lantana fact sheet for prevention and control methods (Declared Plants of Queensland).

https://www.daf.qld.gov.au/_data/assets/pdf_file/0009/62010/IPA-Lantana-PP34.pdf

Rubber Vine (*Cryptostegia grandiflora*)



Plate 5: Rubber Vine

- Class 2 Declared weed species and WoNS.
- Native to Madagascar with infestations now common throughout river systems in Central Queensland.
- Vigorous climber 1–2 m high with twining, with whip-like shoots and glossy dark-green leaves.
- Seeds are spread by wind and water.
- Has been identified in small patches on Valkyrie.
- Refer to DAF Rubber Vine fact sheet for control methods (Declared Plants of Queensland).

https://www.daf.qld.gov.au/_data/assets/pdf_file/0020/52544/IPA-Rubber-Vine-PP11.pdf

Appendix B

PEST ANIMAL MANAGEMENT

Appendix B
Pest animal management

1 Descriptions of pest animals identified on Valkyrie

Feral rabbits



Rabbits (Class 2) are a highly destructive pest that cost the Australian economy between \$600m–\$1b per year. Rabbits are common and were regularly sighted on Valkyrie. They have been increasing in numbers leading to pasture degradation on not only QGC land but also neighbouring properties.

The most effective solution for rabbit control as prescribed in the Rabbit Control in Queensland (2008) handbook, published by the former DPI&F Queensland (now DAFF), is the destruction of warrens with machinery and then as a ‘mop up’, the controlled shooting of the remaining animals.

QGC will participate in any Rabbit control programs that may be coordinated by local government or other stakeholder in consultation with affected landowners.

Feral dogs



There are several techniques for the management of wild dogs mentioned by DAFF including the use of pesticides in bait, trapping, exclusion fencing, shooting and guard animals (DAFF 2013).

Feral dogs are considered a significant threat threatened fauna and other native fauna on Valkyrie and efforts must be made to reduce their presence. DAFF considers shooting by professionals to be of low concern in regard to animal welfare and is considered an appropriate control method.

QGC will engage in consultation with Biosecurity Queensland and regional council in regards to future baiting programs. DAFF have developed a wild dog management strategy (2011–2016) and QGC consult this document to guide future programs (DAFF, 2011 Wild Dog Management Strategy:

https://www.daf.qld.gov.au/_data/assets/pdf_file/0016/62431/Wild-dog-strategy-2011-16.pdf)

Feral Pigs



Feral Pigs are difficult to control for a number of reasons as outlined by the DAFF fact sheet on control of feral pigs, refer:

http://www.daff.qld.gov.au/_data/assets/pdf_file/0005/70925/IPA-Feral-Pigs-Qld_PP6.pdf

The recommended strategy for the control of feral pigs is trapping, and whilst this is time consuming it is acknowledged to be the best solution in terms of welfare and control available. The traps can be made with pig specific triggers that ensure that other local fauna is not affected. QGC will engage in consultation with Biosecurity Queensland and other stakeholders in regards to any future Feral Pig control programs.

Appendix C

FIRE MITIGATION AND MANAGEMENT

Appendix C

Fire mitigation and management

Fire mitigation and management is required for the management or protection of offset values contained within the nominated Offset Areas and Brigalow Rehabilitation Area. The Offset Area will be subject to fire mitigation and management, whilst the Brigalow Offset Area will only be subject to fire mitigation.

OFFSET AREA FIRE MITIGATION AND MANAGEMENT

Fuelbreak establishment

Fuelbreaks will be established in open areas around the nominated Offset Areas or isolated parts of the Offset Area. In instances where the offset is associated with contiguous vegetation or other offset vegetation, the fuelbreak must be positioned at the nearest suitable area, such as along a boundary fenceline, access track or open paddock.

Fuelbreak establishment will be undertaken in accordance with the *Planned Burned Guidelines Brigalow Belt Bioregion of Queensland* (DNPRSR 2013) and will be as follows:

- Provide a 5 m wide mineral earth or maintained grass fuelbreak.
- Fuelbreaks can be established by means of slashing, trittering (turbo mowing) of shrubby woody vegetation, graders or small dozers.
- Removal of established habitat trees is not permitted.
- Establish whoa-boys, cross drains or energy dissipaters where required along fuelbreaks to prevent soil erosion risks.
- Mineral earth fuelbreaks are not to have a maximum grade of >15 degrees and are not to have a crossfall >10 degrees, so as to prevent soil erosion risks, maintained grass fuelbreaks will only be established in these instances.

Fuelbreak maintenance

The maintenance for grass or mineral earth fuelbreaks is as follows:

- Prior to the fire danger season (July–August) grass fuelbreaks shall be slashed to maintain grass fuel loads at low levels i.e. grass ≤ 10 cm tall.
- Following the wet season (April–June) mineral earth fuelbreaks may require regrading to reduce any regenerated vegetation (fuel loads) or to address any soil erosion risks identified through fuelbreak monitoring.
- Fuelbreak maintenance is to be avoided during the fire danger season, to prevent the risk of machinery/ tractors igniting a fire.

Planned burns

Planned burns can be used in the nominated Offset Areas, but only for the purposes of managing vegetation structure and diversity within fire tolerant vegetation. This excludes numerous regional ecosystems that are fire sensitive.

Planned burns will be undertaken in accordance with the measures outlined below:

- Any planned burns will require a permit to burn from the local QFES representative.

- Planned burns must be conducted as cool burns and preferably undertaken by QPWS and/or QFES or shall at least be under the guidance of QPWS.
- Any QGC personnel involved in planned burns must be at least level 1 fire management trained.
- Monitoring of the planned burn area shall be undertaken as soon as possible following a planned burn event to evaluate the percentage of burnt and unburnt areas, and to obtain waypoints around the perimeter of the burnt area for mapping and record keeping purposes. This will be fundamental to planning and managing planned burns across Valkyrie and the Offset Area to ensure biodiversity enhancement and fuel load reduction objectives are being attained.
- In the event of a planned burn in the vicinity of Brigalow or SEVT, fuelbreaks will need to be established or existing fuelbreaks checked prior to conducting the burn.

BRIGALOW REHABILITATION AREA FIRE MITIGATION

Fuelbreak establishment

Fuelbreaks will be established in open areas around patches of Brigalow that are being rehabilitated. In instances where the rehabilitated Brigalow is associated with contiguous non-rehabilitation vegetation or other offset vegetation, the fuelbreak must be positioned at the nearest suitable area, such as along a boundary fenceline, access track or open paddock.

Fuelbreak establishment will be undertaken in accordance with the *Planned Burned Guidelines Brigalow Belt Bioregion of Queensland* (DNPRSR 2013) and will be as follows:

- Provide a 5 m wide mineral earth or maintained grass fuelbreak.
- Fuelbreaks can be established by means of slashing, trittering (turbo mowing) of shrubby woody vegetation, graders or small dozers.
- Removal of established habitat trees is not permitted.
- Establish whoa-boys, cross drains or energy dissipaters where required along fuelbreaks to prevent soil erosion risks.
- Mineral earth fuelbreaks are not to have a maximum grade of >15 degrees and are not to have a crossfall >10 degrees, so as to prevent soil erosion risks, maintained grass fuelbreaks will only be established in these instances.

Fuelbreak maintenance

The maintenance for grass or mineral earth fuelbreaks is as follows:

- Prior to the fire danger season (July–August) grass fuelbreaks shall be slashed to maintain grass fuel loads at low levels i.e. grass ≤ 10 cm tall.
- Following the wet season (April–June) mineral earth fuelbreaks may require regrading to reduce any regenerated vegetation (fuel loads) or to address any soil erosion risks identified through fuelbreak monitoring.
- Fuelbreak maintenance is to be avoided during the fire danger season, to prevent the risk of machinery/ tractors igniting a fire.

Planned burns

Planned burns are not permitted within the Brigalow Rehabilitation Area.

MANAGING REGIONAL ECOSYSTEMS WITH FIRE

The Department of National Parks, Recreation, Sport and Racing (DNPRSR) have developed the *Planned Burn Guideline for the Brigalow Belt Bioregion of Queensland* (2013), which is actively used by the *Queensland Parks and Wildlife Service* (QPWS), regional Councils and other government bodies to manage fuel loads and biodiversity in native vegetation.

The *Planned Burn Guideline* covers fire management for the following vegetation groups; Eucalypt forests and woodlands, grasslands, heaths and shrublands, Melaleuca communities, wetlands and swamps, Cypress and Bull Oak communities, Acacia dominated communities, Brigalow dominated communities, riparian, springs, fringing and fore dune communities, rainforests and vine thickets, even mangroves and salt pans (DNPRSR, 2013). It covers the most common fire management issues arising in the Brigalow Belt.

The *Regional Ecosystems Descriptions Database* Version 9.0 (REDD) (2015) that is managed by the *Queensland Herbarium, Department of Science, Information Technology and Innovation* (DSITI) provides guidance on the fire management requirements for all regional ecosystems in Queensland. Table C.1 presents each regional ecosystem that has been ground-truthed on Valkyrie and the fire management requirements for each as taken from REDD Version 9.0.

This *Planned Burn Guideline* and Table C.1 or REDD, Version 9.0 will be the go to information sources when planning and conducting planned burns on Valkyrie to manage fuel loads and biodiversity.

There are 16 regional ecosystems that have been ground-truthed within Valkyrie, the majority of which are being used as offsets or will be used as advanced offsets. Each regional ecosystem varies, some are sensitive to fire and should not be exposed to fire, whilst others require varying degrees of fire intensity and frequency of fire to maintain and/or enhance biodiversity and ecological values for native flora and fauna.

Table C.1 Regional ecosystem descriptions and specific fire management requirements (Source: DEHP, 2015)

Regional Ecosystem	VM Act status	Short description	Structural category	Specific fire management requirements				
				Season	Fire intensity	Burn interval	Strategy	Issues
11.3.1	Endangered	<i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	Mid-dense	N/A	N/A	N/A	Do not burn deliberately. Protection relies on broad-scale management of surrounding country with numerous small fires throughout the year so that wildfires will be very limited in extent. Frequent fire at the edge of this RE keeps fuel loads low. Protection from fire is necessary	<i>Casuarina cristata</i> is fire sensitive, and Brigalow seed germination is not promoted by fire. Brigalow will only tolerate low intensity fires which trickle through the understory. High intensity fires will cause damage to overstorey. Buffel grass invasion increases fuel loads and as a result increases risk of fire damage
11.3.2	Of concern	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> woodland on alluvial plains	Sparse	Late wet to early dry season	Low to moderate	6–10 years	Restrict to a 30% or less mosaic burn for any year. Burn with soil moisture and with a spot ignition strategy so that a patchwork of burnt/unburnt country is achieved	Low to moderate intensity burns undertaken at times of good soil moisture are required to provide sufficient weed control and wildfire protection whilst minimising loss of hollow bearing trees. Burning of riparian communities should be avoided to ensure habitat retention. Culturally significant (scar) trees are common in this RE and may require protection, such as rake removal of ground fuels
11.3.4	Of concern	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus spp.</i> woodland on alluvial plains	Sparse	Late wet to early dry season	Low to moderate	6–10 years	Aim for 30% mosaic burn. Burn during conditions of good soil moisture and with a spot ignition strategy so that a patchwork of burnt/unburnt country is achieved	Low to moderate intensity burns undertaken at times of good soil moisture are required to provide sufficient weed control and wildfire protection whilst minimising loss of hollow bearing trees. Burning of riparian communities should be avoided to ensure habitat retention. Culturally significant (scar) trees are common in this RE and may require protection, such as rake removal of ground fuels
11.3.11	Endangered	Semi-evergreen vine thicket on alluvial plains	Dense	N/A	N/A	N/A	Do not burn deliberately. Protection relies on broad-scale management of surrounding country with numerous small fires throughout the year so that wildfires will be very limited in extent. Frequent fire at the edge of this RE keeps fuel loads low. Protection from fire is necessary	Fuel load maintenance and re-establishment of adjacent native vegetation communities assists in reducing weed invasion and protecting against wildfire events
11.3.25	Least concern	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	Mid-dense	Early dry season	Low	3–5 years	Protection relies on broad-scale management of surrounding country with numerous small fires throughout the year so that wildfires will be very limited in extent. Frequent fire at the edge of this RE throughout the year keeps fuel loads low	Burning is often inadvisable due to fringing communities being critical habitat. Fire extents must be restricted to protect against excessive vegetation degradation and loss of fauna habitats (e.g. hollow bearing trees). Burning should only occur at times of good soil moisture and when water level in riparian areas is deep enough to protect the bases of aquatic plants
11.3.27f and 11.3.27i	Least concern	11.3.27f - Palustrine wetland (vegetated swamp), <i>Eucalyptus coolabah</i> and/or <i>E. tereticornis</i> open woodland to woodland fringing swamps on closed depressions on floodplains associated with old drainage courses 11.3.27i - Palustrine wetland (vegetated swamp), <i>Eucalyptus camaldulensis</i> or <i>E. tereticornis</i> woodland to open woodland with sedgeland ground layer, in depressions on floodplains	Sparse	N/A	N/A	N/A	Do not burn deliberately. Protection relies on broad-scale management of surrounding country with numerous small fires throughout the year so that wildfires will be very limited in extent. Frequent fire at the edge of this RE keeps fuel loads low. Protection from fire is necessary	Riparian vegetation is generally disadvantaged by fire. If burning must occur, it should only occur at times of good soil moisture and when water level in riparian areas is deep enough to protect the bases of aquatic plants
11.4.2	Of concern	<i>Eucalyptus spp.</i> and/or <i>Corymbia spp.</i> grassy or shrubby woodland on Cainozoic clay plains	Sparse	Late wet to early dry season	Low-moderate	6–10 years	Restrict to a 30% or less mosaic burn for any year. Burn with soil moisture and with a spot ignition strategy so that a patchwork of burnt/unburnt country is achieved	Low to moderate intensity burns undertaken at times of good soil moisture are required to provide sufficient weed control and wildfire protection whilst minimising loss of hollow bearing trees. Burning of riparian communities should be avoided to ensure habitat retention. Culturally significant (scar) trees are common in this RE and may require protection, such as rake removal of ground fuels

Regional Ecosystem	VM Act status	Short description	Structural category	Specific fire management requirements				
				Season	Fire intensity	Burn interval	Strategy	Issues
11.4.3 and 11.4.3x	Endangered	11.4.3 - <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> shrubby open forest on Cainozoic clay plains 11.4.3x - <i>Casuarina cristata</i> and <i>Terminalia oblongata</i> woodland with <i>Eucalyptus cambageana</i> emergent on Cainozoic clay plains	Mid-dense	N/A	N/A	N/A	Do not burn deliberately. Protection relies on broad-scale management of surrounding country with numerous small fires throughout the year so that wildfires will be very limited in extent. Frequent fire at the edge of this RE keeps fuel loads low. Protection from fire is necessary	<i>Casuarina cristata</i> is fire sensitive, and Brigalow seed germination is not promoted by fire. Brigalow will only tolerate low intensity fires which trickle through the understory. High intensity fires will cause damage to overstorey. Buffel grass invasion increases fuel loads and as a result increases risk of fire damage
11.4.7	Endangered	<i>Eucalyptus populnea</i> with <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest to woodland on Cainozoic clay plains	Mid-dense	N/A	N/A	N/A	Do not burn deliberately. Protection relies on broad-scale management of surrounding country with numerous small fires throughout the year so that wildfires will be very limited in extent. Frequent fire at the edge of this RE keeps fuel loads low. Protection from fire is necessary	<i>Casuarina cristata</i> is fire sensitive, and Brigalow seed germination is not promoted by fire. Brigalow will only tolerate low intensity fires which trickle through the understory. High intensity fires will cause damage to overstorey. Buffel grass invasion increases fuel loads and as a result increases risk of fire damage
11.4.8 and 11.4.8x	Endangered	11.4.8 - <i>Eucalyptus cambageana</i> woodland to open forest with <i>Acacia harpophylla</i> or <i>A. argyrodendron</i> on Cainozoic clay plains 11.4.8x - <i>Eucalyptus cambageana</i> , <i>Acacia harpophylla</i> and <i>Casuarina cristata</i> woodland with semi-evergreen vine thicket understorey on Cainozoic clay plains	Mid-dense	N/A	N/A	N/A	Do not burn deliberately. Protection relies on broad-scale management of surrounding country with numerous small fires throughout the year so that wildfires will be very limited in extent. Frequent fire at the edge of this RE keeps fuel loads low. Protection from fire is necessary	<i>Casuarina cristata</i> is fire sensitive, and Brigalow seed germination is not promoted by fire. Brigalow will only tolerate low intensity fires which trickle through the understory. High intensity fires will cause damage to overstorey. Buffel grass invasion increases fuel loads and as a result increases risk of fire damage
11.4.9	Endangered	<i>Acacia harpophylla</i> shrubby woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains	Mid-dense	N/A	N/A	N/A	Do not burn deliberately. Protection relies on broad-scale management of surrounding country with numerous small fires throughout the year so that wildfires will be very limited in extent. Frequent fire at the edge of this RE keeps fuel loads low. Protection from fire is necessary	<i>Casuarina cristata</i> is fire sensitive, and Brigalow seed germination is not promoted by fire. Brigalow will only tolerate low intensity fires which trickle through the understory. High intensity fires will cause damage to overstorey. Buffel grass invasion increases fuel loads and as a result increases risk of fire damage
11.5.3	Least concern	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> on Cainozoic sand plains/remnant surfaces	Sparse	Late wet to early dry season	Various	6–15 years	Ensure planned burn boundaries are secured prior to commencing burn and ignite using a patchwork approach as opposed to continuous ignition strips. Use topographical features and burn only during mild or moist periods to encourage burn mosaics and limit fir intrusion into surrounding vegetation	Shrubby woodland requires longer fire intervals than grassy woodlands due to the presence of fire-killed shrubs and the time required for post-fire regrowth to return to maturity. The seedlings of fire-killed shrubs can take over 5 years to mature. Shrubby woodlands and associated fuel loads make fine mosaic burns difficult to undertake compared to grassy woodlands. Burning temporarily reduced cover and density of exotic grass species which allows increased native species revegetation and establishment
11.11.18	Endangered	Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding	Dense	N/A	N/A	N/A	Do not burn deliberately. Protection relies on broad-scale management of surrounding country with numerous small fires throughout the year so that wildfires will be very limited in extent. Frequent fire at the edge of this RE keeps fuel loads low. Protection from fire is necessary	Fuel load maintenance and re-establishment of adjacent native vegetation communities assists in reducing weed invasion and protecting against wildfire events

Source: Regional Ecosystem Descriptions Database accessed at: <http://www.qld.gov.au/environment/plants-animals/plants/ecosystems/download/>

Planning a planned burn

All planned burns will be planned in collaboration with QPWS and/or RFS. At the planning stage, prior to conducting any planned burns within fire tolerant regional ecosystems, Table C.1 needs to be consulted to inform the type of planned burn that is required for the regional ecosystem(s) requiring a planned burn. It is important to consider the season of the burn, and ensure that the intensity and burn interval creates a mosaic of burnt and unburnt vegetation within the regional ecosystem, so as to not disrupt all of the habitat values for native flora and fauna at the one time.

Planned burn seasons for regional ecosystem types

There are five regional ecosystems in Valkyrie that can tolerate planned burns, 11.3.2, 11.3.4, 11.3.25, 11.4.2 and 11.5.3. Planned burn seasons for different regional ecosystem types are summarised in Table C.1. The majority of planned burns to manage remnant or regrowth vegetation within the Offset Area are to occur during winter (June–August), as shown in Table C.1.

Fire sensitive regional ecosystems

Regional ecosystems 11.3.1, 11.3.11, 11.3.27f, 11.3.27i, 11.4.3, 11.4.3x, 11.4.7, 11.4.8, 11.4.8x, 11.4.9, 11.11.18 are fire sensitive. Burning within these regional ecosystems must be avoided as these regional ecosystem types are sensitive to fire and can be irreversibly damaged by fire.

Protection of these regional ecosystems from fire will rely on broad-scale fire management of surrounding regional ecosystems that can tolerate and require fire as part of their natural regenerative processes. This will reduce fuel loads surrounding the fire sensitive regional ecosystems, which will in turn limit the extent and severity of potential wildfire impacts upon these fire sensitive regional ecosystems.

Fire intensity

All planned burns will be conducted in accordance with the *Planned Burn Guideline for the Brigalow Belt Bioregion of Queensland*, which includes provisions for controlling fire intensity. In reference to Table C.1, there are five regional ecosystems in Valkyrie that can tolerate planned burns. Three require a fire intensity that is low to moderate, one that is low and one that can tolerate varying fire intensity. Even in consideration of these requirements, best judgement based on previous experience should be used to determine the most appropriate fire intensity that needs to be applied, and should also consider factors, such as the presence of emergent canopy saplings, senescent grasses and/or the presence of weeds.

Low intensity planned burn

Low intensity planned burns are the main type of planned burn used to manage biodiversity. Low intensity planned burns are achieved by igniting fire under conditions where a combination of some or all of the following factors influences fire behaviour:

- low fuel loads
- moist fuels
- low temperatures
- high humidity
- low wind speeds
- fire ignition patterns.

The aim of low intensity planned burns is to remove leaf litter, grass and shrub layer whilst limiting or preventing canopy scorching. The fuel mosaic is patchy and actual area burnt may vary between 30 and 80%. The average flame height is less than 1 m.

Moderate intensity planned burn

Moderate intensity planned burns are typically patchy fires with creek and drainage lines generally not burnt. These burns are used more frequently than high or low intensity planned burns.

The aim of a moderate intensity planned burn is to have a substantial portion of the shrub layer removed, especially in woodland vegetation that is becoming more like a forest. The fuel mosaic is patchy and actual area burnt may vary between 60 and 80%. On average flame heights will be between one and two metres and some canopy scorching may occur.

High intensity planned burn

High intensity planned burns are used infrequently and should only be conducted under situations where the aim is to reduce the abundance of saplings in the understorey or to reduce weeds, such as Lantana (*Lantana camara*) and other weed infestations within native vegetation.

The aim of high intensity planned burns is to have average flame heights greater than two metres and to facilitate some canopy fire. The actual area burnt should be greater than 80%.

Burn intervals

As presented in Table C.1, the recommended planned burn intervals for the regional ecosystems ranges between short intervals of 3–5 years up to longer intervals of 6–10 or 6–15 years, as per the *Regional Ecosystem Description Database*. On the other hand, as part of the management of open forest and woodland vegetation within National Parks, QPWS Rangers on average conduct biodiversity planned burns at intervals of 6–12 years.

Careful consideration of specific regional ecosystem burn intervals is required when burning mixed polygon regional ecosystems, to ensure that biodiversity objectives of the most representative regional ecosystem(s) are being met through the application of a planned burn.

REFERENCES

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