

# Denham Park – Ornamental Snake Offset Area Management Plan: EPBC 2019/8413

Stanmore IP South Pty Ltd



**BASE/**

Client: Stanmore IP South

Reference: J0053.3

## Document Control

Title:	Denham Park Ecological Assessment Report
Address:	Denham Park
Job Number:	J0053.3 Ornamental Snake Offsets
Client:	Stanmore

## Document Issue

Issue	Date	Prepared By	Reviewed/Approved by
Rev A – Draft	15/09/2022	Jamie Ernst Andrew Craig Dr Craig Streatfeild	Dr Craig Streatfeild
Rev B – Draft for client review	04/10/2022	Andrew Craig Dr Craig Streatfeild	Dr Craig Streatfeild
Rev O – Issued	16/10/2022	Dr Craig Streatfeild	Richard Oldham (client)
Rev 1 – Response to DCCEEW comments and addition of survey data	28/02/2023	Dr Craig Streatfeild Andrew Craig Isaac Witten	Richard Oldham (client)
Rev 2 – Response to client review	09/03/2023	Dr Craig Streatfeild	Richard Oldham (client)
Rev 3 final – Response to further comments from DCCEEW and DCCEEW acceptance	20/03/2023	Dr Craig Streatfeild	Richard Oldham (client)

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## Approval Holder Declaration

I declare that:

1. To the best of my knowledge, all the information contained in, or accompanying this Biodiversity Offset Management Plan that was supplied by the proponent 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* (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* 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:

DIANA BOZZETTO

Organisation:

STANMORE RESOURCES

Date:

20/03/2023

## Abbreviations

Abbreviation	Description
AU	Assessment Unit
Base	Base Consulting Group
CHPP	Coal Handling and Preparation Plant
DAF	Department of Agriculture and Fisheries
DAWE	Department of Agriculture, Water and the Environment
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DES	Department of Environment and Science
DoEE	Department of the Environment and Energy
DoR	Department of Resources
EA	Environmental Authority
EAR	Environmental Assessment Report
EDL	Ecologically Dominant Layer
EIS	Environmental Impact Statement
ENSO	El Nino-Southern Oscillation
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
GHK	General Habitat Known
GHP	General Habitat Possible
GIS	Geographic Information System
the Guide	<i>Guide to determining terrestrial habitat quality, V1.2</i>
HQAP	Habitat Quality Assessment Plot
HSM	Habitat Suitability Models
IDM	Isaac Downs Mine
IP Coal	Stanmore IP Coal Pty Ltd
IPE	Isaac Plains East
IPEE	Isaac Plains East Extension
IPM	Isaac Plains Mine
MIA	Mine Infrastructure Area
ML	Mining Lease
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NC Act	<i>Nature Conservation Act 1992</i>
OAMP	Offset Area Management Plan
OS-OAMP	Ornamental Snake Offset Area Management Plan
PA Act	<i>Planning Act 2016</i>
PHK	Preferred Habitat Known
PHP	Preferred Habitat Possible
PMAV	Property Map of Assessable Vegetation

Abbreviation	Description
the Project	Isaac Downs Mine Project
RE	Regional Ecosystem
ROM	Run of Mine
SPRAT	Species Profile and Threats Database
Stanmore	Stanmore IP South Pty Ltd
TEC	Threatened Ecological Community
VDec	Voluntary Declaration
VM Act	<i>Vegetation Management Act 1999</i>
WoNS	Weed of National Significance

## 1.0 Introduction

Base Consulting Group (Base) was commissioned by Stanmore IP South Pty Ltd (Stanmore) to prepare this Offset Area Management Plan (OAMP) to address offset obligations for impacts to a listed Commonwealth fauna species from operations at the Isaac Downs Mine (IDM) Project (the Project). The Project has been approved by both State and Commonwealth Governments and this OAMP has been developed to address residual impacts to Matters of National Environmental Significance (MNES) that require offsetting as outlined in the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) approval (EPBC 2019/8413) issued on 26 May 2021 and varied on 6 August 2021 and 24 March 2022. The IDM is located on granted mining lease (ML) 700046, 700048 and 700049.

Stanmore IP Coal Pty Ltd (IP Coal), a separate subsidiary of Stanmore Resources Ltd (Stanmore Resources), operates the Isaac Plains Mine (IPM) on granted ML 70342, ML 700016, ML 700017, ML 700018 and ML 700019, subject to an existing environmental authority (EA). These mining leases encompass the Isaac Plains East (IPE) and Isaac Plains East Extension (IPEE) mining areas and are located immediately to the north of the IDM Project.

As part of the Stanmore Resources' existing IPE, IPEE and IDM projects and to address the Commonwealth's requirements, OAMPs were approved for offsets relating to the Koala, Greater Glider and Squatter Pigeon on the Mt Spencer Station property. Habitat suitable to offset impacts to the Ornamental Snake was not available within the Mt Spencer property and as such, offsets from Ornamental Snake were not included in those OAMPs.

It is the intent of Stanmore to legally secure available offsets for the Ornamental Snake within the Denham Park property (refer Figure 1). The OAMP includes habitat mapping, ecological assessments and habitat quality scores within a Proposed Offset Area of 1020 ha Lot 23 SP262530 referred to as Denham Park. Management actions, performance criteria and competition criteria for the offset area are also outlined.

This OAMP (Revision 1) has been revised to address comments from the Department of Climate Change, Energy, the Environment and Water (DCCEEW) on the previous version and to include results of targeted ornamental snake surveys undertaken in February 2023.

### 1.1 Project Background

The IDM project is operating a metallurgical open cut coal mine located approximately 10 km east of Moranbah in Central Queensland (refer to Figure 1). The IDM Project area is shown in Figure 2. IDM involve a range of activities including:

- Open cut metallurgical coal mine.
- In-pit and out of pit spoil dumps.
- Flood protection levee.
- Mine infrastructure area (MIA).
- Water management infrastructure including mine water dam, sediment dams and clean water diversion.
- Access road from the Peak Downs Highway.
- Linear infrastructure corridors to connect the Project to the existing IPM with a Run of Mine ROM coal haul road, power supply and water pipelines (linear infrastructure).
- Use of existing IPM Coal Handling and Preparation Plant (CHPP), tailings management systems, and train load out facility.

## 1.2 Scope and Purpose of Report

The IDM Project is immediately south of the IPE and IPEE projects. The assessment of significance of residual impacts (prepared for the Project Environmental Impact Statement (EIS)) for the IDM Project (ECOSM, 2020a; ECOSM, 2020b) identified that the MNES for which offsets are likely required are the same as those required for the IPE and IPEE projects (Koala, Greater Glider, Squatter Pigeon and Ornamental Snake). Offsets for the Koala, Greater Glider and Squatter Pigeon have been approved and provided at a separate property at Mt Spencer (BASE, 2021).

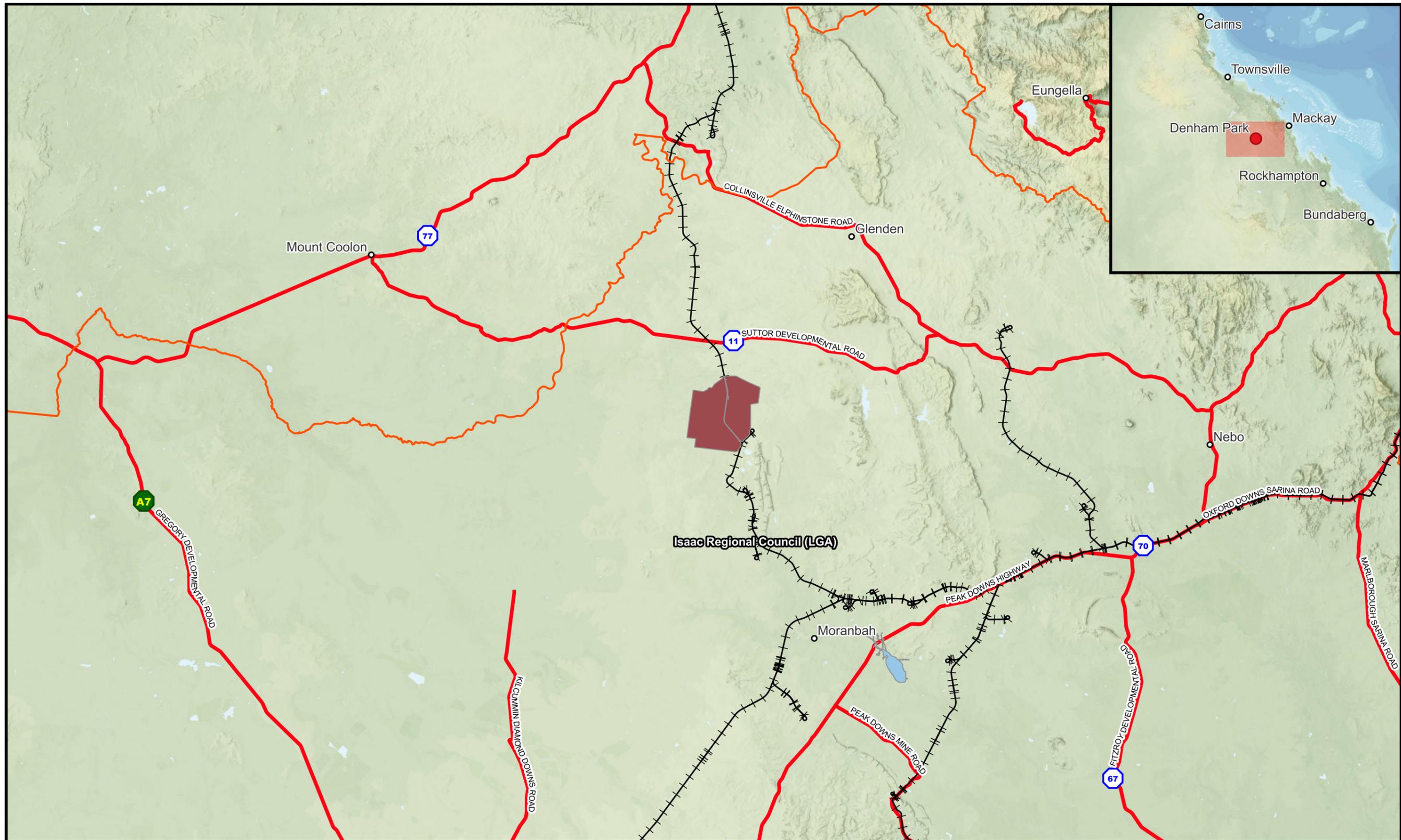
The purpose of this OAMP is to offset significant residual impacts to the Ornamental Snake for the Project. A previous version of the OAMP was prepared for an offset area on a separate property. The then Department of Agriculture, Water and Environment (DAWE; now DCCEEW) raised concerns as to the suitability of the proposed offset site. Following discussions with the then DAWE, Stanmore chose to pursue an alternate offset area on Denham Park, which was recently acquired by a Stanmore Resources subsidiary. DCCEEW also provided comments on the previous version of this OAMP submitted for Denham Park, including demonstrating the presence of the Ornamental Snake within the offset area. This revised version (Rev 2) addresses those comments and includes the results of a targeted Ornamental Snake survey undertaken in February 2023 that confirmed the presence of the species within the offset area on Denham Park.

This OAMP proposes to legally secure the required offset area within Denham Park (Figure 3) as an offset for residual impacts to 293.5 ha of Ornamental Snake habitat (refer to Table 1). Refer to section 2.1.1 for the calculation of the impact area requiring offsets. Ongoing management and monitoring of the offset area is proposed to satisfy the requirements of the Commonwealth's Offset Policy and approval conditions. In accordance with the approval conditions, management of the offset area in accordance with this plan is for the period of effect of the approval.

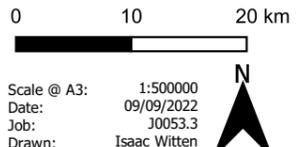
**Table 1: MNES impacted by the Project for which offsets will be delivered**

MNES	EPBC Act Status	Impact area requiring offsets (ha)	Required offset area (ha)
Ornamental Snake ( <i>Denisonia maculate</i> )	Vulnerable	293.5	1020

Detailed ecological assessments of the impact area have been undertaken to support the IDM approvals process (i.e. as part of the approved EIS). As part of these investigations, habitat quality assessments were undertaken to inform the offset requirements for the IDM Project (ECOSM, 2020b).



**Figure 1: Site Context**



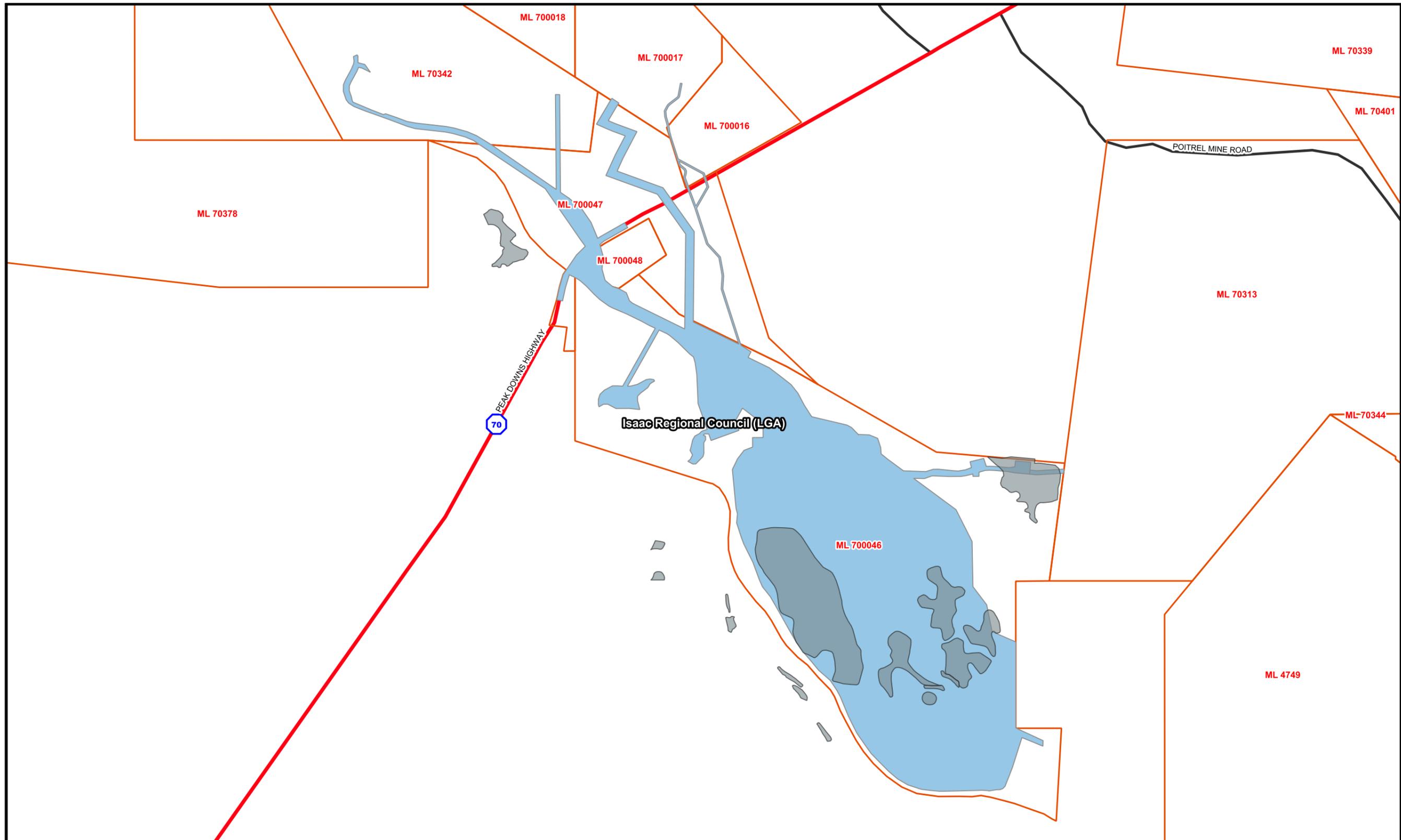
Scale @ A3: 1:500000  
 Date: 09/09/2022  
 Job: J0053.3  
 Drawn: Isaac Witten

DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGIN, IGP, swisstopo, and the GIS User Community, DATSIP

- Denham Park
- Isaac Downs Mine (Impact Area)
- Isaac Regional Council (LGA)
- Cities and Towns
- State Controlled Road
- Rail



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 BASE Dropbox\BASE Project Folder\Job Folder\J0053.3 Stanmore (Ornamental Snake Offsets)\GIS CAD Files\0. Project Files



**Figure 2: IDM Impact Area**

0 1000 2000 m

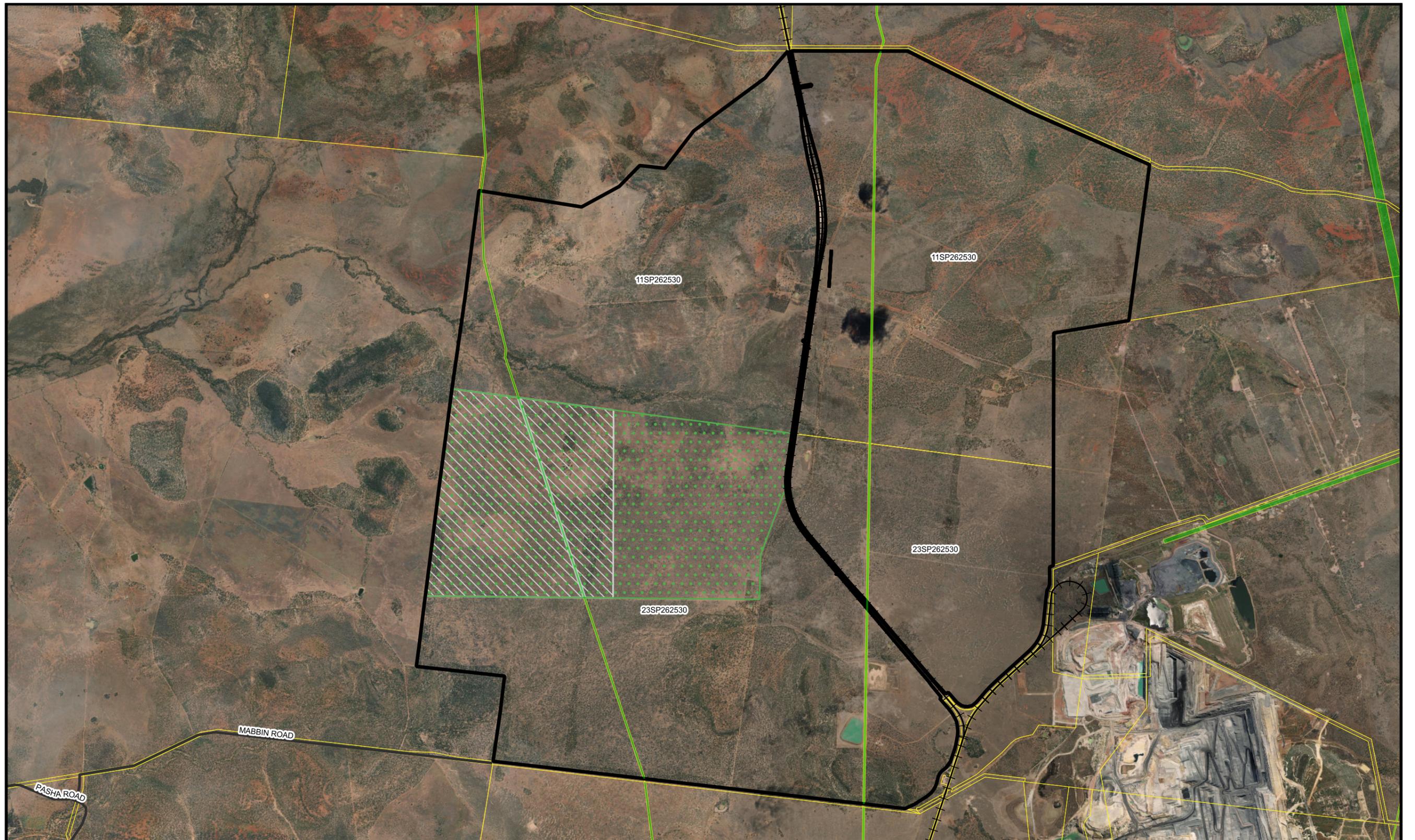
Scale @ A3: 1:35000  
 Date: 30/09/2022  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- ID Project Area
- ML permit granted
- Easement
- Ornamental Snake Habitat
- Road
- + Rail





**Figure 3: Project Area**

0 1000 2000 m

Scale @ A3: 1:50000  
 Date: 11/10/2022  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- Denham Park
- Investigation Area
- Proposed Offset Area
- DCDB
- Easement
- Road
- Rail

**BASE/**

## 2.0 Regulatory Requirements and Policy Framework

### 2.1 Environment Protection and Biodiversity Conservation Act

The EPBC Act is the Commonwealth Government’s principal piece of environmental legislation and is administered by the DCCEE. The EPBC Act is designed to protect MNES, which include threatened species of flora and fauna, threatened ecological communities (TECs), migratory species as well as other protected matters. The Act includes EPBC categories of threat for threatened flora and fauna, identifies key threatening processes to their survival and provides for the preparation of recovery plans for threatened flora and fauna.

#### 2.1.1 Conditions of Approval

The EPBC approval decision (EPBC 2019/8413) for the Project was received on 26 May 2021 and varied on 6 August 2021 and 24 March 2022. Conditions 4 to 7, 10 and 12 of the EPBC Act approval are relevant to the development of this OAMP and are detailed in sections 2.1.1.1, 2.1.1.2, 2.1.1.3, and 2.1.1.4

Note, Condition 2 outlines the approved clearing limits for all impacted MNES, including those where offset have been addressed elsewhere. For the Ornamental Snake, Condition 2 allows for 173.5 ha to be impacted.

The responses to the relevant approval conditions as outlined in the following sections have been revised and updated in this revision (Rev 2) of the OAMP to address comments from DCCEE on Rev O. Specific responses were provided to DCCEE separately via email on 21 February 2023.

##### 2.1.1.1 Conditions 4, 5 and 6

Conditions 4, 5 and 6 of the EPBC Act approval relate to the requirements to the environmental offset area and not clearing of habitat over the specified area until the OAMP has been approved. Offsets have been approved for the Koala, Greater Glider and Squatter Pigeon on Mt Spencer station and only those approval conditions that have relevance to the Ornamental Snake as provided in this OAMP. The condition and where it has been addressed in this OAMP are outlined in Table 2. Of note is the calculation of the impacts requiring offsetting for the Ornamental Snake. Although the significant residual impacts to the Ornamental Snake totalled 173.5 ha, condition 6 allowed for impacts up to 120 ha without an approved OAMP. However, for every hectare of Ornamental Snake impacted prior to approval of an OAMP, the impacted area must be added to the 173.5 ha impact area. All 120 ha has been impacted to date and as such, the total area requiring offsets is 293.5 ha (e.g. 173.5 ha plus 120 ha).

**Table 2: EPBC Act approval of conditions 4,5 and 6 addressed as part of this OAMP**

Condition	Summary of condition	Relevant section
Condition 4	To compensate for the impacts to Ornamental Snake ( <i>Denisonia maculata</i> ) habitat up to the limits specified in condition 2 (e), the approval holder must submit an Ornamental Snake Offset Area Management Plan (OS-OAMP), prepared by a suitably qualified ecologist and consistent with the Environmental offsets policy, within 12 months of the date of the commencement of the action for the written approval of the Minister. The approval holder must implement the approved OS-OAMP, and provide written	Refer to sections 2.2, 4.3, and 0.  The IDM commenced on 09/08/2021, as per a notice provided to DAWE.  A previous OAMP was submitted to the Department on the 14 <sup>th</sup> April 2022 in satisfaction of condition 4. However, following consultation

Condition	Summary of condition	Relevant section
	evidence to the department, within 6 months of the approval of the OS-OAMP.	with the Department an alternative location was required. Hence the submission of Rev O of the OAMP on 29 November 2022.  Refer to Appendix B for suitably qualified ecologist CVs.  Refer to section 2.2 for responses to the policy principles.
Condition 5	The approval holder must not impact more than 120 ha of Ornamental Snake ( <i>Denisonia maculata</i> ) habitat unless the OS-OAMP has been approved by the Minister in writing.	Noted, a maximum of 120 ha of Ornamental Snake habitat has been impacted to date.  Shapefiles of the impacted areas have been provided to DCCEEW by Stanmore.
Condition 6	For every hectare of Ornamental Snake ( <i>Denisonia maculata</i> ) habitat impacted prior to approval of the OS-OAMP (i.e.. prior clearance), the approval holder must provide an offset in addition to the offset for the total impact to the Ornamental Snake ( <i>Denisonia maculata</i> ) habitat.  <i>Note: Condition 6 requires the area of habitat to be input into the impact calculator of the Offsets assessment guide to be the total area of habitat impacted plus prior clearance (&lt;173.5 ha + prior clearance).</i>	All 120 ha has been impacted to date and as such, the total area requiring offsets is 293.5 ha (e.g. 173.5 ha plus 120 ha).  Refer to section 4.3

#### 2.1.1.2 Condition 7

Condition 7 of the EPBC Act approval relates to the requirements of the Ornamental Snake OAMP. These conditions and where they have been addressed in the OAMP are outlined in Table 3.

**Table 3: EPBC Act approval conditions 7 addressed as part of this OAMP**

Condition	Summary of condition	Relevant section
Condition 7 (a)	Details to demonstrate how the offset(s) proposed compensates for the impacts to Ornamental Snake ( <i>Denisonia maculata</i> ) habitat and any prior clearance in accordance with the Environmental offsets policy.	Refer to section 4.3, 5.0 and 5.1
Condition 7 (b)	A description of the offset(s), including location, size, condition, environmental values present and surrounding land uses.	Refer to section 4.3
Condition 7 (c)	Relevant baseline data and other supporting evidence, including results from field validation surveys and quantifiable ecological data, that documents the presence or likely presence of the Ornamental Snake ( <i>Denisonia maculata</i> ) and	Refer to sections 3.2.1.5, 4.3 and Appendix D

Condition	Summary of condition	Relevant section
	the quality of the Ornamental Snake ( <i>Denisonia maculata</i> ) habitat within the offset area(s).	
Condition 7 (d)	An assessment of the site habitat quality score(s).	Refer to section 4.3
Condition 7 (e)	Details of how the offset area(s) will provide connectivity with other habitats and biodiversity corridors and / or will contribute to a larger strategic offset for the Ornamental Snake ( <i>Denisonia maculata</i> ).	Refer to section 4.3
Condition 7 (f)	A description and maps (including shapefiles) to clearly define the location and boundaries of the offset area(s), accompanied by the offset attributes (including physical address of the offset area(s), coordinates of the boundary points in decimal degrees and the size of the environmental offsets in hectares).	Refer to section 4.3
Condition 7 (g)	Specific offset completion criteria derived from the site habitat quality score to demonstrate the improvement in the habitat quality score for Ornamental Snake in the offset area(s) over the period of effect of this approval.	Refer to section 5.1
Condition 7 (h)	Details of the management actions (including timing, frequency, duration and method of outcome measurement), to be carried out to meet the offset completion criteria (the management actions proposed must be consistent with the Environmental management plan guidelines and the approved conservation advice).	Refer to section 5.0 and 6.0
Condition 7 (i)	Interim performance targets that set targets at 5-yearly intervals for expected progress towards the completion criteria set in condition 7 (g).	Refer to section 5.1
Condition 7 (j)	Details of the nature, timing and frequency of monitoring to inform progress against achieving the interim performance targets (the frequency of monitoring must be sufficient to track progress towards each set of milestones, sufficient to determine whether the offset area(s) is / likely to achieve those milestones in adequate time to implement all necessary corrective actions).	Refer to section 5.1
Condition 7 (k)	Timing for the implementation of corrective actions if monitoring activities indicate the interim performance targets have not been achieved.	Refer to section 7.0
Condition 7 (l)	A risk analysis and a risk management and mitigation strategy for all risks to the successful implementation of the OS-OAMP and timely achievement of the offset completion criteria,	Refer to section 9.0

Condition	Summary of condition	Relevant section
	including for if the offset fails to achieve and maintain the completion criteria.	
Condition 7 (m)	The legal mechanism that will be used for legally securing the offset area(s), such that legal security remains in force over the offset area for at least the period of effect of this approval.	Refer to section 4.6

### 2.1.1.3 Condition 7c

Condition 7c states that the Offset Area Management Plan must include relevant baseline data and other supporting evidence, including results from field validation surveys and quantifiable ecological data, that documents the presence or likely presence of the Ornamental Snake and the quality of the habitat. To assess the likely presence of the Ornamental Snake within the offset area, a range of ecologically relevant criteria was developed in consultation with then DAWE now DCCEEW. These criteria and where they have been addressed are outlined below in Table 4. Note, these data criteria were developed during discussions with DCCEEW on determining the 'likely presence' of the species, in the absence of the species being confirmed as present. Targeted field Ornamental Snake surveys were undertaken in February 2023 which unequivocally determined the presence of the species within the Proposed Offset Area as outlined in Appendix C and (BASE, 2023). Hence, whilst the criteria for likely presence outlined in Table 4 provides useful habitat information, the requirements of the 'likely presence' criteria are now redundant following confirmation the species is present.

**Table 4: Criteria to assess the presence or likely presence of the Ornamental Snake**

Criteria for likely presence	Relevant section in this document
<b>Desktop</b>	
Known records in proximity to the potential offset site based on Queensland's Wildnet and ALA records	section 3.2, Figure 4 and Appendix D
Connectivity of site to other areas of suitable habitat	section 3.2 and Appendix D
Additional unpublished records from Qld departments, Queensland Museum, gas industry reports etc which may not be public	section 3.2, Figure 4 and Appendix D
Climatic conditions leading up to and during surveys e.g. temperatures, rainfall	Appendix C (BASE, 2023) and Appendix D.
<b>Field</b>	
<b>Microhabitat features</b>	
Presence of coarse woody debris (CWD) (absent/present, approximate size and length)	section 4.2.3, Appendix C, and Appendix F of the Environmental Assessment Report (EAR) in Appendix D
Estimate of CWD abundance (metres per hectare)	section 4.2.3 and Appendix C of the EAR in Appendix D
Presence of rocks piles (absent/presence, approximate size, material, if known)	Appendix F of the EAR in Appendix D

<b>Criteria for likely presence</b>	<b>Relevant section in this document</b>
Leaf litter presence, density, and depth	section 4.2.3, Appendix C, and Appendix F of the EAR in Appendix D
Herbs, forbs and shrub presence and density	section 4.2.3 and Appendix C of the EAR in Appendix D
Presence and abundance of weed species	section 4.2.3, section 4.2.4, and Appendix C of the EAR in Appendix D
Tree and shrub canopy cover estimate	section 4.2.3 and Appendix C of the EAR in Appendix D
Quality of habitat attributes measured for each Regional Ecosystem (RE) type using BioCondition Benchmarks	section 4.2.3 and Appendix C of the EAR in Appendix D
<b>Gilgais / cracking clays</b>	
Presence and type of gilgais	section 4.2.10 and Appendix F of the EAR in Appendix D
Absence/presence of vegetation and vegetation described noting effects of vegetation and root systems binding cracking clays	section 4.2.2, section 4.2.3, Figure 3 and Appendix C of the EAR in Appendix D
Cracking clay soils	section 4.2.10 and Appendix F of the EAR in Appendix D
Cracking clay soils content described (eg. clay /silt /sand)	section 4.2.10 and Appendix F of the EAR in Appendix D
Presence/absence of disturbance	section 4.2.3, section 4.2.4, section 4.2.6 section, 4.2.7 section, 4.2.8, section 4.2.9 section 4.2.10, and Appendix F of the EAR in Appendix D
Current inundation of cracking clay soils at time of survey and estimate the total area supporting cracking clay soils	section 4.2.10 and Appendix F of the EAR in Appendix D

#### 2.1.1.4 Condition 10 and 12

Conditions 8 and 9 of the EPBC Act approval relates to reporting on the offset area in reaching the interim performance targets and completion criteria, respectively. Conditions 10 and 12 of the EPBC Act approval relates to legally securing the offset. These conditions and where they have been addressed are outlined in Table 5.

**Table 5: EPBC Act approval conditions 10 and 12 addressed as part of this OAMP**

Condition	Summary of condition	Relevant sections
Condition 8	Within 60 business days after the end of each 5 year period from the date of implementation of the OAMP, until the expiry of this approval, the approval holder must submit to the department, and publish on the website for the remainder of the period of the approval, a report that assesses progress towards achieving and maintaining the completion criteria specified in the OAMP and approved OS-OAMP.	Refer to Table 18
Condition 9	Within 60 business days of the 20th anniversary of the date of implementation of the OAMP and the OS-OAMP, the approval holder must submit a report that provides evidence substantiating whether the offset area(s) has/have fully achieved and maintained the completion criteria. If all completion criteria have not been achieved within 20 years from the date of implementation of the OAMP and the OS-OAMP, the approval holder must provide, within 6 months, additional environmental offsets approved by the Minister in writing consistent with the Environmental offsets policy.	Refer to Table 18
Condition 10	The approval holder must legally secure the offset area(s) described in the OAMP and approved OS-OAMP within 12 months of the approval of the associated plan. The OAMP and approved OS-OAMP must be attached to the legal mechanism used to legally secure the associated offset area(s).	Refer to section 4.6
Condition 11	The approval holder must provide evidence to the department within 5 business days of the legal mechanism being executed.	Refer to section 4.6
Condition 12	The legal mechanism used to legally secure the offset area(s) described in the OAMP and approved OS-OAMP must remain in force from the date of obtaining legal security and for at least the remaining period of effect of this approval.	Refer to section 4.6

Under the EPBC Act Environmental Offsets Policy, offsets are required where a residual impact is likely to occur after avoidance, mitigation and management measures have been undertaken. For this project, offsets for residual impacts are to be legally secured for the Ornamental Snake as outlined in Table 1.

## 2.2 Policy Principles

The EPBC Act Environmental Offsets Policy (October 2012), has five key aims that involve:

- Ensuring the use of offsets are efficient, effective, timely, transparent and scientifically robust.
- Providing all stakeholders with greater certainty on how offsets are determined and provided.
- Delivering improved environmental outcomes.
- Outlining the appropriate nature and scale of offsets.
- Providing guidance on acceptable offsets and their delivery.

The Policy also provides eight key principles that are applied in determining the suitability of offsets as follows. These principles are addressed in further detail in section 4.7.

- Deliver an overall conservation outcome that improves or maintains the viability of the MNES in question.
- Be primarily built around direct offsets but may also include other compensatory measures.
- Be in proportion to the level of statutory protection that applies to the MNES.
- Be of a size and scale proportionate to the residual impacts on the protected matter.
- Account for and manage the risks of the offset not succeeding.
- Be additional to what is already required under law or regulations.
- Be efficient, effective, timely, transparent, scientifically robust and reasonable.
- Have transparent governance arrangements including management actions, monitoring and auditing.

Denham Park is a cattle station north of Moranbah, which has approximately 7123 ha of remnant and non-remnant vegetation that has the potential to provide offsets for impacts to the Ornamental Snake. The Denham Park property is split into two (2) lot and plans, Lot 11 on SP262530 and Lot 23 on SP262530. The Proposed Offset Area is in the southern Lot (Lot 23 SP262530) (Figure 3).

The identified 1020 ha Proposed Offset Area, to which this OAMP applies, is located on the western section of the property, and excludes a north-west oriented gas line easement in the central section. The identified offset area (Figure 3) has the potential to provide offsets that offer additional environmental values over and above those required.

### 3.0 Biodiversity Values Requiring Offsets

To support the Project's State and Commonwealth approvals process, detailed ecological surveys and assessments have been undertaken across the IDM project area and include studies undertaken as part of the IDM EIS approval process in 2018 and 2019 (ECOSM, 2020b). As well as collecting data to assess the significance of impacts to MNES, surveys also involved habitat quality assessments for the those impacted MNES. Habitat quality assessments are discussed further in section 4.3.1 and 7.2. The results of the detailed ecological assessments and baseline habitat quality of the impact site are outlined in EcoSM (2020a; 2020b).

Collectively, these surveys and assessments were undertaken, in order to:

- Determine the presence/absence of listed flora and fauna species within the Project area.
- Assess the vegetation characteristics and the presence of ecological communities within the Project area.
- Describe the likely adverse impacts on MNES within the Project area.
- Describe measures that would be implemented to avoid and mitigate impacts on those MNES.
- Assess the baseline habitat quality of the impact area for the MNES requiring offsets.

This section provides a summary of the ecological assessments undertaken to determine the likelihood of occurrence of fauna MNES to occur or potentially occur, within the IDM project area and to assess the potential impacts to those MNES.

#### 3.1 Impact Assessment Ecological Survey Effort

A variety of flora and fauna survey methods were used to detect MNES during the assessment surveys (ECOSM, 2020b). The detailed ecological assessments incorporated a dry season and a wet season fauna and flora survey. The dry season surveys were conducted over nine days in late-September and early October 2018 with the wet season surveys undertaken over eight days in late-February and early March 2019 (ECOSM, 2020b). Flora surveys were undertaken in accordance with the Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland, Version 4.0 (DES, 2017).

Assessment sites were undertaken across the entire Project area and included both vegetation assessment sites and photo monitoring points within each vegetation community type as outlined below.

Numbers in parentheses indicates the number of sites that fall within the IDM project footprint:

- 208 vegetation assessment sites in total comprising.
  - 38 detailed secondary sites
  - 48 tertiary sites
  - 74 modified quaternary sites
  - 48 photo monitoring sites
  - Targeted flora surveys
  - Random traverses

At 30 secondary sites detailed plots were installed and vegetation condition data collected in accordance with the Department and Environment and Science's (DES) '*Guide to determining terrestrial habitat quality, V1.2*' (DES, 2017) (the Guide), which was in effect at the time of the surveys. As described in section 4.3.1, habitat quality was calculated using a combination of the methods outlined in version 1.2 and version 1.3 of the Guide (refer to ECOSM, 2020b).

Fauna assessments were undertaken in 2018 and 2019 and included systematic trap sites, spotlighting, infrared cameras, active searching, supplementary survey sites, and observation (e.g. opportunistic observations). The field work consisted of systematic and supplementary survey sites and opportunistic observations and included:

- 124 pitfall trap nights.
- 200 funnel trap nights.
- 432 hours (36 person hours/ 12 days) of active searching.
- 12 hours (4 person hours/ 3 nights) of spotlighting (Brigalow and gilgai habitat).
- 220 hours (20 person hours/ 11 nights) of drive spotlighting.
- 45 infrared camera trap nights.

Survey methods were undertaken in accordance with applicable Commonwealth and Queensland threatened species and communities survey guidelines including:

- Commonwealth guidelines.
  - Survey guidelines for Australia’s threatened reptiles (DSEWPC, 2011a)
  - Species Profile and Threats Database (SPRAT) for relevant EPBC Act listed species and communities (as of July 2016)
- Queensland guidelines.
  - Flora Survey Guidelines – Protected Plants *Nature Conservation Act 1992* (EHP, 2014) (NC Act)
  - Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre, et al., 2018).

### 3.2 MNES Requiring Offsets

The impact area ecological assessments identified four fauna species (Koala, Greater Glider, Squatter Pigeon and Ornamental Snake) listed as endangered and vulnerable under the EPBC Act as requiring offsets due to residual impacts occurring to the species habitat. This OAMP only address offsets for the Ornamental Snake (Table 6) and offsets for the three remaining MNES have been approved and located elsewhere.

**Table 6: MNES impacted by the Project for which offsets will be required**

MNES	EPBC Act status	Impact area requiring offsets (ha)	Required offset area (ha)
Ornamental Snake ( <i>Denisonia maculata</i> )	Vulnerable	293.5	1020

#### 3.2.1 Ornamental Snake (*Denisonia maculata*)

The only threatened reptile to be recorded within the IDM Project area was the Ornamental Snake, with a single individual recorded at two locations in the southern section of the IDM footprint during the dry and wet season surveys in an area of non-remnant vegetation supporting well developed gilgai and from mid-mature Brigalow with small shallow gilgai formations that grade into a very broad overland flow path.

### 3.2.1.1 Description

#### EPBC Act: Vulnerable

The Ornamental Snake is a stout brown, grey-brown or grey-black snake with a darkly flecked or overall darker head with the lips distinctly barred in white/cream. The belly is white or cream with dark spots/flecks on the outer edges (TSSC, 2014). The iris is usually golden and the tail often grades to a lighter orange-brown at the tip. The Ornamental Snake is nocturnal, moving only at night. It is probably active year-round but can remain inactive in shelters for periods of months during dry conditions (DSEWPC, 2011b). Peak activity is likely to be late spring to early summer (DSEWPC, 2011b).



### 3.2.1.2 Distribution

The Ornamental Snake is only known from the Brigalow Belt North, and parts of the Brigalow Belt South Bioregions (DCCEEW, 2022). The stronghold of this species is within the Fitzroy and Dawson River catchments (McDonald, et al., 1991) where it is sparsely distributed.

### 3.2.1.3 General Habitat Preferences

Ornamental Snakes are found in close association with frogs which form much of its prey and is known to favour woodlands and open forests associated with moist areas, particularly gilgais with clay soils but is also known from lake margins, wetlands and waterways. This species is associated with Brigalow vegetation communities and commonly found in Brigalow (*Acacia harpophylla*), Gidgee (*Acacia cambagei*), Blackwood (*Acacia argyrodendron*) or Coolabah (*Eucalyptus coolabah*) – dominated vegetation communities or pure grassland associated with gilgais (DCCEEW, 2022).

Ornamental Snakes tend to shelter in logs, under coarse woody debris and in ground litter and seem to prefer a diversity of gilgai size and depth, with some fringing groundcover vegetation and timber debris, where soils are of a high clay content with deep-cracking characteristics. Habitat patches greater than 10 ha and connected to larger areas of remnant vegetation are preferred and higher abundance of the species has been found in shallow water where aquatic vegetation is present or where fringing groundcover is inundated, such as shallow wetlands (DCCEEW, 2022; ECOSM, 2020b). EcoSM, 2020b, described Ornamental Snake habitat as gilgai mounds and depressions with cracking-clay soils and moist areas (particularly within, or close to, habitat that is known to be favoured by its prey [frogs]) with microhabitat features (i.e. logs, woody debris and leaf litter), and Brigalow threatened ecological communities. Further, the Draft Referral guidelines for the nationally listed Brigalow Belt reptiles describes gilgai depressions and mounds as being important habitat with habitat connectivity between gilgai and other suitable habitats also being important (DSEWPC, 2011b).

### 3.2.1.4 Foraging and Refuge Habitat

Soil cracks on the high ground of gilgai development provide shelter for Ornamental Snakes during dry periods, and an abundance of frogs in gilgai areas provide food resources during wet. Ornamental Snakes prefer areas with ground cover such as logs and coarse woody debris, and ground litter, which it uses for shelter (TSSC, 2014).

### 3.2.1.5 Suitable Habitat within the Offset Area

The approved conservation advice for the Ornamental Snake (TSSC, 2014) along with habitat definitions included in the EPBC Act approval, indicate that the snake prefers habitat associated with clay pans, cracking clays, gilgais, depressions and along the margins of swamps, lakes, wetlands and watercourses where suitable microhabitat occurs (logs, leaf litter etc.). Further, the SPRAT profile indicates the species has been found in shallow water where aquatic vegetation is present or where fringing groundcover is inundated, such as shallow wetlands. Ornamental Snakes also occur on adjoining areas of elevated ground including woodlands and open woodlands of coolabah, poplar box, and brigalow, and in fringing vegetation along watercourses. The presence of the species is also related to the presence of its favoured prey (frogs) and microhabitat that supports prey species.

Desktop assessment including a review of the DES WildNet and Atlas of Living Australia (ALA) historic records, show multiple records of the Ornamental Snake occurring within the Proposed Offset area, the wider Denham Park property and surrounds (Figure 4). The records running linearly north to south along the western edge of Denham Park were recorded during construction of a gas pipeline in 2004, whilst the other records towards the eastern side of the property were recorded in 2006. Targeted Ornamental Snake surveys were undertaken over four nights in early February 2023 as outlined in Appendix C and provided previously to DCCEE; (BASE, 2023) and observed the species within the Proposed Offset Area. Five Ornamental Snakes were observed on the first night of spotlighting in the south-east section of the Offset Area. Four individuals were observed in areas of advanced regrowth Brigalow associated with RE 11.4.9 (Figure 5) and one individual was found in an area of low regrowth Brigalow mapped as a non-remnant (Figure 5). All of the ornamental snakes were in close proximity to inundated gilgai depressions, which was expected given the timing of the survey and their propensity to favour these areas during the wet season. Four individuals were also observed in similar habitat on the third night of spotlighting (Figure 5).

An abundance of frog prey species were also observed within a variety of habitats within the Proposed Offset Area, including within and in close proximity to gilgai depressions associated with RE 11.4.9 and areas associated with RE 11.9.1.

Within the surrounding area, Ornamental Snakes have also been recorded from 2003 through to 2022 (refer to Figure 4). Recent surveys (2022) undertaken by EMM for a potential gas pipeline undertaken for a third-party, recorded the species within the Denham Park property (Figure 4) (EMM, 2022). Spotlighting during the EMM (2022) surveys following heavy rainfall identified nine Ornamental Snakes on the first survey night and a further thirty on the second night of surveys. All individuals were in gilgais on the eastern side of the property. Surveys on the western section of the property (Proposed Offset Area), were not possible due to flooding at the time of the surveys (EMM, 2022). However, EMM noted that the Ornamental Snake would likely occur in the western area.

Additional records of the Ornamental Snake occur to the north and south of the Denham Park property, which suggests the Proposed Offset Area could be a corridor for the Ornamental Snake between these two areas. State biodiversity corridors also occur to the north, east and south of the Proposed Offset Area with riparian corridors occurring to the west and north (Figure 4). However, these corridors are likely to have limited value for the Ornamental Snake as outlined in 4.3. Denham Park and the Proposed Offset Area are situated within the current known distribution of the species as mapped by DCCEE and the Proposed Offset Area is classed as “species or species habitat is likely to occur” (Figure 6).

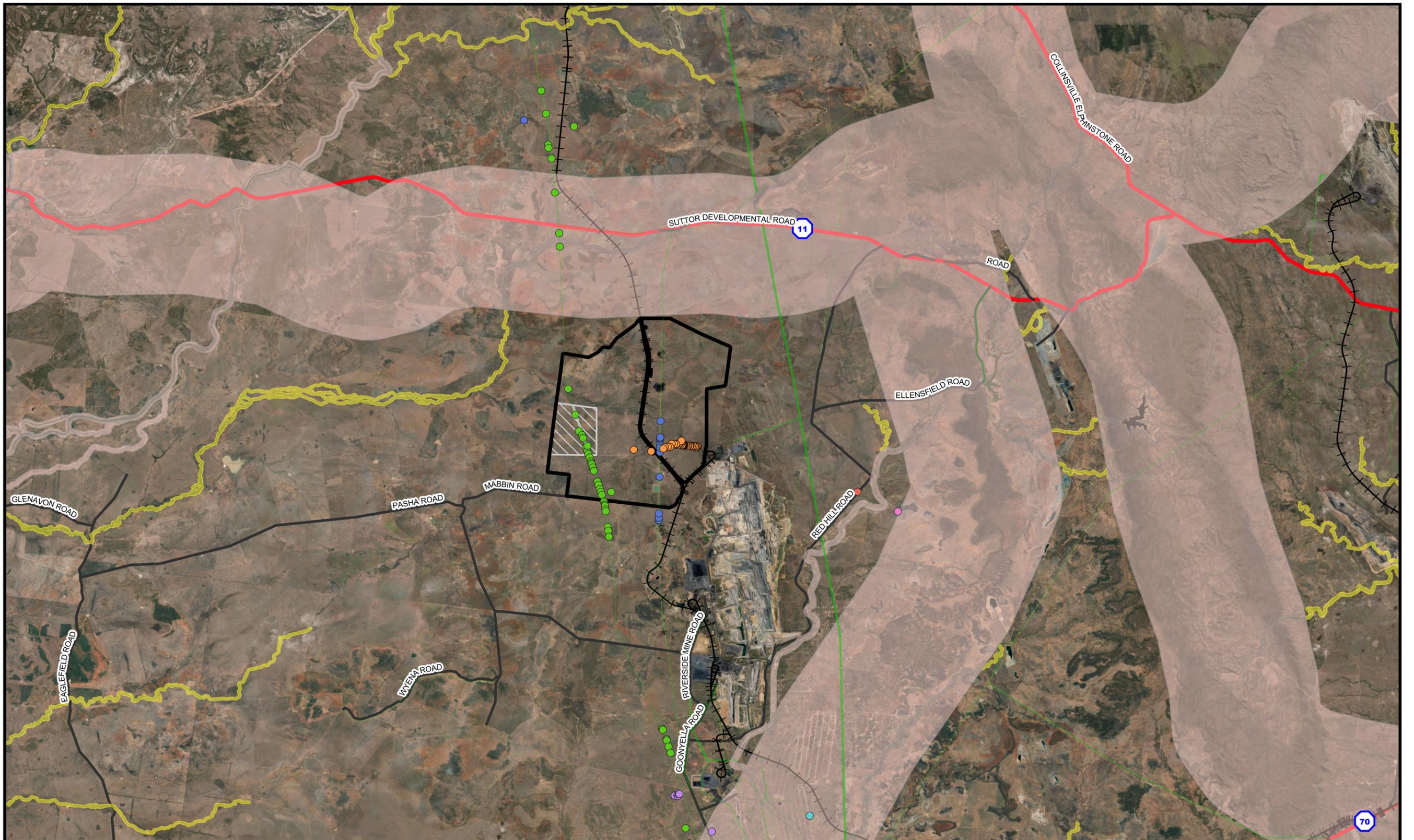
Habitat suitability models (HSM) for Matters of State Environmental Significance (MSES) species are available from DES and the Ornamental Snake is among the species which has a HSM. HSM's depict areas within the landscape that are important habitat areas for a species rather than just broad species distributions. To do this, habitat is classified into four habitat value categories: preferred habitat known (PHK); preferred habitat possible (PHP); general habitat known (GHK); or general habitat possible (GHP) (DES, 2020). As seen in Figure 7, the vast majority of the Proposed Offset Site including areas of RE 11.4.9 and RE 11.9.1, is classed as PHK, which is defined as “*known where the taxon is present (based on high accuracy records/expert advice) and there are indications of reproduction, or where a*

*significant number of individuals are present, or important resources (such as nest sites, roost caves, major food sources) are present, or where important movement corridors for breeding and/or non-breeding (including migratory) individuals have been identified” (DES, 2020).*

On-ground ecological assessments determined an abundance of suitable habitat for the Ornamental Snake including shelter habitat in the form of woody debris, leaf litter and cracking clay soils, and foraging habitat in the form of interconnected gilgais of varying size and structure. Furthermore, the vegetation communities on site are known to support the Ornamental Snake when the full spectrum of habitat requirements are considered. Further, these habitats are also known to support their prey species. A full account of on ground vegetation communities and habitat values is accessible in Table 10 of Appendix D.

#### **3.2.1.6 Key Threats**

The primary threats to the Ornamental Snake are historical broad-scale habitat clearing for grazing and habitat degradation by cattle, particularly around gilgai habitats (Cogger, 2000; TSSC, 2014; Cogger, et al., 1993) combined with ongoing habitat loss for agriculture and development (Cogger, et al., 1993). Feral Pigs are also of great concern, given their degradation of wet areas, competition for frog prey (TSSC, 2014) and potential predation on snakes they encounter. Additional threats include alteration of landscape hydrology and water quality in gilgai environments (which affect the primary prey species of the Ornamental Snake), invasive weeds, and predation by feral predators (Foxes and cats) (ELA, 2015).



**Figure 4: Historic Records and Biodiversity Corridors**

0 5 10 km

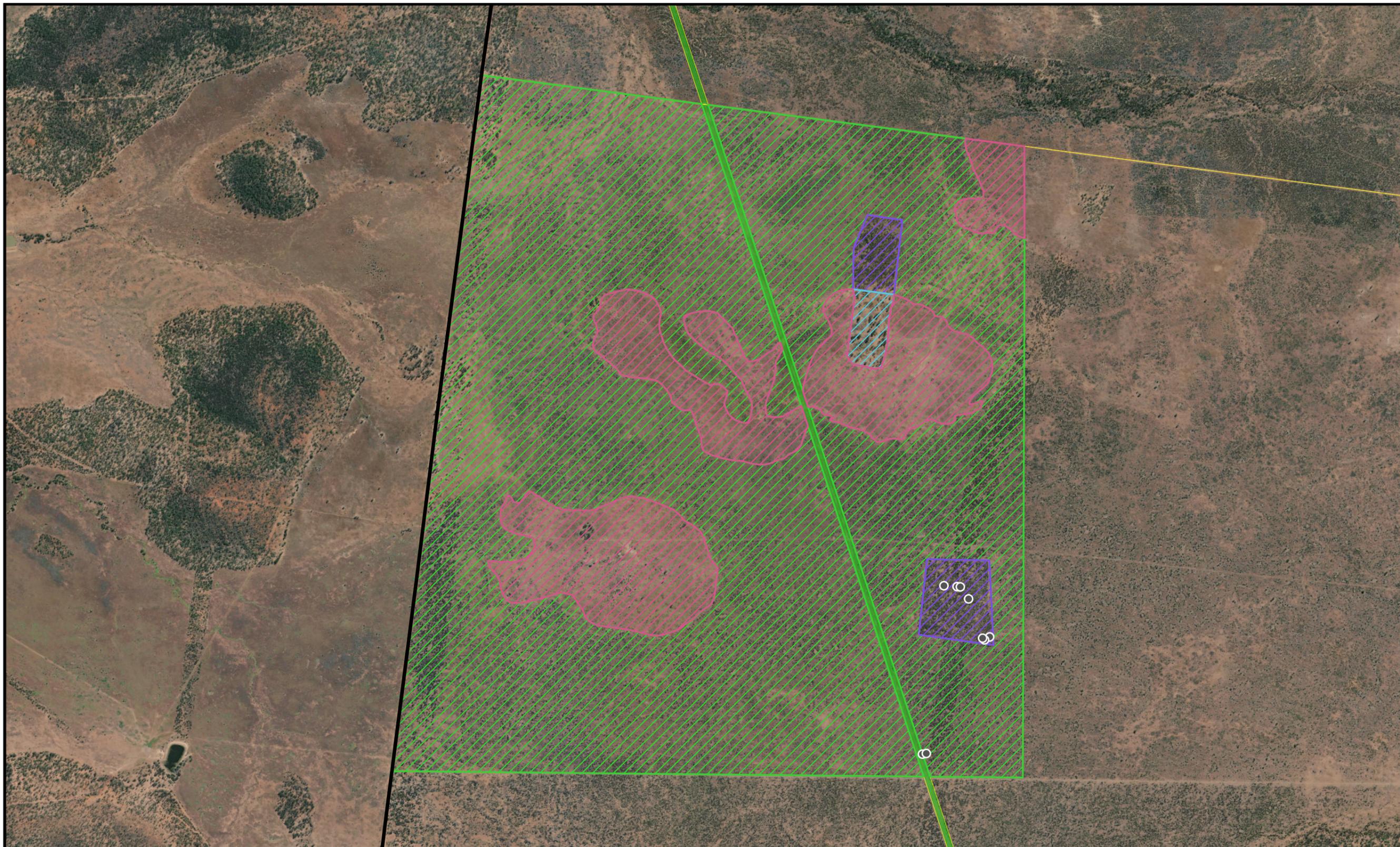
Scale @ A3: 1:200000  
 Date: 11/10/2022  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- |                       |                                 |                            |
|-----------------------|---------------------------------|----------------------------|
| Denham Park           | <b>Ornamental Snake Records</b> | Statewide corridor buffers |
| Proposed Offset Area  | 2003                            | State                      |
| Easement              | 2004                            | Regional                   |
| State Controlled Road | 2006                            |                            |
| Road                  | 2012                            |                            |
| Rail                  | 2014                            |                            |
|                       | 2015                            |                            |
|                       | Ornamental Snake (EMM) (2022)   |                            |





**Figure 5: Ornamental Snake Sightings**

0 350 700 m

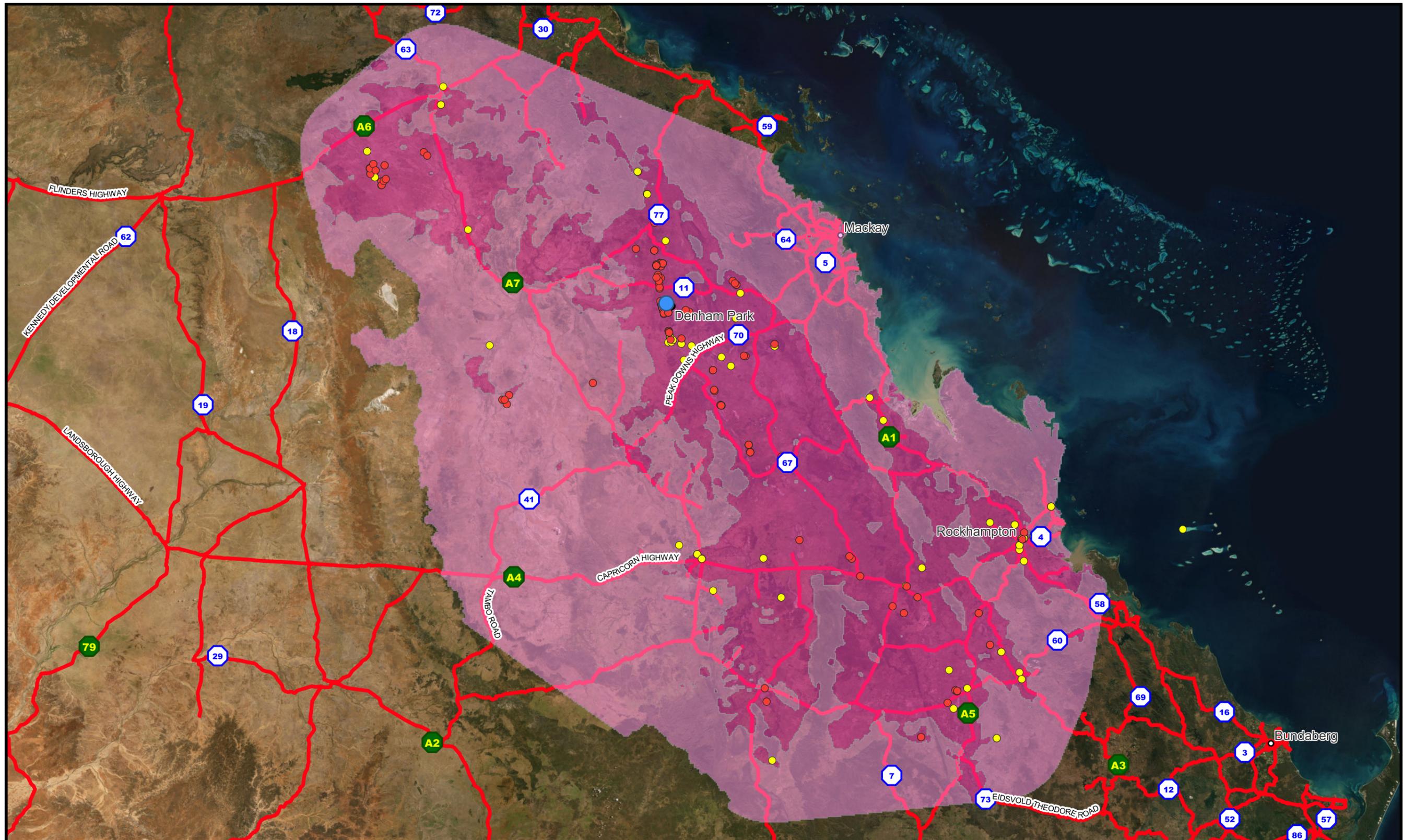
Scale @ A3: 1:15000  
 Date: 08/03/2023  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- |                            |   |
|----------------------------|---|
| Denham Park                | <b>Proposed Offset Area (AU)</b>                          |
| DCDB                       | Assessment Unit 1: (Grassland RE 11.9.1)                  |
| Easement                   | Assessment Unit 2: (Low Regrowth Brigalow RE 11.4.9)      |
| Road                       | Assessment Unit 3: (Regrowth Eucalypt Woodland RE 11.9.1) |
| Rail                       | Assessment Unit 4: (Regrowth Brigalow RE 11.4.9)          |
| Ornamental Snake Sightings |   |

**BASE/**



**Figure 6: Ornamental Snake Distribution (DCCEEW)**

0 50 100 km

Scale @ A3: 1:2250000  
 Date: 11/10/2022  
 Job: J0053.3  
 Drawn: Isaac Witten

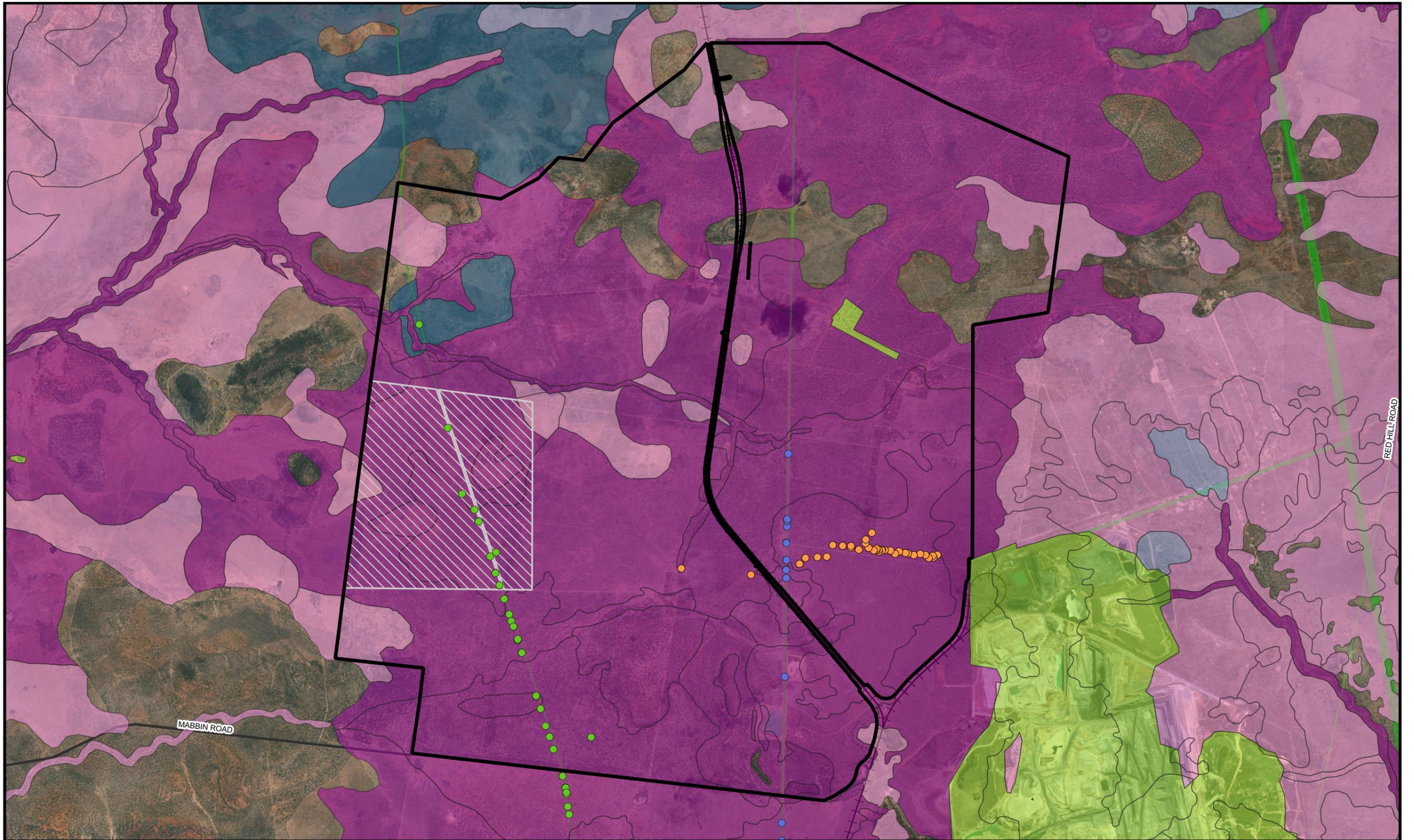


DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- Denham Park
- State Controlled Road
- Ornamental Snake (ALA)
- Ornamental Snake (WildNet)
- Ornamental Snake (EMM) (2022)

- DCCEEW Distribution**
- Species or species habitat likely to occur
  - Species or species habitat may occur





**Figure 7: Habitat Suitability Modelling (DES)**

0 1 2 km

Scale @ A3: 1:50000  
 Date: 08/03/2023  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- |                      |                            |                               |
|----------------------|----------------------------|-------------------------------|
| Denham Park          | Preferred Habitat Known    | Ornamental Snake Records      |
| Proposed Offset Area | Preferred Habitat Possible | 2006                          |
| Easement             | General Habitat Known      | Ornamental Snake (EMM) (2022) |
| Road                 | General Habitat Possible   |                               |
| Rail                 | No longer habitat          |                               |



## 4.0 Proposed Offset

### 4.1 Habitat Quality Methodology and Scoring

As part of the Project's approvals process, detailed ecological assessments were undertaken to determine the presence/absence of listed fauna species within the Project (Impact) area and to assess and determine the level of residual impacts for listed species that had the potential to require offsets (ECOSM, 2020a). As outlined in ECOSM, (2020a) and (2020b), assessments for the purposes of determining habitat quality were undertaken in accordance with version 1.2 and version 1.3 of the *Guide to Determining Terrestrial Habitat Quality* (DES, 2020; 2017) (the Guide).

Since the completion of the impact area ecological surveys, the Habitat Quality Guide has been updated and version 1.3 (DES, 2020) is currently in effect. Therefore, the habitat quality methodology is an adaption of the approach used to originally calculate habitat quality in impact site and habitat quality within the broader strategic offset area (BASE, 2021; ECOSM, 2020a) but incorporating the revised 'species attribute' calculations as per version 1.3 of the Habitat Quality Guide (refer to ECOSM, (2020a) for further information).

Habitat quality scoring for the impact and offset site was assessed using the Habitat Quality Guide which, being based on the Queensland BioCondition survey methodology, uses a range of habitat indicators to measure the ecological viability and habitat values of a site and its capacity to support fauna. The process used for assessing habitat quality is designed so that it is repeatable and relatively simple and uses a combination of field attributes associated with vegetative structure, GIS assessment of the site in reference to its location in the landscape and species-specific habitat requirements.

As stated in the Guide, the assessment must measure habitat quality at the impact site and the offset site in order to quantify and compare the scores. Each of the three indicators are scored then summed to derive a final score out of 10 (refer to the Habitat Quality Guide for calculation methodology). The key indicators for determining habitat quality of a land-based impact site or an offset site are:

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

Habitat quality of the impact and offset sites for the purposes of providing inputs into the EPBC offsets calculator were calculated following advice from the-then Department of Environment and Energy (DoEE) (now DCCEE) in 2018. To assess habitat quality, the majority of the attributes from the three indicators were used but partitioned differently with the majority of the species habitat index attributes being partitioned between site condition and site context as follows.

- **Site Condition (15 attributes):**
  - Recruitment of woody perennial species in Ecologically Dominant Layer (EDL)
  - Native plant species richness - trees
  - Native plant species richness - shrubs
  - Native plant species richness - grasses
  - Native plant species richness - forbs
  - Tree canopy height
  - Tree canopy cover
  - Shrub canopy cover
  - Native perennial grass cover
  - Organic litter

- Large trees
- Coarse woody debris
- Non-native plant cover
- Quality and availability of food and foraging habitat
- Quality and availability of shelter

The first 13 attributes listed above are generated from direct measurements taken in the field within a standardised habitat quality plot. While these attributes are not a direct or specific measurement of the habitat value for a certain species, they do provide an indication of the overall ecological condition of the community. Ecological condition requirements that are specific to a species are captured by the assessment of the quality and availability of food/foraging habitat and shelter attributes in line with the Habitat Quality Guide. EcoSM, (2020a), developed a scoring system for these attributes that is based on the SPRAT profile, published research and field-based knowledge of the target species. As habitat scoring between the impact site and offset need to be comparable, this scoring system was also used to assess habitat quality of the Proposed Offset Area. The methodology for scoring these attributes is provided in Appendix A.

- **Site Context (6 attributes):**

- Size of patch
- Connectedness
- Context
- Ecological Corridors
- Threat to Species
- Species mobility capacity

In line with the Habitat Quality Guide, the first four attributes above are calculated using Geographic Information System (GIS) spatial analysis. Site context requirements that are specific to a species are captured by the assessment of the threats to species and species mobility capacity attributes of the Habitat Quality Guide. The methodology for scoring these attributes is provided in Appendix A.

- **Species Stocking Rate:**

- Species stocking rate as outlined in the EPBC offsets calculator guide, replaces species habitat index as a measure of the presence of a species at the impact and offset site. In accordance with the requirements of DAWE, species stocking rate for this OAMP is assessed on a scale of 0 - 4 as categorised below:
  - 0: No evidence the species is present at the site
  - 1: Evidence of species presence at the site during surveys conducted for the purpose of the EPBC environmental assessment
  - 2: There is a statistically significant increase in species density relative to the species density determined for a score of 1 or species density is equal to or greater than the species density at a reference site (not required to be an important population)
  - 3: Equivalent to the species density at a reference site associated with an important population
  - 4: Equivalent to the maximum species density measured at a DAWE agreed number of reference sites associated with important populations.

To achieve an overall habitat quality score out of 10, site condition and site context are multiplied by a weighting factor out of 10 based on the level of importance attributed to site condition, site context and stocking rate for the MNES in question. The DAWE determined the weighting factors for these MNES will be 30% for site condition, 30% for site context and 40% for species stocking rate.

## 4.2 Impact Area Assessments

Habitat quality scores for the impact area were determined from survey sites within the field verified assessment units and in accordance with the methods outlined in EcoSM (2020a; 2020b). These surveys were undertaken specifically to determine habitat quality of the impact site for input into the EPBC Offsets Calculator to calculate offset areas for the Ornamental Snake for this OAMP. Scores were based on survey site data that corresponded to the species-specific habitats to be impacted as outlined in this OAMP.

Where multiple survey sites occurred within an assessment unit, the corresponding habitat quality score was derived from averaging site condition and site context from the survey sites. The average scores were then summed and divided by the corresponding maximum possible scores.

Site condition and site context were determined for each offset matter using data collected from only those habitats that were deemed as being suitable during the ecological assessments undertaken to support the approvals process. Stocking rate was determined based on the outcomes of the ecological surveys and the presence of MNES. The IDM impact site condition and site context scores that were used to derive the impact area habitat quality scores for the Ornamental Snake are outlined in Table 7.

**Table 7: Impact area habitat quality scores and habitat descriptions for the Ornamental Snake**

Offset attribute	Value	Description
Habitat Quality	3/10	<p><b>Site Condition = 1.1 (raw score = 3.5 multiplied by 30% weighting).</b></p> <p>A majority of Ornamental Snake habitat within the disturbance footprint (i.e. 170.9 ha or 99%) consists of well-developed gilgai in cleared grassland. A single Ornamental Snake was recorded within this habitat during the terrestrial ecology surveys and the vegetation present indicated that the gilgai have the potential to hold water and therefore prey species during periods of high rainfall (ECOSM, 2020b). However, these gilgai have become degraded as a result of cattle activity and Buffel grass infiltration.</p> <p>The project disturbance footprint also encompasses approximately 0.5 ha of remnant Brigalow vegetation (RE 11.4.9) with gilgai and a 2.1 ha palustrine wetland community (RE 11.5.3b), which are considered to provide higher quality habitat than gilgai in cleared (ECOSM, 2020b).</p> <p><b>Site Context = 0.7 (raw score = 2.3 multiplied by 30% weighting).</b></p> <p>The connectivity between gilgai habitat is important for the Ornamental Snake (DSEWPC, 2011b). A majority of habitat for this species within the project disturbance footprint consist of well-developed gilgai in cleared paddocks. While, these areas of habitat adjoin larger tracts of remnant vegetation, they are exposed and subject to cattle activity and infiltration by Buffel grass, both of which are recognised as threats to the Ornamental Snake.</p> <p>The remnant Brigalow vegetation (i.e. RE 11.4.9) and small palustrine community (i.e. RE 11.5.3b) within the project disturbance footprint of vegetation, do have some connectivity with other Brigalow and wetland communities, and larger tracts of remnant vegetation in the broader area (ECOSM, 2020b).</p>

Offset attribute	Value	Description
		<p><b>Species Stocking Rate = 1.</b></p> <p>A single individual Ornamental Snake was recorded within a cleared paddock supporting gilgai (i.e. non-remnant 11.4.9) encompassed by the project disturbance footprint during the terrestrial ecology surveys (ECOSM, 2020b). Another individual was recorded in Brigalow habitat supporting gilgai outside of the project disturbance footprint (i.e. on the southern side of the Isaac River). This demonstrates that the species is present and using habitats both within and adjacent to the project disturbance footprint.</p> <p>The majority (i.e. 170.9 ha or 99%) of Ornamental Snake habitat that will be impacted consists of cleared grassland with well-developed gilgais. However, the gilgai in these areas have become degraded as a result of cattle activity and Buffel grass infiltration. Hence, the cleared paddock with gilgai habitat is considered to be lower quality than remnant Brigalow and wetland communities within and adjacent to the project disturbance footprint (ECOSM, 2020b).</p>

### 4.3 Overview of the Property and Proposed Offset Area

Denham Park is owned by a Stanmore Resources subsidiary and leased as a cattle property and located in the Brigalow Belt bioregion and the Isaac Regional local government area. The property is located within an area that is classified as a fragmented landscape which reflects higher levels of historic disturbance and habitat fragmentation due to historic and ongoing agricultural production and mining. Cattle grazing has been undertaken on Denham Park for over 100 years and based on the first instance of published records, Ornamental Snakes have co-existed with cattle grazing for at least approximately 20 years within Denham Park and the Proposed Offset Area.

Denham Park encompasses approximately 11,800 ha of which approximately 2,460 ha is currently mapped as remnant vegetation with the remainder non-remnant vegetation. Ecological assessments undertaken to field verify the vegetation communities and extent of Ornamental Snake habitat indicated approximately 7100 ha of the Denham Park property is suitable habitat for the Ornamental Snake. The identified 1020 ha proposed Offset Area occurs within a larger Offset Investigation Area that covered approximately 1900 ha (refer to Figure 3) and is located within a single paddock referred to as Belah Paddock (refer to the Ecological Assessment report in Appendix D). The proposed Offset Area covers approximately 10% of the wider Denham Park property and is primarily located in the western section of the southern lot (Lot 23 SP262530) (Figure 3).

State based connectivity and corridor mapping are generally useful for determining the general ecological and biodiversity value of an area and surrounding environments. However, these areas are mapped using a range of broad scale ecological but are generalised across species and in some cases, are not species specific.

For less mobile fauna and/or ground dwelling fauna, a better indicator of habitat connectivity is the availability of microhabitat features that are known to support the species and where the species have been found. Large tracts of remnant Eucalypt woodlands generally support higher levels of biodiversity but can have limited value for species that either don't or periodically utilise those habitats, such as the Ornamental Snake. As shown on Figure 4, six of the >100 Ornamental Snake records (both historic and contemporary) were located within the biodiversity corridor. Further, significant portions of the DCCEEW habitat areas (Figure 6) and the DES preferred known habitat (Figure 7) occur outside the State-wide biodiversity corridors. As shown on Figure 8, approximately 50% of the proposed Offset Area is within

an area of Regional biodiversity significance with areas of State and Local biodiversity significance adjacent to the Proposed Offset Area to the west.

Hence, examining the known microhabitats of the Ornamental Snake and their prey, the DCCEEW and DES known and preferred habitat modelling, and the historic locations of the ornamental snakes are better indicators of connectivity relative to generalised and non-fauna specific biodiversity corridors.

The Proposed Offset Area is bisected by a gas easement that runs north-south and is approximately 30 m wide. The gas easement does not impede movement of Ornamental Snakes between the eastern and western sections of the Proposed Offset Area. The area of this easement has been excluded from the area calculations of the Proposed Offset Area.

The proposed 1020 ha offset area contains suitable habitat and environmental values to offset the required impacts to the Ornamental Snake and was chosen due to the breadth of lifecycle habitat values present and the extensive gilgai and wetland areas. Three field investigations were undertaken by suitably qualified ecologists (refer to Appendix B for CVs) in June and August of 2022 (refer to Appendix D for the ecological survey report) and in February 2023 (refer to the technical survey memo provided previously to DCCEEW and included in Appendix C). A high-level assessment was undertaken in June to assess the suitability of Denham Park to provide an offset for the Ornamental Snake. Following this high-level assessment, a more detailed assessment was undertaken in August to determine habitat quality of the proposed Offset Area. Following consultation with DCCEEW, the targeted survey to assess the presence of the Ornamental Snake was undertaken in February 2023.

The initial reconnaissance survey was undertaken between the 12<sup>th</sup> and 14<sup>th</sup> of June 2022. The objective of the initial survey was to determine the potential suitability of Denham Park to provide an offset for impacts to the Ornamental Snake and to assess the accuracy of current Department of Resources (DoR) mapping. The initial survey incorporated a high-level habitat and vegetation assessment of the entire Denham Park Property with the data used to determine the most suitable location to accommodate the required offsets.

Following the initial high-level survey of the entire property, an additional more detailed assessment was undertaken in August. The intent of this assessment was to field verify the on-ground vegetation communities, assess the extent of Ornamental Snake habitat and to undertake habitat quality assessments.

#### **4.3.1 Offset Area Habitat Availability and Quality**

Surveys confirmed the presence of suitable Ornamental Snake habitat within the broader Denham Park property. Denham Park and the Proposed Offset Area support a mix of vegetation communities comprising; cleared paddocks with sparse eucalypt paddock trees, low regrowth brigalow, eucalypt open forest, and high regrowth brigalow (Table 8). All of the vegetation communities provide habitat features that are suitable for Ornamental Snakes and their prey species.

Ornamental snakes, like all fauna species, require a range of habitat types and values for shelter, breeding, foraging and dispersal between core habitats. The Draft Referral Guidelines (DSEWPC, 2011b) states that Brigalow Belt reptiles, including Ornamental Snakes, occur in a wide variety of vegetation types with a variety of microhabitats. These vegetation types and microhabitats are included in the vegetation types within the offset area. The Proposed Offset Area includes RE 11.4.9 and this vegetation community is recognised as commonly associated with the presence of the species (DSEWPC, 2011b). The Proposed Offset Area also includes RE 11.9.1, which is a *Acacia/Eucalypt* woodland and Brigalow Ecological Community. As outlined in the Brigalow community SPRAT profile (DCCEEW, 2022), a range of fauna species are associated with these communities including the Ornamental Snake. RE 11.9.1 is a major contributor of woody debris due to the presence of Eucalypt along with Acacia species. Hence, including 11.9.1 in the offset area is likely to provide a greater density of woody debris within the ground layer compared to if it was excluded.

Ornamental Snakes can be found in a range of habitats that are likely used when they are moving between preferred habitats (DCCEEW, 2022). The Draft Referral Guidelines (DSEWPC, 2011b) states that habitat connectivity between gilgais and other suitable habitat is important for the species. Within the Proposed Offset Area, this would include the areas of RE 11.9.1 which are isolated patches within the larger expanse of 11.4.9. As the area of RE 11.9.1 is immediately adjacent to RE 11.4.9 these habitat patches are likely to provide shelter habitat for snakes moving (or dispersing) between areas of preferred habitat. Hence, when all habitat requirements for the species are considered and not just gilgai habitat of RE 11.4.9 in isolation, areas of RE 11.9.1 is likely to provide important habitat features for the ongoing presence of the species within the Proposed Offset Area. In addition, preferred habitat of the Ornamental Snake is habitat within, or close to habitat favoured by prey (frogs). Frog species were found in and around RE 11.9.1 habitat as well as within RE 11.4.9 as outlined in Appendix C. This likely explains the historic occurrences of the species in 11.9.1 in the vicinity of the offset site.

The August 2022 survey event determined the baseline habitat quality of the Proposed Offset Area in accordance with the Guide (DES, 2020). Species stocking rate (presence) of the Ornamental Snake was assessed during the field assessments in tandem with the desktop assessment of historical records, connectivity, and previous surveys (Appendix D). Habitat quality of the Proposed Offset Area was determined in accordance with the methods outline in section 4.1 and in the same manner as for the impact site as outlined by ECOSM (ECOSM, 2020b). The habitat quality data in addition to the microhabitat data and desktop assessment of historic record, habitat suitability modelling and distribution allowed robust assessment of the quality of habitat within the Proposed Offset Area and likely presence of the species Appendix D.

The Proposed Offset Area contains numerous previous occurrences of the Ornamental Snake (Figure 4). Although many of these records are from 2004 during construction of the gas pipeline through the area, targeted surveys undertaken in February 2023 by BASE confirmed the presence of the species with nine occurrences of the Ornamental Snake within the Proposed Offset Area (refer to Appendix C). In addition, surveys undertaken by EMM in March 2022 recorded the species within the Denham Park property (EMM, 2022) with 39 occurrences of the species over two nights (EMM, 2022).

Habitat quality within Denham Park was determined from 23 habitat quality assessment plots (HQAP) within four assessment units (AU) or vegetation communities that contain a variety of habitat types that are either preferred Ornamental Snake habitat or habitat that is likely to be important for all lifecycle stages of the species or their prey (refer to (DSEWPC, 2011b; DCCEEW, 2022)). The location of the 23 HQAP was determined prior to confirmation of the Proposed Offset Area and hence, confirmation of the offset boundary. The offset boundary presented in this OAMP was determined based on the outputs from the EPBC Offset Calculator (Offsets Assessment Guide) and in consultation with the land manager. Following refinement of the offset area boundary, 13 of the 23 HQAPs were located within the Proposed Offset Area with the remaining HQAP occurring near the Proposed Offset Area and in the same vegetation communities observed in the Proposed Offset Area. The calculation of the total area-weighted habitat quality score utilised the 13 HQAPs within the Proposed Offset Area (Figure 9).

Although the *Acacia/Eucalypt* woodland of RE 11.9.1 isn't explicitly outlined in the Draft Referral Guidelines for Brigalow Belt reptiles as 'common' suitable habitat (DSEWPC, 2011b), This vegetation community is a Brigalow Ecological Community that is associated with the presence of the Ornamental Snake. Therefore, areas of this vegetation community within the Proposed Offset Area are associated with wetland habitats and would likely provide suitable dispersal and shelter habitat for the species. Therefore, areas of RE 11.9.1 as shown on Figure 9 and outlined in Table 8, have been included within the proposed Offset Area.

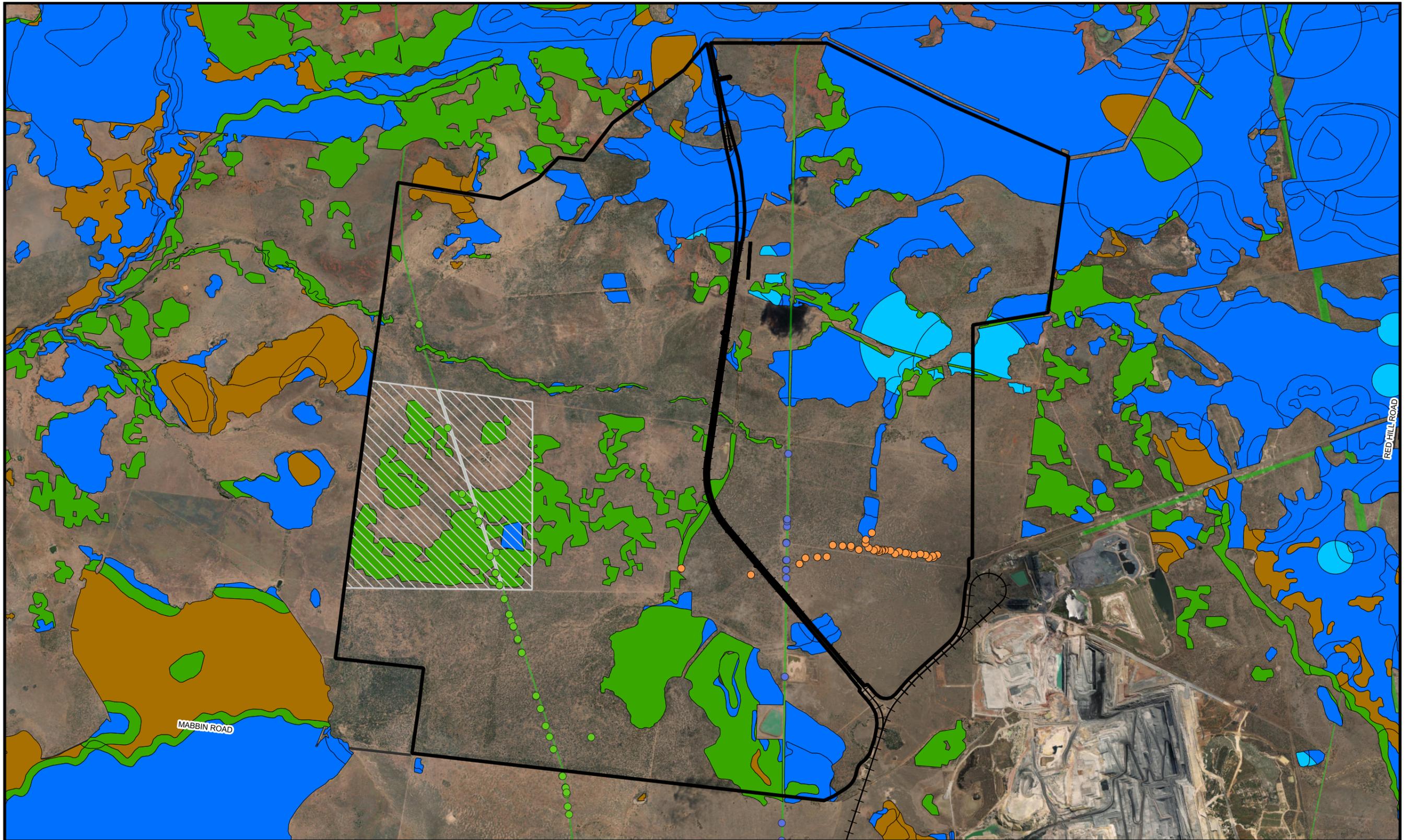
**Table 8: Assessment units and corresponding area within the investigated area and proposed offset area**

AU	AU definition	BioCondition Benchmark RE used	Total area (ha) within Investigation Area	Total area (ha) within Proposed Offset Area	Number of HQAPs in Denham Park	Number of HQAPs in Proposed Offset Area
1	Cleared paddock/regrowth	11.9.1	282	157.6	6	3
2	Low regrowth brigalow	11.4.9	1566.4	832.4	12	6
3	Eucalypt open forest	11.9.1	7.4	7.4	1	1
4	Regrowth brigalow	11.4.9	30.8	22.8	4	3
Total			1886 (ha)	1020 (ha)	23	13

Habitat quality score metrics and the area-weighted habitat quality score of the Proposed Offset Area for the Ornamental Snake are summarised in Table 9. Individual scores from each of the HQAPs are further outlined in Appendix E. The Proposed Offset Area habitat quality descriptions are provided in Table 11. For further information on the condition and habitat values of the vegetation communities and representative photo's of the Proposed Offset Area, refer to Appendix D.

**Table 9: Habitat quality within the Proposed Offset Area**

Final habitat quality score (weighted)	AU1	AU2	AU3	AU4	Average/Final
Site Condition	0.74	1.67	1.02	2.07	1.38
Site Context	0.53	1.02	0.67	1.11	0.83
Species Stocking Rate	1	1	1	1	1
Habitat Quality Score (unweighted)	2.3	3.7	2.7	4.2	3.21
AU Area (ha)	157.6	832.4	7.4	22.8	-
Total Proposed Offset Area (ha)	1020	1020	1020	1020	-
Size weighting	0.15	0.82	0.01	0.02	-
<b>Weighted Habitat Quality Score</b>	<b>0.35</b>	<b>3.02</b>	<b>0.02</b>	<b>0.09</b>	<b>3.47</b>



**Figure 8: Biodiversity Significance**

0 1 2 km

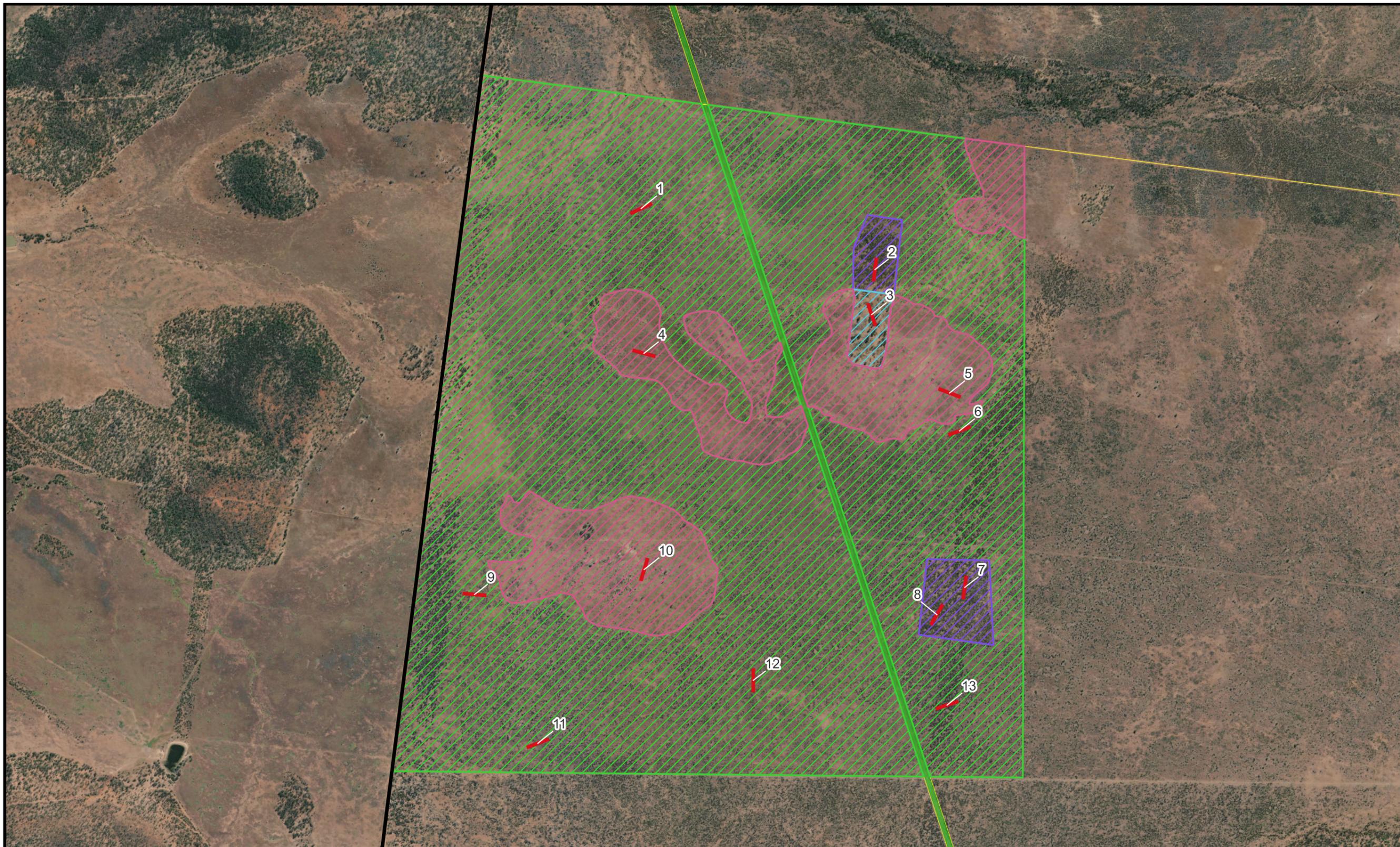
Scale @ A3: 1:50000  
 Date: 08/03/2023  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- |                      |                             |                               |
|----------------------|-----------------------------|-------------------------------|
| Denham Park          | State Habitat for EVNT taxa | 2004                          |
| Proposed Offset Area | State                       | 2006                          |
| Easement             | Regional                    | Ornamental Snake (EMM) (2022) |
| Road                 | Local or Other Values       |                               |
| Rail                 |                             |                               |





**Figure 9: Assessment Units and Habitat Quality Assessment Plots of the Proposed Offset Area**

0 300 600 m

Scale @ A3: 1:15000  
 Date: 08/03/2023  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- |             |  |
|-------------|--|
| Denham Park | <b>Proposed Offset Area (AU)</b>                     |
| DCDB        | Assessment Unit 1: (Grassland RE 11.9.1)             |
| Easement    | Assessment Unit 2: (Low Regrowth Brigalow RE 11.4.9) |
| Road        | Assessment Unit 3: (Eucalypt Woodland RE 11.9.1)     |
| Rail        | Assessment Unit 4: (Regrowth Brigalow RE 11.4.9)     |
|             | Habitat Quality Assessment Plots                     |

**BASE/**

#### 4.3.2 EPBC Offset Area Calculator Attributes

In accordance with the EPBC Act Environmental Offsets Policy, the results of field surveys and calculation of habitat quality as outlined in section 4.1, were used to provide inputs into the EPBC Offset Assessment Guide calculator to determine the offset area required and the percent of impact that could be offset within the Proposed Offset Area for the Ornamental Snake. Based on the results of these analyses, Table 10 outlines the impact area, the offset area required to be secured, the habitat quality score as calculated using the methods outlined in section 4.1 and the percent of the impact that is offset. The habitat quality scores are available in the IDM Biodiversity Offset Strategy (ECOSM, 2020a) for the impact site; and Appendix D of this document for the Proposed Offset Area.

The input values used for the calculation are provided below and reflect a realistic assessment of the area to provide offsets into the future as well as the likely future habitat quality in the absence of offsets. Importantly, the increase in habitat quality of only one unit is highly conservative given the starting habitat quality and the breadth of management actions as outlined in section 6.0 that will improve the current quality of the Proposed Offset Area. The increase in habitat quality is also highly conservative when considering the overall quality of the impact area, including the number of Ornamental Snakes identified, relative to the number of Ornamental Snakes identified within and surrounding the proposed Offset Area.

The EPBC Offset Assessment Guide calculator results indicate that the proposed 1020 ha offset area will fully meet offset requirements for the Ornamental Snake. Although the offsets area has vegetation and habitat suitable for the Ornamental Snake, the area also includes several threatening processes that would limit the habitat values of the area for the Ornamental Snake. The description of the input values for the Ornamental Snake and the output worksheets from the EPBC Offset Assessment Guide calculator are included in Appendix F.

**Table 10: Summary of the offset area to be secured on Denham Park**

MNES	Impact Area (ha)	Impact area habitat quality score	Proposed Offset Area (ha)	Baseline habitat quality score	Future habitat quality with management	Percent acquitted
Ornamental Snake	293.5	3/10	1020	3/10	4/10	100

**Table 11: Offset calculator metrics and habitat details**

Offset calculator input	Score	Comment
Quality of the impact area	3	<p>A single individual Ornamental Snake was recorded within a cleared paddock supporting gilgai. A second individual was recorded in Brigalow habitat supporting gilgai outside of the project disturbance footprint and on the southern side of the Isaac River.</p> <p>The majority of Ornamental Snake habitat that will be impacted consists of cleared grassland with well-developed gilgais. However, the gilgai in these areas have become degraded because of cattle activity and Buffel Grass infiltration. Hence, the cleared paddock with gilgai habitat is considered to be</p>

Offset calculator input	Score	Comment
		<p>lower quality than remnant Brigalow and wetland communities within and adjacent to the project disturbance footprint.</p> <p>The quality of the impact area was assessed in accordance with the Guide and the methods outlined in ECOSM, 2020b which identified a habitat quality score of 3/10.</p>
Starting quality of the Proposed Offset Area	3	<p>The Proposed Offset Area of 1020 ha is a mix of eucalypt open forest, cleared paddocks with sparse eucalypt regrowth, young regrowth brigalow and mature regrowth brigalow, all of which are known to support Ornamental Snakes. The <i>Acacia/Eucalypt</i> dominated open forest is analogous with RE 11.9.1, the cleared paddock supports regrowth species analogous with RE 11.9.1, and the young and mature regrowth brigalow exhibits flora species composition analogous with RE 11.4.9.</p> <p>These vegetation communities are considered suitable habitat for the Ornamental Snake as they support a range of habitat types that provide shelter (cracking clay soils, leaf litter, and fallen timber) and foraging habitat (gilgais) as well as habitat for their preferred prey species.</p> <p>Although evidence of recruitment of canopy trees was observed in the offset area, this did not equate to establishment of large canopy trees which showed low abundance relative to the impact area and benchmark sites of the associated REs. A low abundance of large trees has flow on effects for refuge habitat by providing less leaf litter and large woody debris for use as shelter habitat. Therefore, the offset site has a lower level of foraging and shelter habitat relative to the benchmark.</p> <p>The Proposed Offset Area is currently used for livestock grazing and has moderate levels of disturbance caused by Feral Pigs with indications of pig digs and ground compaction reducing shelter and foraging habitat quality.</p> <p>Past fire practices and incursion by pastural grasses and invasive weed species has resulted in a habitat that is moderately degraded with low species richness, throughout all vegetation strata. Areas subject to recently clearing events (AU1 and AU2), exhibited a very low diversity of tree species.</p> <p>The quality of the Ornamental Snake offset area was assessed in accordance with the Habitat Quality Guide and the methods outlined in section 4.1 which identified a habitat quality score of 3/10 and is similar to the quality of the impact site.</p>
Future quality of the offset area without offset management	3	<p>An assessment of the future likely habitat quality of the offset area was undertaken considering the current habitat quality as determined by and assessed in accordance with, the DES Guide, the threatening processes to the ornamental snake and</p>

Offset calculator input	Score	Comment
		<p>the effect these processes may have on the future habitat quality.</p> <p>In addition, Queensland's <i>Planning Act 2016</i> (PA Act) includes a range of exemptions for landholders to manage vegetation including establishing new infrastructure, fences, roads, tracks, fire management lines and firebreaks. Approval to thin vegetation can also be sought. The implementation of these actions will not result in the entire removal of vegetation; however, coupled with cattle stocking rates has the potential to degrade woodland habitats, such as a further reduction in habitat quality associated with the ground and mid-canopy layers.</p> <p>As shown in the Ecological Assessment Report in Appendix D, historical aerial imagery indicates the current land management practices in terms of vegetation management within the Proposed Offset Area are similar with no discernible difference over the last approximately 30 years. In particular, minimal changes in vegetative cover, vegetation management and land management have occurred between the time of historical Ornamental Snake records in 2004, and the present. As such, the probability of the Ornamental Snake occurring within the Proposed Offset Area remains unchanged from the early 2000s (refer to Appendix D).</p> <p>The current land management practices and the presence of listed weed species including, <i>Parthenium hysterophorus</i>, <i>Harrisia martinii</i>, <i>Opuntia tomentosa</i> and <i>Senecio madagascariensis</i> observed during field surveys could continue to have a detrimental impact on tree species recruitment (and establishment), and native species richness for grasses, shrubs, and forbs, and a decrease in native grass cover and an increase in non-native plant cover.</p> <p>Habitat degradation by feral animals including Feral Pigs and European Hare/Rabbits is likely to include increased erosion and compaction of soils which can lead to a reduction of shelter habitat for the Ornamental Snake. This increases vulnerability to predation by other feral animals known to occur within the offset area, including Feral Cats, Feral Pigs and Wild Dogs.</p> <p>Taking into consideration the above threatening processes, the predicted effects of these processes, current management practices and obligations on all landowners under Queensland biosecurity legislation to appropriately control invasive weeds and pest animals, no decrease in habitat quality is anticipated for the offset site without the offset being in place.</p>
Future quality of the offset area with offset management	4	The quality of Ornamental Snake habitat will improve through the establishment of the Proposed Offset Area. Future habitat quality of the offset area represents the ecological gain that

Offset calculator input	Score	Comment
		<p>can be achieved over 20 years of active land management aimed at improving the ecological condition of habitat specifically for the Ornamental Snake.</p> <p>Detailed management actions are outlined in section 6.0 and are specifically targeted towards providing enhanced habitat values for the Ornamental Snake. The management actions will reduce pest animal abundance, enhance recruitment of large canopy trees in wooded areas, in doing so will increase the quality of foraging and shelter habitat encouraging the Ornamental Snake to inhabit the area. Management actions include:</p> <p>Large woody debris, which provides shelter habitat for the Ornamental Snake, will also be added to the 11.9.1 vegetation communities in Proposed Offset Area to supplement woody debris from the establishment of larger canopy trees.</p> <p>A pest management control program to reduce the number of pest animals, including Feral Pigs and the European Hare/Rabbits which may degrade the area, particularly wetland areas crucial for foraging habitat of the ornamental snake. The pest control program will also focus on predator species including Wild Dogs, Foxes, and Feral Cats which can prey on Ornamental Snakes.</p> <p>Cattle grazing will be excluded during the wet season and following heavy rainfall events (refer to section 6.4) to avoid disturbance to wetland and gilgai habitats but permitted during the dry season as a tool to manage weed groundcover abundance and to promote improved tree and shrub recruitment.</p> <p>Weed management to reduce the infestation of weeds that currently out-compete native flora species.</p> <p>Strategic fire management to maximise recruitment and establishment of large canopy trees and increase canopy cover. Maximising the establishment of canopy trees will increase shelter habitat through an increase in leaf litter and large woody debris.</p> <p>Properly managed fire regimes will promote cooler fires and avoid hot and intense fires which are known to destroy fauna habitat, including shelter and food resources.</p>
Confidence in the offset achieving the predicted quality score	90%	<p>Implementing the actions outlined in this OAMP provides a high degree of confidence that the highly conservative increase in future habitat quality of one (1) unit from the current condition can be achieved.</p> <p>Biodiversity monitoring will also be conducted as part of the OAMP (refer to section 7.2) to measure the progress of the offset area and ensure the offset area achieves its required</p>

Offset calculator input	Score	Comment
		<p>habitat quality. Annual reporting will be undertaken for compliance with the management action outlined in the OAMP. This will allow for timely identification of any corrective actions required.</p> <p>An increase in future habitat quality of one (1) is highly conservative and is based on assessing the current habitat quality scores and those scores that could realistically be achieved through implementation of the management actions. An assessment has been undertaken and considered the current habitat score, the proposed management actions, and the resulting changes to the habitat quality scoring. The proposed management actions are predicted to increase the abundance of large trees in wooded areas, decrease non-native plant cover, increase, species richness, increase abundance of large woody debris, increase quality and availability of food and foraging habitat, increase the quality and availability of shelter, and decrease threats to the species.</p>
Risk of loss without the offset	0%	<p>Without the offset there is a zero (0) % risk that the vegetation communities will be lost and/or altered considering historical land management practices and due restrictions implemented by the Queensland Government on vegetation clearing for agricultural purposes. Although there are several threatening processes occurring within the offset area, these processes are likely to result in a loss of habitat quality rather than a loss of habitat per se.</p> <p>Based on these factors, zero (0) % is considered a reasonable estimate of the risk of loss without the offset</p>
Risk of loss with the offset	0%	<p>Risk of loss with offset is estimated to be zero (0) %. The offset area is proposed to be protected (legal security mechanism) through a Voluntary Declaration which will prevent clearing. By definition, the risk of loss under a protection mechanism must be less than or equal to the risk of loss in the absence of such a mechanism. Therefore, a risk of loss with protection is also zero (0) %.</p> <p>The offset area will be declared as an area of high nature conservation value under section 19F of the <i>Vegetation Management Act 1999</i> (VM Act).</p>
Confidence in the risk of loss predictions	90%	<p>The legally binding Voluntary Declaration will be registered on the land title and will be binding on all current and future landowners to ensure that the habitat is protected in perpetuity.</p> <p>The legally binding mechanism precludes development unless the Queensland Government authorises an activity. However, for the activity to be authorised, offsets must be provided for the original offset obligation as well as any additional offsets that are required by the new activity. This process is very</p>

Offset calculator input	Score	Comment
		costly both economically and in time and provides a strong deterrent for development within a protected offset area.
Time over which the risk of loss is averted	20 years	The offset area will be protected by a legally binding mechanism which will remain in effect in perpetuity as required by the applicable State and Commonwealth legislative requirements. Therefore, the time over which loss is averted is the maximum allowable time of 20 years as per the EPBC Offset Assessment Guide calculator.
Time until ecological benefit	20 years	<p>It is estimated that to achieve an improved habitat quality score of one (1) unit could take up to 20 years but improvements could occur in as little as 10 years. The improvement of habitat quality will be achieved by implementing a range of management actions (refer to section 6.0) aimed at managing the current threatening processes that are constraining habitat improvement. Such actions will involve managing fire, grazing, weed and pest management and are aimed at increasing recruitment and establishment of large canopy trees which will increase foraging and shelter habitat as well as decreasing potential threats from feral animals and weeds.</p> <p>These management actions will result in an improvement in the habitat quality score within the 20-year timeframe.</p>

#### 4.4 Property Details

Stanmore SMC Pty Ltd (SMC), a subsidiary of Stanmore Resources, is the landowner for the Denham Park properties.

#### 4.5 Registered Interests

A number of easements traverse Lot 23 SP262530, one of which is a gas pipeline that runs through the Proposed Offset Area in a north-south direction. This area of this gas pipeline easement has been excluded from the 1020 ha offset area. No mining interests (exploration or production) and no petroleum interests (exploration or production) occur over the Proposed Offset Area.

#### 4.6 Offset Area Protection Mechanism

The offset will be secured by a Voluntary Declaration under section 19E and 19F of the VM Act as an area of high nature conservation value. It is Stanmore's intention that the Voluntary Declaration will be declared over the proposed 1020 ha offset area for Ornamental Snake in accordance with the approval conditions (i.e. within 12 months of approval of this OAMP). The Voluntary Declaration will be registered on the property's title and will be binding on current and future landholders. Once the declaration has been registered on the property title, the offset area will be mapped as a Category A area on the Property Map of Assessable Vegetation (PMAV) which is shown as red and described as an "Area subject to compliance notices, offsets and voluntary declarations".

A Voluntary Declaration under the VM Act is an authorised legally binding mechanism and is considered an appropriate mechanism to legally secure MNES values and protect the area from vegetation clearing.

The Voluntary Declaration will remain in place in perpetuity and may only be removed if the chief executive of the Queensland Department of Natural Resources considers it is necessary.

However, Queensland’s Guide to Voluntary Declarations under the VM Act states that under section 19L of the VM Act, a declaration cannot end (i.e. be removed from the property title) until the management outcomes of the management plan have been achieved (the OAMP will be attached to the Voluntary Declaration). Hence, the legally binding mechanism, and by extension implementation of this OAMP, will remain in effect for the period of the EPBC Act approval. The EPBC Act Environmental Offset Policy states the offset must be provided for duration of the impact.

As per condition 11 of the EPBC approval, Stanmore will notify the DCCEEW within five (5) business days of the legal mechanism being executed.

#### 4.7 Environmental Offsets Framework

An overview of how the proposed offset area outlined in section 4.3 meets the requirements of the EPBC Act Environmental Offsets Policy is outlined in Table 12.

The offset area meets the requirements of the Environmental Offsets Policy (EOP). Consideration was also given to property plans and any potential conflicting future use of the property to minimise the potential for conflicting land use pressures within and around the Proposed Offset Area.

**Table 12: EPBC Act environmental offsets policy requirements**

Policy requirements	Project offsets
<p>Deliver an overall conservation outcome that improves or maintains the viability of the MNES in question</p>	<p>The proposed offset area within Denham Park fully acquits the offset requirements for the approved impacts to the Ornamental Snake.</p> <p>The proposed offset area currently poses a number of threatening processes that limit the habitat value of the area as outlined in Table 11. The proposed offset area will be managed to improve habitat condition and the viability of the Ornamental Snake in accordance with EPBC Act offset obligations and the management action outlined in this OAMP. The offset area will be managed and monitored for the duration of the approval and to ensure it meets the completion criteria i.e. the future habitat condition improves to the predicted future habitat quality scores outlined in Table 10.</p> <p>The impact area identified only two Ornamental Snakes in marginal habitat and historical records within and surrounding the impact area are considerably lower than at Denham Park. Within the Proposed Offset Area, nine occurrences of the Ornamental Snake were recorded as outlined in Appendix C and (BASE, 2023), and over 30 occurrences within several kilometres of the offset area (EMM, 2022). Given the high numbers of Ornamental Snake records within the Proposed Offset Area and the wider Denham Park, the expanse of suitable habitat within and surrounding Denham Park and the proposed management actions to improve habitat quality, it is questionable whether a more suitable offset site could be located and secured.</p>
<p>Be primarily built around direct offsets but may also</p>	<p>Denham Park is able to fully acquit the offset requirements for Ornamental Snake through direct offsets and legally securing</p>

Policy requirements	Project offsets
include other compensatory measures	suitable habitat for the species and its preferred prey. Therefore, no other compensatory requirements are necessary at this stage.
Be in proportion to the level of statutory protection that applies to the MNES	The threat status of the Ornamental Snake is taken into account by the EPBC Offset Assessment Guide calculator in determining the area of the offset to be provided and was taken into account during the approval of the Project's impact.
Be of a size and scale proportionate to the residual impacts on the protected matter	<p>The size of the proposed offset area has been calculated in accordance with the EPBC Act Environmental Offsets Policy and the EPBC Offset Assessment Guide calculator. Inputs and justifications are based on the results of the detailed field assessments that were undertaken within the impact and offset areas with the corresponding habitat quality calculated in accordance with the Habitat Quality Guide and the methods outlined in section 4.1 and in ECOSM, (2020a). Note, this includes the additional impact area mentioned in condition 6 of 120 ha.</p> <p>Further, the Proposed Offset Area includes a range of habitat values that are known to support the full lifecycle of the species as outlined in section 4.3.1.</p>
Account for and manage the risks of the offset not succeeding	The suitability of the offset area has been calculated in accordance with EPBC Act Environmental Offsets Policy and the EPBC Offset Assessment Guide calculator which takes into consideration a number of metrics including confidence in the offset succeeding. The inputs and justifications are shown in Table 11. Risks associated with the offset have been assessed (refer to section 9.0) and appropriate mitigation and management measures are provided in section 6.0
Be additional to what is already required	The proposed IDM offset area is zoned rural under the <i>Isaac Regional Planning Scheme 2021</i> and is located within the Isaac Regional Local Government Area. These areas have been historically used for cattle grazing with improvements including sheds, accommodation, water storages, fencing and dirt roads. The land manager is currently obliged to appropriately manage pest animals and invasive weed species to protect environmental values (amongst other values) under state government general biosecurity obligations. However, the proposed pest animal and weed management activities, decreased grazing periods and fire management are additional to those required under the <i>Biosecurity Act 2014</i> (Qld). See section 6.0 for further detail.
Be efficient, effective, timely, transparent, scientifically robust and reasonable	The Proposed Offset Area has been identified and its suitability assessed using standard practices approved by both Commonwealth and State Governments and were undertaken by suitably qualified ecologists using an evidence-based and scientifically robust approach. Stanmore commits to legally securing the offset area within 12 months, as outlined in the EPBC approval conditions. This OAMP outlines a transparent and scientifically robust ongoing monitoring program (refer to section 7.0) that can be readily audited

Policy requirements	Project offsets
	to assess its effectiveness of assessing the success of the offset area in achieving the required offset obligations. Further, this OAMP supports an efficient, effective, timely, transparent, scientifically robust and reasonable approach to providing offsets.
Have transparent governance arrangements including management actions, monitoring and auditing	This OAMP outlines a clear governance framework and delivery pathway to legally secure the offset area and a transparent and scientifically robust monitoring and reporting program. The OAMP also provides an auditing framework that allows for continual improvement to ensure the offset area achieves the required offset obligations.

#### 4.8 Additional Management and Protection

Establishing the Proposed Offset Area would add additional protection for biodiversity values from clearing and provide additional biosecurity management. The majority of the Proposed Offset Area is mapped as non-remnant and can be legally removed or altered under Queensland’s VM Act. Securing an offset over this area will add additional protections to the land that are currently not afforded under Queensland legislation. The remnant vegetation is still subject to limited clearing for essential management as well as removal/thinning of undergrowth vegetation and removal of fallen woody debris. Further, the VM Act does not require landholders to maintain the existing condition of regulated vegetation or fauna habitat areas. Establishing the offset would therefore provide additional protection and management for both remnant and the non-remnant vegetation.

Queensland’s *Biosecurity Act 2014* imposes a ‘general biosecurity obligation’ on all people to manage biosecurity risks that are under their control and that they know about or could reasonably be expected to know about. In general terms, this means that for livestock owners, the owners are expected to stay informed about pests and diseases that could affect or be carried by the animals, as well as weeds and pest animals that could be present on their property. Landowners are also expected to manage them appropriately. For landowners, there is an expectation that they will stay informed about the weeds and pest animals (such as Wild Dogs, Feral Pigs, etc.) that could be on their property. There is also an expectation that appropriate management will be undertaken.

The obligations outlined in this OAMP are additional to these general *Biosecurity Act 2014* obligations. For example, ongoing feral animal control will be undertaken to minimise the numbers of all feral animals with the end goal being eradication, where possible. This is above and beyond the requirements of the *Biosecurity Act 2014* as is the reduction of weed species to less than 10% weed cover within the Proposed Offset Area over the life of the OAMP.

## 5.0 Management Objectives

The environmental outcomes sought by this OAMP are to improve the condition and ecological values of the vegetation communities for the Ornamental Snake within the Proposed Offset Area. The environmental outcomes will be realised by achieving the completion criteria defined in Table 14.

Implementation of this OAMP will also effectively manage risks to the Ornamental Snake and implement adaptive management actions to continually refine, revise and update the management actions as additional data on the success of the offset area is collected.

As outlined in Table 15 the specific management objectives of this OAMP area:

- Strategically graze cattle to reduce and manage understorey fuel loads and native and non-native flora densities.
- Improve overall habitat quality within the Proposed Offset Area including the supplementation of woody debris.
- Reduce the risk of unplanned fire causing adverse impacts on the Ornamental Snake through strategic fire management.
- Minimise habitat degradation caused by Feral Pigs (*Sus scrofa*) and rabbits (*Oryctolagus cuniculus*) to reduce impacts on habitat variables for MNES including, tree species recruitment, understorey vegetation composition, and overall health of foraging habitat (gilgais).
- Restrict unauthorised access to prevent alternative land-use.
- Control invasive weed species to reduce impacts on the Ornamental Snake from over dominance of non-native floristic abundance in the understorey.
- Minimise predation risk to the Ornamental Snake by Feral Cats (*Felis catus*), Wild Dogs (*Canis domesticus*) and Feral Pigs (*Vulpes vulpes*).

These management objectives and the corresponding management actions outlined in section 6.0 and Table 15 are specific to the 1020 ha Proposed Offset Area and based on the MNES requiring offsetting, with consideration of identified threats and recovery actions specific to the Ornamental Snake as outlined in the Commonwealth listing and conservation advice, recovery plans and other relevant documents (Table 13).

**Table 13: Relevant conservation advice, recovery plans and threat abatement plans**

MNES	Relevant conservation advice and plans	Main threats and recommended actions	Measures proposed in this OAMP
Ornamental Snake	Approved Conservation Advice for <i>Denisonia maculata</i> (Ornamental Snake) (TSSC, 2014)	Habitat clearing.  Habitat degradation including wetland and frog habitat, primarily from Feral Pigs but also cattle during the wet season.  Poisoning from ingestion of Cane Toad.	Ensure continued presence of Ornamental Snake and avoid loss of habitat.  Increase habitat quality and vegetation structure including the addition of wood debris.  Prevent habitat degradation and decline in habitat values within the Proposed Offset Area.

MNES	Relevant conservation advice and plans	Main threats and recommended actions	Measures proposed in this OAMP
			<p>Reduce habitat degradation and potential predation on the Ornamental Snake by pest animals.</p> <p>Minimise habitat alteration or degradation from changes to water quality and hydraulic activity.</p> <p>Removal of Cane Toads and Cane Toad eggs.</p>

## 5.1 Completion Criteria and Interim Performance Targets

The EPBC Act EOP states that an offset area must deliver an overall conservation outcome that improves or maintains the viability of the MNES as if the action had not occurred. In accordance with the EOP the final habitat quality score (offset completion criteria) at the offset site must be equal to or greater than the habitat quality score of the impact area.

Completion criteria and interim performance targets associated with habitat for the Ornamental Snake is summarised in Table 14 and have been developed as a measure to assess and ensure that the final habitat quality scores as outlined for the offset matters in section 4.3.2, are achieved. Interim performance targets are also included in Table 14. The intent of these targets is to assess, revise and if required, amend the OAMP to allow the completion criteria to be achieved within the proposed 20-year time frame. The interim performance targets will help to assist the management and improvement of the offset area, enabling evaluation of the effectiveness of progress towards completion criteria.

The completion criteria and corresponding increase in habitat quality scores will be reached by the implementation of the management actions outlined in Table 15 and ongoing monitoring of the effectiveness of those actions section 7.0. Annual reports will provide transparency regarding the implementation of the management measures and where relevant, identify any non-compliance with the OAMP and *force majeure* events that impact the offset area. Failing to meet the interim performance targets will prompt adaptive management and the land manager will apply various corrective actions Table 15 to ensure the completion criteria will be met. The need for additional mitigation measures will be addressed during the annual compliance reporting of the OAMP.

The intent of the interim performance targets is to assess, revise and if required, amend the OAMP such that the completion criteria can be attained within the proposed 20-year time frame. Corrective actions that must be undertaken if interim performance targets are not met are outlined in Table 15. Once attained, the completion criteria will be maintained for at least the duration of the approval.

**Table 14: Completion criteria and interim performance targets**

Assessment Unit and percentage of Offset Area	Starting Habitat Quality Score	Interim Performance Targets			Final Habitat Quality – Completion Criteria
		Year 5	Year 10	Year 20	
AU1 – Cleared paddock (15%)	2.3	2.5	2.7	2.9	2.9
AU2 – Young regrowth Brigalow (82%)	3.7	3.9	4.1	4.3	4.3
AU3 – Eucalypt open forest (1%)	2.7	2.9	3.1	3.3	3.3
AU4 – Mature regrowth Brigalow (2%)	4.2	4.4	4.6	4.8	4.8
<b>Total Offset Area Habitat Quality Score (Area-Weighted)</b>	<b>3.5 (rounded to 3)</b>	<b>3.8 (rounded to 4)</b>	<b>4.0 (rounded to 4)</b>	<b>4.2</b>	<b>4.2</b>

The completion criteria and final habitat scores for the Ornamental Snake, will be calculated using the scoring method described in section 4.1. The specific attributes of site condition, site context and species stocking rate that are expected to change over the life of the approval and lead to the final habitat score/competition criteria may change from those outlined below. However, the calculation method will remain unchanged and the final habitat quality/completion criteria scores remain as outlined in Table 14.

It is anticipated that the management measures described in 6.0 will result in habitat quality improvements as follows:

- Increasing the species richness of native trees (AU1, AU2 and AU3), grasses (AU1 and AU3), and forbs (AU1 and AU3).
- Increasing canopy height and cover (AU1, AU2 and AU4).
- Increasing native shrub cover (AU1 and AU3).
- Organic litter and coarse woody debris is expected to increase with the growth of above ground biomass or tree species over time and the application of an appropriate fire regime. In addition, woody debris will be added to the Proposed Offset Area and will come from other locations within Denham Park following natural tree falls.
- The number of large trees is expected to increase through natural growth of canopy and subcanopy trees by excluding clearing in areas of non-remnant and remnant vegetation and implementing controlled burns.
- Increasing large trees and controlling the potential for hot fires, coarse woody debris is expected to increase.
- Non-native flora cover is expected to be reduced within the first 5 years by mechanical removal, spraying and an appropriate fire regime. The control of non-native species will be applied throughout the life (20 years) of the offset to maintain a weed cover at <10%, this will be maintained for the duration of the approval of this OAMP.

- Reduction of pest species that are associated with the degradation of Ornamental Snake habitat, particularly foraging habitat (gilgais).
- Reduction of threats to the Ornamental Snake via a pest control program focusing on predator species.

Overall, the increase in habitat quality scores will increase the quality of Ornamental Snake habitat by improving habitat quality of the each of the Assessment Units through encouraging tree growth, decreasing weed cover, increasing shelter and foraging habitat and minimising threats to the Ornamental Snake. Further, coarse woody debris will be added to the 11.9.1 vegetation communities within the Proposed Offset Area in areas determined by suitably qualified experts such that the woody debris at year 5 is at least 75% of benchmark levels, at year 10 is at least 100% and remains equal to or greater than, benchmark levels through to year 20.

## 6.0 Management Actions

This OAMP is based on the principles of adaptive management, and management objectives and actions that have been developed based on field surveys. The ongoing suitability of the management actions will be informed by the results of the monitoring activities outlined in section 7.0. This OAMP will be adapted and updated annually, if required as determined by any corrective actions as outlined in Table 15.

This section of the OAMP outlines the management actions that will be implemented within the offset area to abate the identified threats to the Ornamental Snake and to protect and enhance the habitat values of the offset area. The management actions focus on the key threatening processes for the species as outlined in section 6.0 and described in the DCCEE SPRAT species profiles and relevant EPBC Act statutory documents for the species. Additional threats that are known to degrade habitat have also been taken into consideration.

Detailed management actions for the Proposed Offset Area are outlined in Table 15 and should be read in conjunction with section 6.1 to section 6.7. These sections provide the detail on how the management actions will be implemented. The majority of the ongoing and routine management actions are expected to be undertaken by the land manager (e.g. grazing management, fire management, feral animal, addition of woody debris and weed management) under agreement with Stanmore Resources (note that Stanmore SMC Pty Ltd, as landholder, may lease Denham Park to a land manager or manage the land itself).

Ongoing ecological monitoring will be undertaken by suitably qualified ecologists also under agreement with Stanmore Resources as outlined in section 7.0 and Table 16. Should the results of ongoing monitoring identify that the relevant management action(s) have been unsuccessful, corrective action(s) will be undertaken and the management actions reviewed and updated accordingly as shown in Table 15.

**Table 15: Management actions, triggers for further action and corrective actions**

Habitat management objective	Management and mitigation measures	Trigger for further actions	Monitoring	Corrective actions
<p>Avoid habitat or vegetation loss through unplanned land clearing.</p>	<ul style="list-style-type: none"> <li>No unapproved and/or intentional clearing of vegetation within the offset area for the duration of the approval, except for clearing that is required for fencing, access, firebreaks or public safety.</li> <li>Signs and fences will be erected within three months of the offset being legally secured. They will be erected at all entrances and potential access points to the site identifying the area as an environmental offset and stating that access to the site is forbidden.</li> <li>Fences will be maintained to prevent unauthorised access, to minimise incursions by feral herbivores and to control stock presence.</li> <li>Ecological thinning is not recommended. It may be carried out, but only in accordance with the advice of a suitably qualified expert and only as approved by DCCEEW.</li> </ul>	<ul style="list-style-type: none"> <li>Any activities that are in contravention of the Voluntary Declaration and this OAMP.</li> <li>Detection of damaged fences associated with vehicle access roads/tracks.</li> <li>Detection of prohibited forestry operations, native timber harvesting or clearing outside of established access tracks, fire control lines and fence lines (existing infrastructure).</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring and inspections (section 7.0 and Table 16) will document if there is evidence of recent forestry or timber harvesting activities or illegal clearing.</li> <li>Monitoring will also document vegetation clearing that has occurred for fire break, access road or fence line maintenance.</li> <li>Monitoring will occur at least quarterly during routine land management practices by the land manager.</li> <li>The annual compliance report will document any illegal/ unauthorised land clearing.</li> </ul>	<ul style="list-style-type: none"> <li>Upon being notified or becoming aware of prohibited forestry operations, native timber harvesting or clearing outside of existing infrastructure, the landholder is to assess how unauthorised persons accessed the site.</li> <li>Review existing access restrictions and inspect signage and offset area fencing within one fortnight of detection of the clearing.</li> <li>Corrective actions will be implemented immediately (e.g. the regeneration of those areas will be undertaken, and these areas added to the ongoing monitoring sites for the duration of the approval) and if appropriate the OAMP will be revised and updated if required.</li> <li>Any changes to the OAMP will be reported to the Minister for approval prior to changes in management.</li> <li>Any impact on the offset resulting from unauthorised activities must be reported to DCCEEW as a non-compliance as per condition 28 and 29.</li> </ul>
<p>Control invasive weed species to reduce impacts on Ornamental Snake from an overdominance of non-native floristic abundance in the understorey.</p>	<ul style="list-style-type: none"> <li>Access to the offset site will be restricted to authorised persons only.</li> <li>Weed management and weed hygiene restrictions will be implemented across the offset site to reduce the extent of existing weeds and to control the potential introduction of other exotic weed species.</li> <li>Weed hygiene and management will be undertaken in consultation with the land manager.</li> <li>Mechanical control of declared weed species will be undertaken in accordance with the control measures outlined in the</li> </ul>	<ul style="list-style-type: none"> <li>An increase in the average percent (%) cover score of weed species from baseline or previous monitoring events.</li> <li>Outbreak of infestations of weed species not previously recorded in the offset area during baseline or previous monitoring events.</li> <li>An increase in the presence of weeds (relative abundance and/or area of occurrence) as determined from photo monitoring results.</li> <li>An interim performance target is not likely to be attained, or a completion criterion is not likely to be attained and/or maintained.</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring of weeds and non-native plants (section 7.0 and Table 16) will be undertaken during the habitat quality assessment surveys using the same methodology used to assess baseline habitat quality.</li> <li>Monitoring of weeds and non-native plants will occur in year one (1) of the approval following the wet season then every (5) years subsequently.</li> <li>The annual compliance report will document the presence of weeds, weed control measures and extent of weed cover during the reporting period, and the relevant responsive actions.</li> </ul>	<ul style="list-style-type: none"> <li>Any increase in the relative abundance of invasive or other weed populations from those recorded during the baseline survey, or subsequent monitoring events will trigger the following corrective actions that must be undertaken: <ul style="list-style-type: none"> <li>Review adherence to current weed hygiene procedures to ensure compliance and to update restrictions.</li> <li>Review timing and frequency of weed management measures as outlined in section 6.6, and implement alternative weed management timeframes.</li> <li>Investigate alternative weed management control actions (e.g. injection of herbicides) and implement.</li> </ul> </li> </ul>

Habitat management objective	Management and mitigation measures	Trigger for further actions	Monitoring	Corrective actions
	<p>Biosecurity Queensland Fact Sheets<sup>1</sup> or other sources of information.</p> <ul style="list-style-type: none"> <li>• Broadscale herbicides are not recommended due to the potential impact on Ornamental Snake and habitat for their prey.</li> </ul>			<ul style="list-style-type: none"> <li>• Undertake additional weed management measures until weed populations are reduced.</li> <li>• Suitably qualified ecologist to review the OAMP within one month and update if required</li> </ul>
<p>Strategic cattle grazing to minimise degradation of gilgai habitats during the wet season and to reduce and manage understorey fuel loads and, native and non-native flora densities and improve water quality within wetland habitats.</p>	<ul style="list-style-type: none"> <li>• Stock management will be undertaken in consultation with the land manager and as required to achieve the performance objectives and completion criteria.</li> <li>• If and where new fencing is required to demarcate the offset area, ensure fencing is permanent and prohibit unintended grazing by cattle.</li> <li>• Grazing will be excluded during the peak Ornamental Snake activity periods which, in a typical/neutral year is nominally between November-March).</li> <li>• The onset, length and end of the wet season changes with the El Nino-Southern Oscillation (ENSO). The length of the wet season is typically three to five months with the duration typically defined by the Bureau of Meteorology (2022) as: <ul style="list-style-type: none"> <li>• Neutral year starting in November end ending in March</li> <li>• El Nino year starting in December and ending April</li> <li>• La Nina year starting in October and ending in March</li> </ul> </li> <li>• Stock to be removed from the offset area following heavy rainfall at any time of the year, that results in light vehicles unable to drive along unsealed tracks with cattle only returned once conditions permit vehicle access. This is an indicator that cattle could damage gilgai or wetland habitats .</li> </ul>	<ul style="list-style-type: none"> <li>• Livestock located in the offset areas during strategic grazing events such as the typical/neutral year wet season (November-March).</li> <li>• Damaged fencing is observed.</li> <li>• If local weather produces an extended or varied peak activity period for Ornamental Snake outside the typical/neutral year wet season (November- March).</li> <li>• If fuel loads are assessed and indicate the groundcover exceeds thresholds (45% cover for AU1 and AU3; 40% for AU2 and AU4).</li> </ul>	<ul style="list-style-type: none"> <li>• Regular inspections (refer to section 7.0) at least quarterly) of the offset area will be undertaken during normal land management and farming practices to examine fence lines when stock are grazing in the offset area and/or adjacent to the offset area.</li> <li>• Annual records will be kept of when and how many cattle graze in offset area. These records will be kept whenever stock enter the offset area.</li> <li>• Regular inspections (refer to section 7.0) will be undertaken to assess signs of overgrazing and pugging.</li> <li>• Habitat quality assessments (refer to section 7.0)will be undertaken in accordance with this OAMP and will include assessment of percentage cover of native perennial grasses. These Habitat quality assessments will take place in year one (1) of the approval following the wet season then every (5) years subsequently.</li> </ul>	<ul style="list-style-type: none"> <li>• Repair offset area boundary fencing if damaged within one week of detection.</li> <li>• Remove stock immediately when found to be grazing in the typical/neutral year wet season.</li> <li>• Remove stock following heavy rainfall when light vehicles are unable to drive along unsealed access tracks with cattle only returned once conditions permit vehicle access. This is an indicator that cattle could damage gilgai or wetland areas.</li> <li>• Construct additional fencing if stock have been located within the offset area as required.</li> <li>• Should monitoring activities identify triggers for further action, the OAMP will be reviewed by a suitably qualified ecologist within one month and updated if required.</li> <li>• Any corrective action identified will be implemented within 1 month of the OAMP being updated.</li> </ul>
<p>Minimise habitat degradation caused by feral animals including feral pigs and rabbits.</p>	<ul style="list-style-type: none"> <li>• Pest animal management will be undertaken in consultation with the land</li> </ul>	<ul style="list-style-type: none"> <li>• Any increase in sightings/signs (tracks) and/or the relative abundance of pest</li> </ul>	<ul style="list-style-type: none"> <li>• Feral animal presence will be monitored as outlined in section 7.0. As a minimum through visual signs recorded during</li> </ul>	<ul style="list-style-type: none"> <li>• If one of the triggers for further action is triggered, a review of the adherence to</li> </ul>

<sup>1</sup> <https://www.daf.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/fact-sheets>

Habitat management objective	Management and mitigation measures	Trigger for further actions	Monitoring	Corrective actions
	<p>manager and in accordance with general pest management processes.</p> <ul style="list-style-type: none"> <li>• Pest management will include a range of best management practice actions including shooting, trapping, fencing and baiting, and will be undertaken in accordance with Queensland's Department of Agriculture and Fisheries (DAF) guidelines<sup>2</sup> and the requirements of the <i>Biosecurity Act 2014</i>.</li> <li>• If an increase in feral pest species is noted above trigger levels, additional pest management/control measures will be instigated until the increased activity has ceased.</li> </ul>	<p>animals above baseline levels and/or previous monitoring event.</p> <ul style="list-style-type: none"> <li>• Observation of, or signs of, a feral animal not identified as occurring within the offset area during the baseline surveys.</li> <li>• Habitat quality scores for interim performance targets are not likely to be achieved by: <ul style="list-style-type: none"> <li>• Year 5</li> <li>• Year 10</li> <li>• Year 15</li> <li>• Year 20</li> </ul> </li> </ul>	<p>monitoring, routine land management and direct observations.</p> <ul style="list-style-type: none"> <li>• Remote camera monitoring will also be used to assess the presence of feral animals. Remote cameras will be placed during ecological surveys to assess habitat quality in year one (1) of the approval following the wet season then every (5) years subsequently. Remote cameras will be placed for a period of 20 camera trap nights targeting gilgais and other Ornamental Snake habitats.</li> <li>• Feral animal monitoring results, and associated actions, will be included in annual reporting to the Department.</li> <li>• Monitoring of habitat quality scores (refer to section 7.0), will be undertaken. The results of monitoring events will be compared against baseline habitat quality scores, interim performance targets and completion criteria to determine the progress of the offset area and recorded as part of reporting.</li> </ul>	<p>pest animal management actions will be undertaken immediately.</p> <ul style="list-style-type: none"> <li>• Investigate potential sources or reasons for an increase in pest animal numbers and rectify.</li> <li>• Increase the frequency or revise the type of invasive pest animal control efforts in accordance with DAF guidelines, and in conjunction with neighbouring landowners.</li> <li>• Suitably qualified ecologist to review the OAMP within one month and update if required.</li> </ul>
<p>Reduce the risk of unplanned fire causing adverse impacts to the Ornamental Snake by strategic fire management</p>	<ul style="list-style-type: none"> <li>• Controlled burns will be undertaken in consultation with the land manager and in accordance with the recommended fire management guidelines for Regional Ecosystems and will involve a range of burn strategies including patchwork burns.</li> <li>• Fire is to be excluded from the offset area except for planned and strategic burns as required to reduce understorey fuel loads having a detrimental impact on canopy tree recruitment and establishment and to maintain existing fire breaks.</li> <li>• Create firebreaks around the offset area boundary, if required or where a natural firebreak (e.g. creek line, paddock roads or fence lines) does not occur, to minimise unplanned fire from adjacent lands.</li> </ul>	<ul style="list-style-type: none"> <li>• Unplanned fire within the offset area.</li> <li>• Planned fires become out of control or the required burning regime is not achieved.</li> <li>• If fuel loads are assessed and indicate the native perennial groundcover exceeds thresholds (i.e 45% cover for AU1 and AU3; 40% for AU2 and AU4 and as per benchmark scores).</li> </ul>	<ul style="list-style-type: none"> <li>• Fire breaks are to be inspected annually in September.</li> <li>• Visual inspection of signs of fire during routine land management (at least quarterly) and during the habitat quality assessments in year one (1) of the approval following the wet season then every (5) years subsequently.</li> <li>• Fuel loads will be monitored during habitat quality assessments (refer to section 7.0), through monitoring of ground cover which will inform fire management strategies.</li> </ul>	<ul style="list-style-type: none"> <li>• Occurrences of fire are to be recorded during the visual inspections undertaken during routine land management. (section 7.0).</li> <li>• If an uncontrolled bushfire has impacted the offset area (including if controlled burning becomes out of control), review the grazing management and fire management strategies and adherence to these strategies will take place within one (1) month. Cattle will immediately be excluded from the offset area for at least three months (depending on conditions for re-growth). All fire breaks will be inspected, maintained, and repaired if required within one (1) month of the damage occurring.</li> </ul>

<sup>2</sup> <https://www.daf.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/fact-sheets>

Habitat management objective	Management and mitigation measures	Trigger for further actions	Monitoring	Corrective actions
	<ul style="list-style-type: none"> <li>• Firebreaks, if required, are to be co-located, where possible, with roads, fence lines and vehicle access tracks. No areas of Ornamental Snake habitat will be cleared unless necessary for safety management and without consideration to the impacts and Department requirements (i.e. habitat areas are not reduced).</li> </ul>			<ul style="list-style-type: none"> <li>• To ensure compliance with performance criteria, undertake remedial action within one month including: <ul style="list-style-type: none"> <li>○ Alteration to stocking rates, and/or duration and frequency of strategic grazing events. Amendments to fire management practices as required including fire safety and containment management.</li> </ul> </li> <li>• Suitably qualified ecologist to review the OAMP within one (1) month and update if required.</li> </ul>
<p>Habitat degradation and indirect impact to the Ornamental Snake due to unauthorised access to the Proposed Offset Area</p>	<ul style="list-style-type: none"> <li>• All signs and fences will be erected within three (3) months of the offset being legally secured.</li> <li>• Signs will be erected at all entrances and potential access points to the site stating that access to the site is forbidden.</li> <li>• Fences will be maintained to prevent unauthorised access, to minimise incursions by feral herbivores and to control stock presence.</li> </ul>	<ul style="list-style-type: none"> <li>• Evidence of unauthorised or unplanned access by persons, vehicles, and/or stock is detected during exclusion periods.</li> <li>• Evidence of stock is detected at any point during exclusion times.</li> <li>• Damage is detected to any fence or sign, or Ornamental Snake habitat.</li> </ul>	<ul style="list-style-type: none"> <li>• Monitoring of fence lines will be undertaken by the Landholder or suitable qualified person appointed by the approval holder within three (3) months of the offset area being legally secured and during quarterly inspections.</li> <li>• Inspections will monitor and document damage or loss of signs, damage to Ornamental Snake habitat and evidence of unauthorised access to the offset area.</li> </ul>	<ul style="list-style-type: none"> <li>• Upon being notified or becoming aware of prohibited access to the offset area, the approval holder is to immediately reassess access protocols for any lessees, easement holders etc., signage and general access.</li> <li>• Damage to signage and fences will be repaired within one month of noting the damage.</li> <li>• If there are areas that have been negatively impacted by unauthorised access, the regeneration of those areas will be undertaken, and these areas added to the ongoing monitoring sites.</li> <li>• Signage will be repaired and maintained as required within one (1) fortnight by the Landholder or suitable qualified person appointed by the approval holder.</li> </ul>
<p>Offset fails to achieve the interim performance targets and completion criteria within the anticipated 5, 10, 15 and/or 20-year time intervals including the required benchmark levels of wood debris which provides shelter habitat for Ornamental Snakes.</p> <p>Ongoing monitoring does not confirm the presence of the Ornamental Snake within the offsets area within 5 years.</p>	<ul style="list-style-type: none"> <li>• All management actions outlined in this OAMP will be implemented to ensure that the interim performance targets and completion criteria are achieved.</li> <li>• The Voluntary Declaration under the VM Act will ensure that the landholder remains obliged to undertake active management of the offset until all completion criteria are achieved.</li> <li>• Monitoring and management, as needed, will continue for the life of the approval to ensure that completion criteria have been met and maintained.</li> </ul>	<ul style="list-style-type: none"> <li>• Interim performance targets are not likely to be achieved by year 5, 10 or 15.</li> <li>• Completion criteria are not achieved by year 20.</li> <li>• At least 75% of course woody debris benchmarks levels not attained by year 5 in 11.9.1 vegetation communities.</li> <li>• At least 100% of course woody debris benchmarks levels not attained by year 10 in 11.9.1 vegetation communities.</li> </ul>	<ul style="list-style-type: none"> <li>• Habitat quality score assessments will be undertaken in year one (1) of the approval following the wet season then every (5) years subsequently.</li> <li>• Targeted monitoring for the Ornamental Snake will be undertaken annually in the first five (5) years, as a minimum.</li> <li>• Monitoring of the offset area will be undertaken in accordance with the methods outlined in this OAMP.</li> <li>• Monitoring results will be compared against the interim performance targets and completion criteria to assess</li> </ul>	<ul style="list-style-type: none"> <li>• Within one (1) month of detection of the trigger, complete an investigation into the reasons why the interim performance targets or the completion criteria were not or are not likely to be achieved within the specified timeframes. This investigation must re-evaluate the suitability of the relevant management actions and identify appropriate corrective actions.</li> <li>• As soon as practicable, and within six months of detection of the trigger, implement revised corrective actions. These may include (but not limited to): <ul style="list-style-type: none"> <li>• Increasing the frequency and intensity of pest animal and weed</li> </ul> </li> </ul>

Habitat management objective	Management and mitigation measures	Trigger for further actions	Monitoring	Corrective actions
	<ul style="list-style-type: none"> <li>Add course woody debris to the 11.9.1 vegetation communities within the offset area to achieve at least 75% of course woody debris benchmark levels by year 5 and 100% of benchmark levels by year 10.</li> </ul>		<p>progress of offset area in achieving the requirements of this OAMP.</p>	<p>control measures or revising the type of measures to be implemented.</p> <ul style="list-style-type: none"> <li>Modify fire management measures, to better support enhancement of offset values.</li> <li>If the investigation outlined above requires changes to the management actions, then as soon as possible, and within six (6) months of detection of the trigger, implement a revised OAMP, as approved by the Minister, incorporating those recommended changes.</li> <li>Add additional course woody debris if natural processes and anthropogenic supplementation haven't seen benchmark levelsrealised.</li> </ul>

## 6.1 Access and Fencing

Access to the offset area is restricted to authorised personnel only including the land manager and persons authorised by the land manager and Stanmore Resources to undertake monitoring programs and maintenance. Although a pipeline easement bisects the Proposed Offset Area (and has been excluded from the offset area), the offset area will be fenced to restrict access. Existing and new fences, if required, will be used to restrict access into offset areas. Signs will be erected in prominent locations (i.e. at access points into the offset site) which recognise that the area is protected for conservation purposes and that access into these areas is restricted to authorised personnel only. Signs will be installed prior to commencement of the action. Environmental awareness training will be provided to all workers as part of site induction and will include specific topics on risks and protective measures, and identification of the Ornamental Snake.

Existing access tracks where possible, will be used to enable management, monitoring and maintenance to be undertaken. In the event that existing access tracks become impassable (e.g. from erosion, flooding or vegetation regrowth), maintenance and remediation of the existing access tracks will be undertaken. Any new access tracks will be noted in revisions of this OAMP, and the offset area increased accordingly where tracks impact Ornamental Snake habitat. Should new tracks be required, consultation will be undertaken with DCCEE prior to construction to ensure appropriate approvals, if required, are obtained including Minister approval of any revised OAMP.

## 6.2 Vehicles

Vehicle access will be restricted to vehicles (e.g. quad bikes) approved by the land manager /offset area manager and Stanmore. Vehicle movement will be limited to designated access tracks, where possible and excluding access for general cattle management (e.g. mustering, checking on sick or injured animals etc.) within the offset area. Vehicles will travel to track conditions and as advised by the land manager /offset area manager in order to minimise the risk of injury to Ornamental Snakes or habitat degradation by vehicles and/or recovery machinery should vehicles become bogged or accidents occur. Speed limits of 30 km/h will be enforced by the land manager on access tracks throughout the offset area.

Persons entering the offset area will be required to ensure all vehicles and equipment are certified weed free. Any authorised personnel (e.g. contractors) entering the offset area will be required to hold a current weed hygiene certificate and be approved to access the area by the land manager/offset area manager. Evidence is to be provided on request to the land manager that vehicles and any machinery are weed and seed free prior to entry to minimise potential weed spread. Records of people entering the offset area and evidence of certified weed free must be kept and provided to the Department upon request.

All vehicles entering the offset area will be required to stay on the formed tracks and be issued with weed inspection certificates and all staff or contractors entering offset areas are to be made aware of, and provided access to, this OAMP.

## 6.3 Vegetation Clearing

Vegetation clearing is not permitted within the offset area. With the exception of clearing that is exempt under Queensland's VM Act and is required for:

- Maintenance of currently established access tracks and/or fire breaks.
- As directed by emergency management response personnel in the event of uncontrolled bushfire or other emergency procedures. Any native vegetation cleared from the offset area in this circumstance will be revegetated using the same species that were cleared. The OAMP

will be revised to include revegetation works and submitted to DCCEE within 3 months of this clearing occurring.

## 6.4 Grazing Management

The offset area has historically been used for cattle grazing and there was evidence of grazing throughout the offset area and coexistence with Ornamental Snakes. To optimise canopy tree and shrub recruitment and establishment and to achieve the interim performance targets and final completion criteria of ground layer species richness and cover, grazing will be strategically controlled. Excluding cattle grazing during the wet season as shown below will also minimise degradation of the gilgai habitat and minimise encounters with the Ornamental Snake or the trampling of the species shelter or foraging habitat. These measures will allow the species habitat to continue to improve, to minimise the potential for unplanned fires adversely impacting the offset area, and to minimise soil compaction and erosion.

Existing fences and if required, new fences, will be used to manage access to and demarcate the offset area, including management of strategic grazing activities. New fencing is not required where paddocks containing the offset area are fenced and managed in the same manner as the offset area. If and where additional fencing is required to be installed, it should preferably be constructed of 1.4 m high, 4-strand barbed-wire, with plain wire as the top strand and the bottom wire set 350 mm from the ground to allow native wildlife access, or an alternative and equally suitable fence design as determined by the land manager (e.g. where the fence line crosses periodically inundated areas, a 3-strand barbed wire fence is applicable). Restricted access will also be established prior to commencement of the action to prevent unauthorised access.

Grazing will be permitted throughout the offset area, with the exception of the wet season and other constraints outlined in Table 15 (such as rainfall events that restrict vehicle access), under strict controls in order to reduce fuel loads, to control exotic flora and to increase native species richness of the ground layer and to avoid trampling of the species habitat. Following grazing, the offset area will be spelled to allow for grasses to seed and to facilitate recovery of perennial grasses and the herbaceous layer while mitigating wildfire risk by restricting fuel loads. The suitability of conditions for undertaking a grazing event outside the wet season exclusion period, will be directed by climate, the length of the wet season, rainfall and the suitability for cattle to graze without land degradation.

To minimise erosion and subsequent impacts on water quality within wetland habitats that may in turn impact on Ornamental Snake habitat and/or affect attainment of the interim performance targets and/or completion criteria, strategic grazing will be excluded within the offset area during the peak activity season for the Ornamental Snake which is the nominally during the wet season (i.e. nominally November-March during a neutral wet season but does depend on seasonal rainfall). The location and extent of grazing exclusion areas will be reviewed annually based on the results of management and monitoring events and reported on in annual compliance reports for implementation of this OAMP.

The onset of the wet season changes with the ENSO and is broadly defined by the Bureau of Meteorology (2022) as outlined below. While the duration is less clear, the wet season typically lasts for three to five months as indicated below:

- Neutral year starting in November and ending in March.
- El Nino year starting in December and ending in April.
- La Nina year starting in October and ending in March.

The location and extent of grazing exclusion areas will be reviewed bi-annually based on the results of management and monitoring events and reported on in annual compliance reports for implementation of this OAMP.

Strategic grazing, when permitted, will be determined by biomass monitoring described in section 7.7.

## 6.5 Fire Management

Fuel loads in the offset area and in the surrounding paddocks will be controlled through a combination of strategic grazing, weed control measures and fuel reduction burns to minimise the risk and impacts of unplanned and hot and intense fires and to improve habitat quality through controlling weeds and increased recruitment and establishment of native plants.

Regular maintenance (e.g. grading and vegetation spraying) of firebreaks, roads and tracks will be an integral part of fire management to mitigate the risks associated with unplanned fire. Ground cover monitoring will be undertaken annually as part of fire management activities to assess fuel loads, determine the risk of unplanned fires to the offset area and inform fire management strategies (section 7.7).

New fire breaks may not be required where natural firebreaks occur (e.g. creek lines or existing paddock roads or fence line tracks).

Fire management will be consistent with the recommended fire management regime for REs within the offset area as per the Fire Management Guidelines produced by the Queensland Herbarium (refer to Appendix G for the relevant fire management regime for each of the REs composing the mixed RE vegetation community of the offset area).

All the REs within the offset area benefit from controlled burns of low intensity fires that occur in the early dry season where there is good soil moisture. Controlled burns will be low intensity with the aim of reducing fuel loads and promoting understorey growth. Moderate to high intensity fires will be avoided as they can degrade vegetation structure and destroy fauna habitats and kill native fauna.

Good fire management within offset areas should be based on maintaining vegetation composition, structural diversity, animal habitats (in particular shelter habitat such as leaf litter, fallen timber and logs) and preventing extensive wildfires. Regional ecosystem Fire Management Guidelines outline the following for regional ecosystems 11.4.9 and 11.9.1 (REs which make up the offset area):

- STRATEGY: Maintain fire management of surrounding country 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.
- ISSUES: *Casuarina cristata* is fire sensitive, although germination can be good in bare areas. *Brigalow* is soft-seeded, therefore germination is not promoted by fire. Buffel grass invasion will increase risk from fire. High intensity fires will cause damage to overstorey. Grazing may be an option for reducing fuel loads where exotic grass such as buffel have invaded.

Burn intervals for conservation purposes will differ from that for grazing purposes with the latter generally being much shorter.

## 6.6 Pest and Animal Management

Several pest animals have been recorded in the offset area and include wild dogs, feral pigs, feral cats, European rabbits and cane toads (Appendix D). These pest animals pose threats to the Ornamental Snake including predation (wild dogs, feral cats and feral pigs), habitat degradation (feral pigs and European hare) and poisoning (cane toads).

Additional assessments of pest animals will be undertaken as part of a comprehensive baseline habitat quality assessment that will be undertaken in year one (1) (refer to sections 7.2 and 7.6). These assessments will form part of the ongoing monitoring program and will consist of surveys to assess the presence, and extent of, pest animals within the offset area and to also assess impacts to Ornamental Snake habitat values and vegetation condition (refer to section 7.0 for monitoring schedules). Results from these assessments will inform the most appropriate species-specific control measures and

management activities. These results and any additional management actions will be included in an updated OAMP and as part of the annual compliance report.

Pest animal controls will be undertaken in accordance with the *Biosecurity Act 2014*, DAF guidelines and in conjunction with neighbouring landowners and include the following control methods as approved by DAF:

- Wild Dogs (DAF, 2020a): Shooting, trapping, baiting and fencing. Baiting and trapping will be undertaken at peak activity times including breeding (March/May) and rearing of young (September/November) and will target watering locations. Dingoes will not be shot or trapped. One or a combination of the control methods outlined below will be implemented to reduce the abundance of Wild Dogs accessing/utilising the offset area.
  - Shooting is an opportunistic method, mostly used for control of small populations or individual problem animals.
  - Trapping is predominantly used in areas with low populations and to control 'problem' Wild Dogs. Foot-hold traps will be used at times of the year corresponding with peak activity, with traps placed in high activity areas and poisoned with strychnine for humane reasons and to prevent escape. Lures such as scents can be used to attract dogs to the traps.
  - Baiting can be used in conjunction with other control tools, provided they aren't detrimental to the native fauna including the Ornamental Snake. Poison baits using 1080 and strychnine and fresh meat baits are delivered by hand, from vehicles or aircraft.
- Feral Pigs (DAF, 2020b): Control of feral pigs will be by implementing a collaborative approach with surrounding landowners and will include:
  - Poisoning with 1080 baits. Generalised feeding with non-poisoned bait will be performed for several days prior to laying poisoned baits to attract animals.
  - Shooting is an opportunistic method, mostly used for control of small populations or individual problem animals.
  - Trapping in smaller areas to control remaining individuals from poisoning programs.
- European Hare/Rabbits (DAF, 2021): An integrated control approach, combining different control methods in concert with land management practices, will be implemented to control Rabbits and includes:
  - Destroying (ripping) rabbit warrens. All warrens within 1 km of a permanent water sources will be ripped.
  - Baiting using 1080-sodium fluoroacetate or Pindone in the non-breeding season and when food sources are low. Pre-feeding should be undertaken to accustom Rabbits to the new food sources.
  - Trapping using a mix of cage traps and barrel traps, followed by humanly euthanising. Traps will be put in place and left open for 2-3 days to allow Rabbits to be accustomed to the trap before trapping begins.
  - Shooting as a means to target remaining individuals following other control measures. Shooting is most effective when rabbits are active (early afternoon, late afternoon or night).
- Feral Cats (DAF, 2020c): Control programs will be comprised of multiple methods, including night shooting, poisoning, trapping and fencing, combined with land management practices:
  - Shooting at night when Cats are foraging.
  - Poisoning using fresh meat baits containing 1080 (sodium fluoroacetate).
  - Rubber-jawed and leg-hold traps will be set at territorial markers such as faecal deposits and pole-clawing are present.

- Trapping using cage traps baited with meat or fish.
- Cane Toads (DAF, 2022): There is currently no available effective broad scale control methods. However, combining different small scale control methods combined with land management practices have proven successful to control Cane Toads and include.
  - Individuals may be killed humanely using commercial spray, may be stunned and decapitated (only by experienced operators).
  - Selective removal of eggs from small water bodies.

## 6.7 Weed Management

A total of 18 non-native species were recorded during the HQAPs within the Investigation Area of which, four (4), *Harrisia martini*, *Opuntia tomentosa*, *Senecio madagascariensis* and *Parthenium hysterophorus* are considered 'restricted matter' under the Queensland *Biosecurity Act 2014* of which all four are also identified as a Weed of National Significance (WONS). Several other species of invasive plants were also identified (refer to the Proposed Offset Area Ecological Assessment Report in Appendix D).

These weeds and invasive plants pose a considerable threat to habitat quality in the offset area due to the increase in groundcover biomass and the risk of uncontrolled fires. The highest distribution of weeds and invasive plants were generally confined to areas of prior disturbance, riparian corridors, wetland features and drainage lines and along existing access tracks.

Additional comprehensive surveys of the offset site will be undertaken in year one to determine distribution and abundance of weeds species. Results of these comprehensive surveys will inform the most appropriate species-specific weed control measures, location and timing for management activities. In general, however, weed management will be undertaken in accordance with the current management practices implemented at Denham Park.

General visual inspections will also be undertaken to monitor the distribution and abundance of weed species and invasive plants within the offset area. Weed infestations will be controlled and managed by preventing seed set and dispersal in accordance with Queensland's DAF recommended control measures<sup>3</sup>. Species-specific control measures including timing of management activities will be reviewed by a suitably qualified ecologist on an annual basis based on the results of ongoing weed monitoring in the offset area.

Weed management will include spot spraying weeds within riparian corridors, gilgais and drainage lines, and along existing access tracks and fence lines as well as mechanical removal and the strategic use of fire. Spraying will occur in the early dry season following periods of active growth. Strategic spraying of small, isolated patches of invasive species will be undertaken and follow-up inspection and treatment will be implemented two to four weeks later if regrowth is evident, including mechanical removal of woody weeds. Woody weeds will be managed through a combination of herbicide and mechanical techniques.

Weed hygiene measures will also be implemented to prevent the movement of weed material into the offset area (section 6.2). Prior to entering the offset area, all vehicles and equipment will be inspected for weeds, and will only be permitted access if approved by the land manager and accompanied by a weed inspection certificate. To further restrict the spread of weeds, vehicles will be restricted to designated access tracks.

Ongoing regular maintenance of firebreaks, roads and tracks will also help reduce the risk of weed incursion by preventing traffic into Ornamental Snake habitat.

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<sup>3</sup> <https://www.daf.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/plants-weeds>

## 6.8 Woody Debris

Woody debris, along with other microhabitat factors such as rocks and leaf litter provide shelter habitat for the Ornamental Snake (DSEWPC, 2011b). The management actions outlined in Table 15 and the above sections are proposed to allow an increase in habitat quality within the Proposed Offset Area, including increasing a range of vegetation attributes towards benchmark values.

Increasing woody debris to the Proposed Offset Area is dependent to a large degree on the presence and regeneration of shrubs and trees and from fallen branches from this vegetation. Depending on the type of vegetation, woody debris can take many years to accumulate. Therefore, course woody debris is proposed to be added to the Offset Area to supplement the accumulation of woody debris from natural processes.

The amount of woody debris to be supplemented will be determined by benchmark levels and the amount provided through natural processes. As a minimum, course woody debris will be added to the 11.9.1 vegetation communities such that at least 75% of course woody debris benchmarks levels are attained by year 5 and at least 100% of benchmark levels attained by year 10. Given the benchmark levels for RE 11.9.1 are 612 m/ha, locating sufficient naturally occurring fallen woody debris to achieve 100% benchmark levels in the first 5 years is likely to be difficult to achieve.

## 7.0 Monitoring

Stanmore commits to implementing a monitoring program to assess the effectiveness of management measures outlined in section 6.0 and to make timely decisions on corrective actions to ensure the performance criteria outlined in sections 5.1 and 6.0 are achieved.

The monitoring methods are as follows:

- Specific to the interim performance targets and completion criteria being assessed and to enable detection of whether the performance criteria have been or are likely to be achieved or whether corrective actions are needed.
- In accordance with the recommended survey guidelines for the Ornamental Snake.
- Quantitative and repeatable such that the monitoring assessments can be compared to each other which provides for changes between sampling events can be detected.

Further to this, the monitoring undertaken will be:

- Sufficient to evaluate performance of the OAMP against interim performance targets and completion criteria as outlined in Table 14.
- Able to ensure management triggers are sufficiently defined and enable detection of problems in good times as outlined in Table 15.
- Sufficient to develop and implement corrective actions when management triggers are detected as outlined in Table 15.
- Sufficient to inform subsequent reviews and amendments to the OAMP.
- Be undertaken in accordance with the requirements of DCCEE's Guidelines for biological survey and mapped data (DoEE, 2018).

Table 16 below displays a monitoring schedule, summarising monitoring timing, frequency and methods. sections 7.1 through to 7.7 further details each monitoring parameter.

**Table 16: Monitoring schedule for the offset area**

Monitoring type	Monitoring attribute	Monitoring frequency	Monitoring method	Monitoring location
Habitat quality surveys undertaken by suitably qualified ecologists				
Initial habitat quality assessment	Site condition, site context and species stocking rates as outlined in this OAMP.	Initial assessments were completed in June and August 2022 to inform this OAMP.  Baseline monitoring will commence in Year 1 following approval of the OAMP.	Visual inspections and detailed habitat quality assessment as per the Guide (DES, 2020) and as outlined in this OAMP.	Assessment sites outline in section 7.2 and Figure 9.
Ecological condition	Recruitment of woody perennial species in the ecologically dominant layer (EDL)	Year one (1) following approval of the initial OAMP and securing the offset area, then every five (5) years until the end of the approval.	As per the methods outlined in the Guide (DES, 2020) and in section 4.1.  Visual observations and, where relevant, methods outlined in the Guide to determining terrestrial habitat quality and with reference to interim criteria as per Table 14 for the relevant RE and AU being monitored.	
	Native plant species richness – trees			
	Native plant species richness – shrubs			
	Native plant species richness – grasses			
	Native plant species richness – forbs			
	Tree canopy height			
	Tree canopy cover			
	Shrub canopy cover			
	Native perennial grass cover			
	Organic litter			
	Large trees			
	Course woody debris			
	Non-native plant cover (weeds)			
Quality and availability of food and foraging habitat (e.g. tree canopy height and cover, organic litter, tree and shrub species richness).				
Quality and availability of shelter (e.g. presence of organic litter, course woody debris and cracking clay soils).				

Monitoring type	Monitoring attribute	Monitoring frequency	Monitoring method	Monitoring location
Site context <sup>4</sup>	Threats to species (e.g. presence of feral animals and weeds etc.).			
	Threats to mobility capacity.			
Species stocking rates/targeted Ornamental Snake surveys	Presence/absence of the Ornamental Snake. Ornamental Snake densities if observed.	Year one (1) following approval of the initial OAMP and securing the offset area, then every five (5) years until the end of the approval.	Refer to section 4.1.	Refer to section 7.2.
<b>Visual inspection surveys undertaken by the land manager or authorised land manager representative and targeted weed and feral animal surveys undertaken by suitably qualified ecologists.</b>				
Photos points	General vegetation condition and cover.	Year one (1) following approval of the initial OAMP and securing the offset area, then every five (5) years until the end of the approval.	Photographs of offset area to be taken from the same location and direction for each monitoring event.	Assessment sites outline in section 7.2 and Figure 9.
Grazing	Stocking rates, ground cover, evidence of pugging and fencing.	Stocking rates will be monitored quarterly until the end of the approval. Biomass will be monitored annually in the early dry season. Fencing will be monitored during routine land management of the offset area and at least quarterly. Livestock access will be monitored following heavy rainfall events and include evidence of light vehicle access.	Assessments of the offset area will be undertaken by the land manager or authorised representative to observe and record grass cover, presence of weeds and pest animals, evidence of fire and evidence of unauthorised access.  Fire break and fence maintenance activities will be recorded for inclusion in the annual report. Any unplanned fires will also be recorded as well as monitoring results for any planned cool or mosaic burns on habitat.	Throughout the offset area.
Fire	Presence of fire and extent of burning. Condition of fire breaks.	Presence of fire will be monitored during routine land management and at least quarterly and following known fire events.  Biomass will be monitored annually in the early dry season.	Weed cover will be recorded as per the Level 2B methodology described in the Land Manager's Monitoring Guide (DERM, 2010) (or any subsequent published version of this document or similar recognised methods). This methodology is suitable for landowners to rapidly assess whether weed management measures need to be conducted within the offset area.	
Feral animals	Presence of pest animal, control measures undertaken and success of control measures.	Incidental observations during routine land management at least monthly.  Year one (1) following approval of the initial OAMP and securing the offset area, then every five (5) years until the end of the approval.	Detailed assessments as outlined in section 7.0 will also be undertaken in conjunction with the habitat quality assessments.	
Non-native plants	Presences of weeds, control measures undertaken and success of the control measures.	Incidental observations during routine land management at least monthly.  Year one (1) following approval of the initial OAMP and securing the offset area, then	For grazing following heavy rainfall, visual evidence of light vehicle access.	

<sup>4</sup> Non-GIS attributes that can be measured in the field

Monitoring type	Monitoring attribute	Monitoring frequency	Monitoring method	Monitoring location
		every five (5) years until the end of the approval.		
Fencing and site access	Unauthorised clearing, degradation of habitat or disturbances.	Monitoring of fences and unauthorised site access will take place during routine land management at least quarterly.		
Unauthorised impacts to vegetation from activities such as illegal harvesting and illegal access.	Unauthorised clearing or disturbances.	Visual inspections undertaken during routine land management and undertaken at least quarterly.	Observe and record accessibility to the offset site (i.e. condition of fencing), evidence and location of illegal clearing, fire and/or pest animal incursion.	
Cyclone event.	Condition and damage to vegetation.	Following cyclones or large tropical rainfall events.	Visual throughout the offset area.	

## 7.1 General Site and Visual Inspections

Offset area inspection visits will be conducted biannually (prior to and following the wet season) by the land manager/offset area manager to inspect the offset area and assess the following:

- Fencing and signage condition (Note: fencing will be inspected every four weeks when stock are adjacent to the offset area).
- Evidence of excessive pugging or areas of overgrazing while stock are in the offset area.
- Condition of firebreaks.
- Fuel loads.
- Damage and/or degradation resulting from pest animal activity within the offset area.
- New weed outbreaks.
- Signs of unplanned fires.
- Incidental fauna observations and any additional risks to offset values (i.e. evidence of predation on the Ornamental Snake).

## 7.2 Habitat Quality Monitoring Sites

Ongoing habitat quality monitoring will be undertaken at the 13 permanent monitoring sites within the offset area as per Figure 9. The location of the sites will be in accordance with QLD guidelines (DES, 2020) and methodologies used in this OAMP (section 4.1). The location of the sites will ensure there is sufficient spatial coverage to assess any variation in condition across the offset area and effectively assess key habitat features for the Ornamental Snake.

All habitat monitoring sites will be used to assess habitat quality for the Ornamental Snake. Each monitoring site will include a 100 m transect, with the start and central points to be marked with permanent markers (i.e. star picket) and the GPS location recorded. The final monitoring locations will be included in the first annual compliance report for the offset area. Photo monitoring will also be undertaken with photographs taken from north, south, east and west directions. All subsequent monitoring events will be undertaken at the same locations.

The permanent habitat quality monitoring sites will be utilised as part of the following monitoring activities:

- Habitat quality assessments undertaken in accordance with the Guide (DES, 2020) and the methods outlined in section 4.1.
- Fauna assessments including targeted surveys and spotlighting surveys.
- Photo monitoring, undertaken at the ends of each of the habitat monitoring site transects.
- Presence of feral animals.
- Presence of weeds and invasive plants.
- Signs of fire.

## 7.3 Habitat Quality and Fauna Monitoring

Initial baseline habitat quality and fauna assessments were undertaken in August 2022. A comprehensive habitat quality and fauna assessment will be undertaken in year one following approval of this OAMP and during or immediately following the wet season. Targeted surveys for the Ornamental Snake will be undertaken in year one to confirm the presence and abundance of the species within the offsets area. Subsequent assessments, for both habitat quality and abundance of Ornamental Snake,

will be undertaken every five (5) years and then at the end of approval. The results will be used to determine how the offset is tracking against the interim performance targets and the completion criteria.

If habitat quality and fauna monitoring indicate a decline in habitat quality and / or a reduction in the abundance or distribution of the Ornamental Snake in the offset area, monitoring may increase in frequency (e.g. every two years for the presence of the Ornamental Snake and vegetation quality) until trends indicate an increase in habitat quality and/or abundance of the Ornamental Snake.

The Guide (DES, 2020) as well as the methods outlined in section 4.1 of this OAMP and Appendix A, will be used to assess habitat quality for the Ornamental Snake and is based on the methodology set out in the BioCondition Assessment Manual and BioCondition benchmarks (Eyre, et al., 2015). A range of habitat variables are assessed using standard methods and compared to regional ecosystem benchmarks (undisturbed) sites as a measure of how well a terrestrial ecosystem is functioning for biodiversity.

The Guide allows for a habitat quality score to be calculated for the Ornamental Snake based on three key indicators as outlined in section 4.1 and include:

- Site condition: assessment of vegetation compared to benchmark (undisturbed) areas.
- Site context: a geospatial analysis of the assessment area in relation to the surrounding environment.
- Species habitat index: the ability of assessment area site to support a species.

To assess habitat quality in line with the EPBC Offsets Policy, the attributes from the three indicators are used but partitioned as outlined in section 4.1 which uses 15 attributes for site condition and 7 attributes for site context.

For inputs into the EPBC offsets calculator, species stocking rate as outlined in the EPBC offsets calculator guide, replaces species habitat index as a measure of the presence of a species at the impact and offset site. As recommended by DCCEEW to meet the requirements of the offsets policy, species stocking rate for this OAMP is to be assessed on a scale of 0-4 as outlined in section 4.1.

The habitat quality assessment will include targeted fauna surveys for the Ornamental Snake and will be undertaken in accordance with the relevant Survey Guidelines, described in Table 17. Fauna surveys as well as the habitat quality assessment will be undertaken by suitably qualified ecologists generally during the mid to late wet season (nominally February/March/April/May) which corresponds to peak species activity and detectability. The habitat quality assessments will also include assessments of weed abundance and distribution and an assessment on the presence of pest animals.

**Table 17: Survey techniques for the Ornamental Snake**

MNES	Survey	Survey guidelines
Ornamental Snake	<ul style="list-style-type: none"> <li>• Nocturnal spotlight searches will be conducted over a minimum of four (4) survey nights during periods of known peak activity (wet season) while frogs are active around suitable gilgai habitat.</li> <li>• Opportunistic nocturnal driving searches on roads near suitable gilgai habitat will be conducted over a minimum of three (3) survey days and nights during periods of known peak activity (wet season) while frogs are active.</li> </ul>	<ul style="list-style-type: none"> <li>• Survey guidelines for Australia’s threatened reptiles (DSEWPC, 2011b)</li> <li>• Terrestrial Vertebrate Fauna Survey Guidelines for Queensland Version 4.0 (Eyre, et al., 2022)</li> </ul>

MNES	Survey	Survey guidelines
	<ul style="list-style-type: none"> <li>• Diurnal active searches will be undertaken in areas of suitable gilgai habitat under potential sheltering sites (rocks, logs or other large objects on the ground) for a minimum of three (3) survey days and nights.</li> <li>• Pitfall and/or funnel traps will be utilised in suitable gilgai habitat (microhabitat) over a minimum of four (4) survey days and nights during periods of known peak activity (wet season) while frogs are active.</li> </ul>	

Where the habitat quality assessments do not demonstrate improvements in each of the individual site condition and site context attributes, and the overall habitat quality/interim performance targets and/or the completion criteria for the offset area in the required timeframes, adaptive management will be undertaken. The adaptive management framework allows for a review of management actions and corrective actions to be undertaken to assess if additional management measures or corrective actions are required. If the review deems additional actions are required, the OAMP will be revised and approval of the revised OAMP sought from the Minister.

As outlined in Table 14, a period of 20 years has been chosen as the time period of which the final habitat quality, and hence, increased habitat values will be reached (i.e. 2042). This time period was chosen as 20 years is the nominated time until ecological benefit used in offsets calculations and is the time required for the restoration in gilgai and for large canopy trees to become established. Targeted Ornamental Snake monitoring is scheduled in year one and every five years thereafter and vegetation quality assessments are scheduled every five years through to the end of the approval. The final assessment will be undertaken in approximately 2042 (depending on whether the completion criteria are on target to be met) to demonstrate that the final habitat quality of the offset area conforms to that outlined in this OAMP and that the completion criteria has been achieved.

Where the completion criteria, as in Table 14 and Table 15 are not achieved by the end of the approval, management actions will continue until the offset requirements are realised. In contrast, if the completion criteria are met prior to the end of the approval, all management actions and monitoring will continue until the end of the approval to ensure the completion criteria and habitat quality is maintained throughout the life of the approval.

## 7.4 Photo Point Monitoring

Photo monitoring will be undertaken at each monitoring location during the habitat quality assessments to allow habitat changes to be visually assessed over time. Photos at each photo monitoring point will be taken in a north, east, south and westerly direction. A permanent feature will be included within the photo frame to provide a fixed reference point. A record of the photographs will be maintained, including GPS location, date, time, direction and the height above the ground at which the photograph was taken. Data from habitat quality assessments and photo monitoring will be recorded on survey sheets and these will be attached to annual monitoring reports.

## 7.5 Weed Monitoring

The offset area will be monitored for weeds and invasive plants and will include a comprehensive weed survey in year one which will map the distribution and density of weed infestations in the early dry season. The final weed mapping methodology will be determined by the suitably qualified ecologist prior

to and during the comprehensive year one surveys. Ongoing seasonal weed monitoring surveys will be undertaken in conjunction with the habitat quality monitoring surveys outlined in section 7.2. Comprehensive weeds surveys aimed at re-mapping the distribution and density of weeds will be undertaken every five years.

Assessing the presence and abundance of weed cover will be done in accordance with the methodology outlined in the Guide for assessing non-native plant cover (DES, 2020). Briefly, this method involves establishing a 50 m x 10 m plot and dividing this plot into 20 smaller 5 m x 5 m sub-plots. Percent (%) weed cover will be assessed in each of the 20 sub-plots and the total percent weed cover determined by taking the average from the 20 plots. Photo monitoring will also be undertaken within each plot in the same manner described in section 7.4.

In addition to the permanent weed monitoring sites, incidental observations will be recorded from the offset area from general observations undertaken during routine land management. This will inform any instances of weed infestations that occur away from the permanent weed monitoring sites. If trigger levels outlined in Table 15 for weeds are met or exceeded, additional monitoring will be undertaken and will occur in conjunction with appropriate weed management measures outlined in section 6.7, until the presence and distribution of weeds reduces to baseline levels or below.

## **7.6 Feral Animals Monitoring**

The offset area will be monitored for pest animals and will include a comprehensive survey in year ONE (1) which will map the presence of feral animals. Ongoing feral animal monitoring surveys will be undertaken in conjunction with the habitat quality monitoring surveys outlined in section 7.2 and at the same surveys locations as the habitat quality assessment surveys in Figure 9. Monitoring will primarily entail standardised timed visual observations as well as baited camera trap monitoring and nocturnal spotlighting surveys. Evidence of faecal samples and damage caused by pest animals will also be recorded. The final methodology will be determined by the suitably qualified ecologist during the initial comprehensive survey in year one (1). Exact monitoring methods will be determined by the suitably qualified ecologist engaged to undertake the monitoring.

Feral animals will also be opportunistically surveyed throughout the year outside of monitoring times, including observations for potential new pest animal species that have not been previously recorded, and which are known to prey on Ornamental Snakes and/or degrade their habitat. Any evidence of mortality or injury to the Ornamental Snake because of pest animals will also be recorded during the surveys. If trigger levels as defined in Table 15 for any pest animal species are met or exceeded, additional monitoring will be undertaken and will occur in conjunction with appropriate feral animal management measures until pest animal presence reduces to baseline levels or below.

## **7.7 Fuel load Monitoring**

Fuel load monitoring for fire management will be undertaken annually in the early dry season when biomass (i.e. ground cover) is at its greatest, to determine the risk of fire to the offset site and to inform fire management strategies. Groundcover will be monitored at the same permanent habitat quality monitoring sites established as part of the comprehensive baseline surveys in year 1.

Fuel loads will be managed through strategic grazing events if the percent cover of native grasses exceeds 45% in AU 1 and 3 and 40% in AU 2 and 4. For strategic grazing, the cattle stocking rate will be determined by the percent ground cover vegetation and native grass cover as outlined in Table 15.

## 8.0 Data Management, Reporting, Implementation and Auditing

### 8.1 Data Management

Stanmore Resources or their authorised representative, will be responsible for overseeing and managing the monitoring activities required as part of this OAMP. This will include maintaining data records to confirm all activities associated with the management actions in this OAMP have been undertaken as outlined in this OAMP and/or any subsequent approval conditions. These records will be made available to DCCEEW.

### 8.2 Reporting

A reporting schedule is shown in Table 18 and this process will enable assessment of changes in vegetation condition/habitat quality relative to baseline data and determine progress towards the offset completion criteria (see section 5.1). Reporting will also determine the success of the management actions and note any changes due to climatic conditions and will inform the type and frequency of management measures required in the upcoming monitoring period.

The results of the monitoring activities will be documented by suitably qualified ecologists in stand-alone progress reports and combined into an annual compliance report.

The reports will include the following information:

- EPBC approval number.
- General description of the climatic conditions for the monitoring period (e.g. rainfall, duration of the wet season etc.).
- All activities undertaken during the monitoring period including monitoring undertaken and the entity who undertook the monitoring and results of the monitoring undertaken.
- Location (GPS coordinates) and details of all confirmed sightings of Ornamental Snake identified during surveys and monitoring.
- An indication of whether any additional risks/threats over and above those outlined in the final approved OAMP are apparent and management actions to be employed to manage those risks.
- If any triggers were detected, and if so, the corrective actions that were implemented.
- Discussion on progress towards achieving the management objective and offset obligations outlined in the OAMP.
- Recommendations for improving/updating the OAMP in accordance with adaptive management.

Additional notifications and/or reporting will be undertaken in accordance with all relevant EPBC approval conditions including:

- Condition 8 – Five yearly progress report provided to the DCCEEW within 60 business days after then end of each five-year period from the OAMP implementation date showing how the offset is achieving and maintaining the completion criteria.
- Condition 9 – Final compliance report provided to the DCCEEW within 60 business days of the 20<sup>th</sup> anniversary of the OAMP implementation date showing the offset obligation has been met.
- Condition 11 – Provide evidence to DCCEEW within five business days of the legally securing mechanism being executed.

### 8.3 Implementation

Following approval, the OAMP will be implemented and will remain effective for the life of the approval. Stanmore commits to implementing management actions under this OAMP and legally securing the environmental offsets within 12 months from the commencement of clearing habitat for the Ornamental Snake outlined in Condition 10 of the approval. Stanmore commits to commencing components of this OAMP (e.g. year one (1) baseline monitoring) of the offset area following approval of the OAMP and prior to formal legal security. The schedule of monitoring activities is shown at Table 16 and the schedule of reporting is shown in Table 18.

**Table 18: Reporting schedule**

Report	Reporting period	Responsibility	Submission period
EPBC Act Annual Compliance Report which will report on compliance with the EPBC Act approval.	Every 12 months for the duration of the approval or until otherwise advised by the Minister.	Stanmore.	Publication of the report within 60 business days of every 12-month anniversary of the commencement of the action and notify DCCEEW within 5 business days of the publication, including a weblink to the report.
Offset Area Report that will outline the results and the effectiveness of the management actions outlined in this OAMP, including against habitat quality score criteria and presence of Ornamental Snake. This report will include all monitoring results, management actions, investigations and any corrective actions taken.	Every 12 months from the approval.	Generally, Stanmore but with inputs from a relevant suitably qualified persons, and/or the land manager.	The report will be an appendix to the Annual Compliance report.
Ecological Condition Assessment Report that provides results of habitat quality surveys.	In year one (1) and then every five (5) years and then every five (5) years from the approval for the life of the approval.	Suitably qualified person, directed by Stanmore.	The report will be appended to the Annual Compliance Report.
Internal Audit Report that confirms compliance and effectiveness of the OAMP. This report will also provide any necessary corrective	In year one (1) and then every five (5) years subsequently from the grant of the Voluntary Declaration	Stanmore.	Within three (3) months of the submission of the Ecological Condition Assessment Report.

Report	Reporting period	Responsibility	Submission period
actions of management action improvements.	(VDec) for the life of the approval.		
External Audit Report confirming compliance with the approval conditions.	As and if required by DCCEEW.	Generally, Stanmore but with inputs from relevant suitably qualified persons.	As and if required by DCCEEW
Revised OAMP as approved by the Minister to document any required changes to the management actions of the offset area due to the interim habitat quality values or completion criteria not being met.	Only required if the management actions in the OAMP needs to be amended to ensure the interim and/or completion criteria are met, or should additional offsets be required in the event that completion criteria cannot be achieved.	Stanmore.	Within 6 months of failing to meet the interim habitat quality values or completion criteria where the management actions require amending.
Notification and details of any non-compliance with the EPBC Act approval conditions or with the requirements of this OAMP	Only required if any non-compliance occurs	Stanmore	Notify DCCEEW as soon as possible in writing and no later than two (2) business days after becoming aware of the non-compliance. Further, details of any non-compliance must be provided to DCCEEW no later than 10 business days after becoming aware of any non-compliance.
Notification of illegal timber harvesting or clearing to the relevant Queensland Governments Departments and Queensland Police (where relevant).	Only required if illegal clearing or timber harvesting occurs within the offset area.	Stanmore	Within 10 business days of the detection of illegal clearing or timber harvesting.
Final EPBC Act Compliance Report which will report on compliance with the EPBC Act approval.	Once following the 20 <sup>th</sup> anniversary of the OAMP being implemented.	Stanmore.	Publication of the report within 60 business days following the 20 <sup>th</sup> anniversary of the OAMP being implemented.

## **8.4 Auditing and Review**

Internal audits/reviews of management and monitoring activities will be undertaken in response to a trigger for further action (outlined in Table 15) being triggered and non-compliances with the OAMP requirements. External auditing will be undertaken as required by the approval conditions and will be published in annual compliance reports that will include details on the progress towards achieving the interim performance targets and/or completion criteria specified in this OAMP.

The effectiveness of actions within this OAMP will be reviewed annually and amended (if required) to incorporate changes identified through management activities and monitoring activities. Any changes to this OAMP, including but not limited to monitoring and management measures must be approved in the form of a revised OAMP by the Minister, prior to implementing changes to practices. Changes may include amendments to management actions, identification of additional monitoring activities and responses to adaptive management triggers. If the completion criteria have been attained prior to the end of the approval, the OAMP will continue to be implemented and reviewed to ensure the completion criteria are maintained until the approval expires.

## 9.0 Risk Assessment

A risk assessment was undertaken using the risk assessment process provided by the DCCEEW to assess the risks associated with failing to achieve the objectives outlined in this OAMP for mitigating impacts to the Ornamental Snake. For each identified risk, the potential consequence of the risk (Table 19) was assessed against the likelihood of that risk occurring (Table 20) to determine an overall risk rating using the matrix in Table 21. The consequence and likelihood of each risk occurring was reassessed following the implementation of the management and mitigation measures (i.e. control measures) to provide a residual risk rating (Table 22).

**Table 19: Consequence classification**

Qualitative measure of consequences (what will be the consequence/result if the issue does occur)	
Minor (Mi)	Minor risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing low cost, well characterised corrective actions.
Moderate (Mo)	Moderate risk of failure to achieve the plan's objectives. Results in short term delays to achieving plan objectives, implementing well characterised, high cost/effort corrective actions.
High (H)	High risk of failure to achieve the plan's objectives. Results in medium-long term delays to achieving plan objectives, implementing uncertain, high cost/effort corrective actions.
Major (Ma)	The plan's objectives are unlikely to be achieved, with significant legislative, technical, ecological and/or administrative barriers to attainment that have no evidenced mitigation strategies.
Critical (C)	The plan's objectives are unable to be achieved, with no evidenced mitigation strategies.

**Table 20: Likelihood classification**

Qualitative measure of likelihood (how likely is it that this event/circumstances will occur after management actions have been put in place/are being implemented)	
Highly likely (Hi)	Is expected to occur in most circumstances.
Likely (L)	Will probably occur during the life of the project.
Possible (P)	Might occur during the life of the project.
Unlikely (U)	Could occur but considered unlikely or doubtful.
Rare (R)	May occur in exceptional circumstances.

**Table 21: Risk rating matrix**

		Consequence				
		Minor	Moderate	High	Major	Critical
Likelihood	5. Highly Likely	Medium	High	High	Severe	Severe
	4. Likely	Low	Medium	High	High	Severe
	3. Possible	Low	Medium	Medium	High	Severe
	2. Unlikely	Low	Low	Medium	High	High
	1. Rare	Low	Low	Low	Medium	High

For the purposes of this risk assessment, the risk levels are defined as follows:

- Severe: Unacceptable risk that must not proceed until suitable and comprehensive control measures have been adopted to reduce the level of risk.
- High: Moderate to critical consequences. Works should not proceed without considerations of additional actions to minimising the risk.
- Medium: Acceptable with formal review. Medium level risks require active monitoring due to the level of risk being acceptable.
- Low: Acceptable with active management not considered required.

Table 22: Risk assessment and management

Risk Event	Risk Description	Initial Ranking			Risk	Management Measures / Actions	Residual Ranking			Risk	Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Result <sup>3</sup>			Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Result <sup>3</sup>					
<b>Standard Risks</b>														
Habitat or vegetation loss through unplanned clearing	<p>As the offset site occurs within a beef production property, it is possible for unplanned/ illegal clearing to occur. This is unlikely as the landholder will enter into an offset arrangement with the approval holder.</p> <p>Clearing can also occur by vehicles traversing the area off designated roads/tracks. This is also considered improbable as access to the site will be restricted.</p> <p>Potential unplanned clearing could come from application of chemicals on adjacent properties which stray across the offset site boundary.</p>	U	Ma	H	<p>No unapproved and/or intentional clearing of vegetation within the offset area, except for clearing that is required for fencing, access, firebreaks or public safety.</p> <p>Ecological thinning is not recommended and may only be carried out in accordance with the advice of a suitably qualified expert and only after approval by the Department.</p>	R	Ma	M	<p>No unauthorised access.</p> <p>No evidence of clearing within the offset area.</p> <p>Offset Area is mapped as Category A on PMAV.</p>	<p>No unauthorised access to the offset site.</p> <p>No evidence of unapproved clearing within the offset area.</p> <p>Offset area mapped as</p>	<p>Any activities that are in contravention of the Voluntary Declaration.</p> <p>Detection of prohibited clearing outside of established access tracks, fire control lines and fence lines (existing infrastructure).</p>	<p>Upon being notified or becoming aware of clearing outside of existing infrastructure, the landholder is to assess how any unauthorised clearing occurred and, where relevant, any unauthorised persons accessed the site</p> <p>Report breach to the Department within 2 business days with further details of the extent of clearing within 10 business days.</p> <p>Review existing access restrictions and inspect signage and offset area fencing within one fortnight of detection of the clearing.</p> <p>Any corrective action identified will be implemented within 1 month of the OAMP being updated.</p>	<p>Monitoring and inspections will monitor and document if there is evidence of recent illegal clearing.</p> <p>Monitoring will also document vegetation clearing that has occurred for fire break, access road or fence line maintenance.</p>	
Timber harvesting /collection	<p>Unauthorised access to the offset area may result in timber harvesting/ collection. Such actions can remove important habitat features and harm the structure of the vegetation communities and habitat for the Ornamental Snake.</p>	U	H	M	<p>All signs and fences will be erected within three months of the offset being legally secured.</p> <p>Signs will be erected at all entrances and potential access points to the site identifying the area as an environmental offset and stating that access to the site is forbidden.</p>	R	H	L	<p>No unauthorised access to the offset site.</p> <p>No evidence of unapproved clearing within the offset area.</p> <p>Offset area mapped as</p>	<p>Damaged fences associated with vehicle access.</p> <p>Detection of prohibited forestry operations, native timber harvesting or clearing outside of established access tracks, fire control lines and fence lines</p>	<p>Upon being notified or becoming aware of prohibited forestry operations, native timber harvesting or clearing outside of existing infrastructure, the landholder is to assess who and how unauthorised persons accessed the site</p>	<p>The annual compliance report will document any illegal/ unauthorised timber harvesting.</p> <p>All field monitoring will report on the presence of any unauthorised access and clearing.</p>		

Risk Event	Risk Description	Initial Ranking			Management Measures / Actions	Residual Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Risk <sup>3</sup>		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Risk <sup>3</sup>				
					Fences will be maintained to prevent unauthorised access, to minimise incursions by feral herbivores and to control stock presence.				Category A on PMAV.	(existing infrastructure).	Report breach to the Department within 2 business days. Further details of clearing activity will be provided to the Department within 10 business days.  The approval holder is to reassess access protocols for any lessees etc., signage and general access within one fortnight.	
Control invasive weed species to reduce impacts to the Ornamental Snake.	<p>Infestation of previously unidentified weeds within the offset area.</p> <p>Expansion of range and abundance of existing weed species within the offset site.</p> <p>Left unchecked, weed invasion and proliferation could cause significant deterioration of the offset site.</p>	P	H	M	<p>Access to site will be restricted to authorised persons.</p> <p>Weed management and weed hygiene restrictions will be implemented across the offset site to reduce the extent of existing weeds and to control the potential introduction of new exotic weed species.</p> <p>Weed hygiene and management will be undertaken in consultation with the land manager.</p> <p>Chemical and/or mechanical control of all declared weeds in accordance with the control measures outlined in the Biosecurity Queensland Fact Sheets or other sources of information.</p>	U	Mi	L	<p>No infestations of new species in the offset area, covering more than 100 m<sup>2</sup>.</p> <p>No increase in the average percent (%) cover score weed species from baseline or previous monitoring events.</p>	<p>An increase in the average percent (%) cover score weed species from baseline or previous monitoring events.</p> <p>Outbreak of infestations of weed species not previously recorded in the offset area during baseline or previous monitoring events.</p> <p>An increase in the presence of weeds (relative abundance and/or area of occurrence) from photo monitoring results.</p> <p>An interim performance target is not attained, or a completion criterion is not attained and/or maintained.</p>	<p>Review adherence to weed hygiene procedures to ensure compliance and to update restrictions where required.</p> <p>Review timing and frequency of weed management measures, and implement alternative weed management timeframes as required.</p> <p>Investigate alternative weed management control actions (e.g. spot spraying and/or injection of herbicides, as well as intensification for most affected areas) and implement as required.</p> <p>Undertake additional weed control measures and continue until weed cover is below baseline levels and in accordance with performance criteria.</p> <p>Update OAMP as required.</p>	<p>Monitoring of weeds and non-native plants will be undertaken during the habitat quality assessment surveys using the same methodology used to the baseline habitat quality as outlined in the section 4.1, as well as incidental observations as part of routine management.</p> <p>The annual report will document the weed presence, weed control measures and extent of weed cover during the reporting period and relevant responsive actions.</p>

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Risk <sup>3</sup>		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Risk <sup>3</sup>				
Inappropriate grazing regimes	<p>Inappropriate cattle grazing destroys shrubs and native grass cover and slows or reverses the regeneration of threatened fauna habitat.</p> <p>Grazing can also lead to the trampling of Ornamental Snake shelter and foraging habitat.</p>	P	H	M	<p>Stock will be managed in accordance with section 6.4.</p> <p>If and where new fencing is required to demarcate the offset area, ensure fencing is permanent and prohibit unintended grazing by cattle.</p> <p>Ornamental Snake peak activity can vary depending on localised site conditions but generally peaks in the wet season (November-March). Restricted grazing will reduce gilgai and microhabitat degradation.</p>	U	Mi	L	<p>Stock are removed from the offset area for it to be spelled to allow for grasses to seed and to facilitate recovery of perennial grasses and the herbaceous layer while mitigating wildfire risk by restricting fuel loads.</p> <p>Ground cover always remains above the minimum cover limits (BioCondition benchmarks for the REs).</p>	<p>Stock are observed on site in exclusion times, outside of strategic grazing events.</p> <p>Livestock located in the offset areas outside of strategic grazing events.</p> <p>Livestock located in Ornamental habitat during the wet season.</p> <p>Damaged fencing is observed</p> <p>Habitat quality assessments indicate native grass groundcover is less than the relevant benchmark levels for each assessment unit.</p> <p>If ecological surveys indicate an increased coverage of gilgai degradation outside the early to wet season.</p>	<p>Amend livestock management practices including amendment of stocking rates, and/or timing, and/or duration and/or frequency of strategic grazing events until native grass cover at the relevant benchmark levels for each assessment unit.</p> <p>Repair offset area boundary fencing if damaged.</p> <p>Remove stock from Ornamental Snake habitat.</p> <p>Removing stock when excessive pugging or overgrazing is observed such that native grass cover is below benchmark levels.</p> <p>Construct additional fencing if required. Additional fencing will not clear areas of Ornamental Snake habitat.</p> <p>Should monitoring activities identify triggers for further action, the OAMP will be reviewed by a suitably qualified ecologist within one month and update if required.</p> <p>Any corrective action identified will be implemented within 1 month of the OAMP being updated.</p>	<p>Regular site inspections by land manager during exclusion periods as well as to assess for signs of overgrazing and pugging.</p> <p>Regular inspections of the offset area will be undertaken during normal land management and farming practices to examine fence lines when stock are grazing in the offset area and/or adjacent to the offset area.</p> <p>Habitat quality assessments will be undertaken in accordance with this OAMP and will include assessment of percentage cover of native perennial grasses</p> <p>The annual offset compliance report will document vegetation condition.</p>

Risk Event	Risk Description	Initial Risk Ranking			Management Measures / Actions	Residual Risk Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Result <sup>3</sup>		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Result <sup>3</sup>				
Increased population of feral animals in the offset area causing habitat degradation or direct impacts to Ornamental Snakes.	<p>Pest animals pose threats to the MNES including predation (Wild Dogs, Feral Cats and Foxes) and habitat degradation (Feral Pigs and Rabbits) and poisoning (Cane Toads).</p> <p>Feral Pigs and Rabbits can impact on Ornamental Snake habitat including understorey vegetation composition, shelter and foraging habitats.</p>	P	H	M	<p>Pest animal management will be undertaken in consultation with the land manager and in accordance with general pest management processes.</p> <p>Pest management will include a range of best management practice actions including shooting, trapping, fencing and baiting, and will be undertaken in accordance with Queensland's Department of Agriculture and Fisheries (DAF) guidelines<sup>5</sup> and the requirements of the <i>Biosecurity Act 2014</i>.</p> <p>If an increase in feral pest species is noted, additional pest management/ control measures will be instigated until the increased activity has ceased.</p>	P	Mi	L	<p>No increase in abundance of feral animals.</p> <p>Maintain pest animal control program.</p> <p>No evidence of new pest species.</p>	<p>Observed increase in sightings/signs and/or the relative abundance of pest animals above baseline levels or previous monitoring event (whichever is lower).</p> <p>Observation of, or signs of, a feral animal not identified as occurring within the Project area during the baseline surveys.</p> <p>Habitat quality scores for interim performance targets are not likely to be achieved by Year 5, Year 10, Year 15 and Year 20.</p>	<p>Review adherence to pest animal management.</p> <p>Investigate potential sources or reasons for an increase in pest animal numbers and rectify</p> <p>Increase the frequency or revise the type of invasive pest animal control efforts in accordance with DAF guidelines, and in conjunction with neighbouring landowners.</p> <p>Update OAMP if required.</p>	<p>Review adherence to pest animal management actions.</p> <p>Investigate potential sources or reasons for an increase in pest animal numbers and rectify.</p> <p>Increase the frequency or revise the type of invasive pest animal control efforts in accordance with DAF guidelines, and in conjunction with neighbouring landowners.</p> <p>Suitably qualified ecologist to review the OAMP within one month and update if required</p>
Unauthorised access	Access to the offset site by any unauthorised persons poses risks to the Ornamental Snake through habitat degradation (introduction of new weeds), incursion by feral herbivores if gates are left open, Ornamental Snake mortality through vehicle strike.	P	Mo	M	<p>All signs and fences will be erected within three months of the offset being legally secured.</p> <p>Signs will be erected at all entrances and potential access points to the site stating that access to the site is forbidden.</p> <p>Fences will be maintained to prevent unauthorised access, to minimise incursions by feral</p>	U	Mo	L	<p>No unauthorised access to the offset site.</p>	<p>Evidence of unauthorised or unplanned access by persons, vehicles, and/or stock is detected during exclusion periods.</p> <p>Evidence of stock is detected at any point during exclusion times.</p>	<p>Upon being notified or becoming aware of prohibited access to the offset area, the approval holder is to reassess access protocols and signage and general access within one fortnight.</p> <p>Damage to signage will be repaired within one month of noting the damage.</p>	<p>Monitoring of fence lines will be undertaken by the Landholder or suitable qualified person appointed by the approval holder within 3 months of the offset area being legally secured and during quarterly inspections.</p>

<sup>5</sup> <https://www.daf.qld.gov.au/business-priorities/plants/weeds-pest-animals-ants>

Risk Event	Risk Description	Initial Ranking			Management Measures / Actions	Residual Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Risk <sup>3</sup>		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Risk <sup>3</sup>				
					herbivores and to control stock presence.					Damage is detected to any fence or sign.  If there are areas that have been negatively impacted by unauthorised access, the areas will be allowed to naturally regenerate and those areas will be added to the ongoing monitoring sites.  Signage will be repaired and maintained as required by the Landholder or suitable qualified person appointed by the approval holder.	Inspections will monitor and document damage or loss of signs and evidence of unauthorised access to the offset area.	
Bushfire (unplanned)	If unchecked bushfire may degrade some or all of the offset site and increase related risks such as erosion.  Fire late in the management period would also reduce the environmental improvement achieved at the offset site.	P	H	M	Controlled burns will be undertaken in consultation with the land manager and in accordance with the recommended fire management guidelines for Regional Ecosystems and will involve a range of burn strategies including patchwork burns.  Fire is to be excluded from the offset area except for planned and strategic burns as required to reduce understorey fuel loads having a detrimental impact on canopy tree recruitment and establishment and to maintain existing fire breaks.  Create firebreaks around the offset area boundary to minimise unplanned fire from adjacent lands. Utilise natural firebreaks (e.g. creek lines) where possible.	U	H	M	No unplanned fire with the offset area.	Unplanned fire within the offset area.  Planned fires become out of control or the required burning regime is not achieved.  Habitat Quality assessments indicate native grass groundcover is >15% above benchmark levels for each assessment unit (see section 7.7 and Table 15).	Occurrences of fire are to be recorded during the visual inspections undertaken during routine land management.  If an uncontrolled bushfire has impacted the offset area (including if controlled burning becomes out of control), review the grazing management and fire management strategies and adherence to these strategies and exclude cattle for nominally at least three months (depending on conditions for re-growth). All fire breaks will be inspected, maintained, and repaired if required.  To ensure compliance with performance criteria, undertake remedial action including:  Alteration to stocking rates, and/or duration and	Fire breaks are to be inspected annually in September  Visual inspection of signs of fire during routine land management and during the habitat quality assessments.  Fuel loads will be monitored via ground cover estimates as assessed during habitat quality monitoring and will inform fire management strategies.

Risk Event	Risk Description	Initial Ranking			Management Measures / Actions	Residual Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Risk <sup>3</sup>		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Risk <sup>3</sup>				
					Firebreaks are to be co-located, where possible, with roads, fence lines and vehicle access tracks. No areas of Ornamental Snake will be cleared unless necessary for safety management.						frequency of strategic grazing events; and/or  Amendments to fire management practices as required including fire safety and containment management.  Suitably qualified ecologist to review the OAMP within one month and update if required.	
Offset fails to achieve the interim performance targets and completion criteria within the 5, 10, 15 and/or 20-year time intervals.  Offset site initially achieves the completion criteria but declines before the end of the approval.	The offset site has not met the requirement of the offset policy or this OAMP, nor achieved the outcomes that were key to the rationale for the approval decision.	U	C	H	The Voluntary Declaration under the VM Act will ensure that the landholder remains obliged to undertake active management of the offset until all completion criteria are achieved, leading to further management.	U	Ma	H	Completion criteria are achieved, by the timeframes established and maintained through to the end of the approval.	Interim performance targets are not achieved by year 5, 10 or 15.  Completion criteria are not achieved by year 20.	Within one month of detection of the trigger, complete an investigation into the reasons why the interim performance targets or the completion criteria were not achieved within the specified timeframes. This investigation must re-evaluate the suitability of the relevant management actions and identify appropriate corrective actions.  As soon as practicable, and within six months of detection of the trigger, implement revised corrective actions. These may include (but not limited to):  <ul style="list-style-type: none"> <li>Increasing the frequency and intensity of pest animal and weed control measures or revising the type of measures to be implemented.</li> <li>Modify fire management measures, to better</li> </ul>	Monitoring of the offset area will be undertaken in accordance with this OAMP.  Monitoring results will be compared against the interim performance targets and completion criteria to assess progress of offset area in achieving the requirements of this OAMP.

Risk Event	Risk Description	Initial Ranking			Management Measures / Actions	Residual Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Risk <sup>3</sup>		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Risk <sup>3</sup>				
											support enhancement of offset values. <ul style="list-style-type: none"> <li>If the investigation outlined above requires changes to the management actions, then as soon as possible, and within six months of detection of the trigger, implement a revised OAMP, as approved by the Minister, incorporating those recommended changes.</li> <li>Alternative and/or additional offsets may need to be sought by the approval holder, and approved by the Minister, should the above corrective actions not be successful.</li> </ul>	
<b>Force Majeure Events</b>												
Drought	The risk posed by drought is a decrease in groundcover, an increase in the likelihood of unplanned fire due to the dry conditions from lightning strikes and an increase in weed cover when rainfall is received.  Reduced/ retarded plant growth may be expected, depending on the severity of drought. This may prevent or affect achieving interim performance targets or the completion criteria within the 20-year period.	P	Mo	M	Limited mitigation measures can be implemented.  Should the offset be deemed by the approval holder or the Department to have been delayed, all parties will work together to determine an appropriate response, including extending timeframes for completion criteria to be met.	P	Mo	M	Achievement of 20-year completion criteria.	Drought declaration.	Allow offset area to recover post drought, particularly through the control of weeds as per section 6.7.  Exclude stock grazing until groundcover improves to benchmark levels immediately prior to the annual grazing period.  Within one month of determining that the outcomes of the OAMP are likely to be delayed, consultation between Stanmore, the land manager and DCCEEW will	The annual offset compliance report will document vegetation condition and report on drought impacts.

Risk Event	Risk Description	Initial Ranking			Management Measures / Actions	Residual Ranking			Performance Criteria	Management Triggers	Corrective Actions	Monitoring Mechanisms
		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Result <sup>3</sup>		Likelihood <sup>1</sup>	Consequence <sup>2</sup>	Result <sup>3</sup>				
											be undertaken to develop an appropriate response, which may include extending timeframes for completion criteria.	
Cyclone/ severe tropical lows/ flooding	<p>The most significant impact from tropical cyclones or tropical lows is typically flooding and destruction of habitat</p> <p>The season for such weather events is between December and April.</p>	L	Mo	M	<p>Limited mitigation measures can be implemented.</p> <p>Part of the offset site is relatively flat and may experience flooding from the nearby waterways. However, cyclones and severe tropical lows are relatively infrequent (although likely to occur at some point during the life of the offset). Although flooding is not expected to be of sufficient duration, wind speed has the potential to be severe and may cause substantial long-term harm to the site. Additionally, the increased availability of soil moisture following flood is expected to increase the growth rates of vegetation, and thus facilitate repair to damage to vegetation, following subsidence of flood waters.</p> <p>Increased soil moisture may assist weed growth. The subsequent monitoring event (as per section 7.0) will include groundcover survey to detect any areas of increased weed density.</p>	L	Mi	L	<p>The subsequent monitoring event (as per section 7.0) will include habitat quality surveys and supplemented habitat features assessments, as soon as is safe and reasonably practicable to do so following any cyclone or flood. Appropriate weed management measures will be implemented, as required.</p>	Any incident of cyclone or flood impacting the site.	As soon as reasonably practicable and safe following the cyclone or flood, undertake a monitoring event and implement management measures as required. This may include additional placement of Ornamental Snake habitat features as determined by suitably qualified ecologists.	<p>The annual offset compliance report will document vegetation condition and report on cyclone/ flood impacts.</p> <p>Notification to DCCEEW if substantial damage to offset area from cyclone or flood, to report as an incident.</p>

<sup>1</sup> HI - Highly Likely; L - Likely; P - Possible; U - Unlikely; R - Rare

<sup>2</sup> Mi - Minor; Mo - Moderate; H - High; Ma - Major; C - Critical

<sup>3</sup> L - Low; M - Medium; H - High; S - Severe

## 10.0 References

- BASE, 2021. *Isaac Downs - Offset Area Management Plan: EPBC 2019/8413*, Brisbane: Base Consulting Group.
- BASE, 2023. *Denham Park Ornamental Snake Survey Technical Note*, s.l.: s.n.
- BOM, 2022. *Northern Rainfall Onset Outlook*. [Online] Available at: <http://www.bom.gov.au/climate/rainfall-onset/#tabs=Normal-onset&tabs2=Outlook> [Accessed 19 September 2022].
- Cogger, H., 2000. *Reptiles and Amphibians of Australia - 6th Edition*. Sydney: Reed New Holland.
- Cogger, H., Camerson, E., Sadlier, R. & Egger, P., 1993. *The action plan for Australian Reptiles*, Canberra: Australian Nature Conservation Agency.
- DAF, 2020a. *Fact sheet: Wild dog (Canis familiaris)*, Brisbane: Department of Fisheries and Agriculture.
- DAF, 2020b. *Feral pig (sus scrofa)*, Brisbane: Department of Agriculture and fisheries.
- DAF, 2020c. *Fact sheet: Feral cat (Felis catus)*, Brisbane: Department of Fisheries and Agriculture.
- DAF, 2021. *Fact sheet: Rabbit (Oryctolagus cuniculus)*, Brisbane: Department of Fisheries and Agriculture.
- DAF, 2022. *Fact sheet: Cane toad (Rhinella marina)*, Brisbane: Department of Agriculture and Fisheries.
- DAWE, 2012. *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*, Canberra: Department of Agriculture, Water and the Environment.
- DAWE, 2022. *Species Profile and Threats Database - Denisonia maculata*. [Online] Available at: [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=1193](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1193)
- DCCEEW, 2022. *Species Profiles and Threats Database*. [Online] Available at: [https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=1193](https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1193) [Accessed 28 September 2022].
- DERM, 2010. *Land Manager's Monitoring Guide: Ground cover indicator*, Brisbane: Department of Environment and Resource Management.
- DES, 2017. *Guide to determining terrestrial habitat: A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy Version 1.2*, Brisbane: Department of Environment and Science.
- DES, 2017. *Method for mapping Matters of State Environmental Significance: for the State Planning Policy 2017. Version 4.0*, Brisbane: Department of Environment and Science.
- DES, 2018. *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland Version 3*, Brisbane: Queensland Herbarium, Department of Environment and Science.
- DES, 2020. *Guide to determining terrestrial habitat quality: Methods for assessing habitat quality under the Queensland Environmental Offsets Policy Version 1.3*, Brisbane: Offsets Policy, Conservation Policy and Planning, Department of Environment and Science.
- DES, 2020. *Method for mapping Matters of State Environmental Significance: for the State Planning Policy 2017. Version 6.0*, Brisbane: Department of Environment and Science.
- DES, 2021. *Remnant vegetation cover - 2019 - Queensland*. Brisbane: Department of Environment and Science.
- DoEE, 2018. *Guidelines for biological survey and mapped data*, Canberra: The Australian Government.

- DSEWPC, 2011a. *Survey guidelines for Australia's threatened reptiles*, Canberra: Australian Government.
- DSEWPC, 2011b. *Environment Protection and Biodiversity Conservation Act 1999 - Draft Referral guidelines for the nationally listed Brigalow Belt reptiles*, Canberra: Australian Government.
- ECOSM, 2020a. *Biodiversity offsets strategy - Isaac Downs Project*, s.l.: Prepared for Stanmore IP South PTY LTD.
- ECOSM, 2020b. *Terrestrial Ecology Impact Assessment Report: Isaac Downs Project*, Brendale: Ecological Survey and Management.
- ELA, 2015. *Species Management Plan - Carmichael Coal Mine and Offsite Infrastructure (Prepared for Adani Mining Pty Ltd)*, Brisbane: Eco Logical Australia.
- EMM, 2022. *Matters of National Environmental Significance (MNES) Assessment Report: QPM Energy Project (Draft in progress)*, Brisbane: EMM.
- Eyre, T. et al., 2018. *Terrestrial Vertebrate Fauna Survey Assessment Guidelines for Queensland*, Brisbane: Department of Environment and Science, Queensland Government.
- Eyre, T. et al., 2022. *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland Version 4.0*, Brisbane: Department of Environment and Science, Queensland Government.
- Eyre, T. et al., 2015. *A Condition Assessment Framework for Terrestrial Biodiversity in Queensland Version 2.2*, Brisbane: Department of Environment and Science, Queensland Government.
- McDonald, K., Covacevich, J., Ingram, G. & Couper, P., 1991. The status of frogs and reptiles. In: *An atlas of Queensland's Frogs, Reptiles, Birds and Mammals*. Brisbane: Queensland Museum, pp. 223-245.
- Nalder, V. J. et al., 2020. *Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland*, Brisbane: Queensland Herbarium, Queensland Department of Environment and Science.
- Neldner, V. et al., 2020. *Methodology for Survey and Mapping of Vegetation Communities and Regional Ecosystems in Queensland Version 5.1*. s.l.:State of Queensland.
- Queensland Herbarium, 2021. *Department of Environment and Science*. [Online] Available at: <https://www.qld.gov.au/environment/plants-animals/biodiversity/benchmarks>
- Queensland Herbarium, 2021. *Regional Ecosystem Description Database (REDD). Version 12*, Brisbane: Department of Environment and Science.
- TSSC, 2014. *Approved conservation advice for Denisonia maculata (Ornamental Snake)*, Canberra: Department of the Environment.

## Appendix A

# Species Habitat Scoring Attributes

## Ornamental Snake (*Denisonia maculata*)

### 1. Quality and availability of foraging habitat

Indicator	Description			Score
Presence, abundance and variety of gilgai	<b>5</b> Sparse, isolated gilgai with minimal surrounding deep cracking soil or no gilgai present	<b>20</b> Multiple gilgai present within assessment unit with some variety of depth and size. Deep cracking soil present.	<b>40</b> Abundant connected gilgai with a variety of size and depth.	<b>40</b>
	<b>1</b> Cleared paddocks dominated by exotic grass species.	<b>7</b> Regrowth vegetation with some areas of leaf litter and woody debris.	<b>15</b> Remnant or advanced regrowth with abundant areas of deep leaf litter, coarse woody debris and native tussock grasses.	
Vegetation structure				<b>15</b>
<b>Total</b>				<b>55</b>

#### Rationale

The species appears to be a habitat specialist with few records occurring outside of gilgai and cracking clay habitats. This species is most commonly found in vegetation communities that occur on Cainozoic clay plains, with REs 11.4.3, 11.4.6, 11.4.8 and 11.4.9 representing the most common Regional Ecosystems in which this species has been recorded (DAWE, 2020). This species has also been recorded on REs 11.3.3 and 11.5.16 (DAWE, 2020), as well as RE 11.9.5 and non-remnant vegetation where gilgai are prevalent (Marston *pers comms*). The capacity of soils within gilgai systems to form deep cracks and retain ponded areas following rainfall, appears to be the main criteria for the distribution and preferential selection of gilgai habitats by the species (Veary et al., 2011).

The diet of this species consists predominately of frogs and particularly frogs of the *Cyclorana* genus (TSSC, 2016). The prey species of Ornamental Snake are associated with gilgai, cracking clay soils and ephemeral water bodies. As an example, a high abundance of snakes at a site near Nebo was observed to coincide with an abundance of young frogs emerging from an ephemeral pool (DAWE, 2020).

The quality of gilgai habitat will be assessed during field surveys and will be determined by assessing the presence, abundance and variety of gilgai habitat within an assessment unit. Gilgai presence will require consultation of current and historic aerial photographic imagery and walking areas of the assessment unit with apparent gilgai formations. This indicator will be measured qualitatively based on the combination of size, depth, bank angle and vegetation structure of gilgai within the assessment unit.

Assessment units that show no indication of gilgai and cracking soils and are not on land zone 4 (with an exemption for gilgai formations on land zone 9) will not be considered suitable habitat for the species.

## 2. Quality and availability of habitat required for shelter and breeding

Indicator	Description			Score
<b>Presence, abundance and variety of gilgai habitat</b>	<b>Low (0)</b> Sparse, isolated gilgai with minimal surrounding deep cracking soil.	<b>Moderate (5)</b> Multiple gilgai present within assessment unit with some variety of depth and size. Deep cracking soil present.	<b>High (10)</b> Abundant connected gilgai with a variety of size and depth. Abundant areas of deep cracking soil.	<b>10</b>
<b>Presence of ground timber, deep leaf litter and tussock grass</b>	<b>Low (1)</b> Sparse tussock grass and coarse woody debris	<b>Moderate (3)</b> Moderate abundance of tussock grass and coarse woody debris across the patch	<b>High (5)</b> Abundant tussock grass and coarse woody debris particularly adjacent or close to gilgai	<b>5</b>
<b>Total</b>				<b>15</b>

### Rationale

The species is known to seek refuge during dry periods in deep cracking clay associated with gilgai habitat (DAWE, 2020). The species is not known to leave gilgai habitat for breeding purposes. The presence and abundance of gilgai habitat within an assessment unit is the most important characteristic of quality and availability of habitat required for shelter and breeding. While the habitat conducive to the species is likely to be governed by underlying soil, in periods of extreme rainfall the species has been observed utilising the dense cover of tussock grasses for diurnal shelter (Veary, 2011). The species is also thought to shelter in logs and under coarse woody debris and ground litter (DAWE, 2020).

Both of these indicators will be determined during field survey assessments through habitat quality plots and visual qualitative assessments.

### 3. Quality and availability of habitat required for mobility

Indicator	Description			Score
<b>Presence, abundance and variety of gilgai</b>	<b>Low (1)</b> Sparse, isolated gilgai with minimal deep cracking soil present	<b>Moderate (5)</b> Multiple gilgai present within assessment unit with some variety of depth and size. Deep cracking soil present.	<b>High (10)</b> Abundant connected gilgai with a variety of size and depth.	<b>10</b>
<b>Patch size</b>	<b>Low (1)</b> No adjacent suitable habitat. Habitat patch <10 Ha.	<b>Moderate (3)</b> Some adjacent suitable habitat. Habitat patch >10 Ha.	<b>High (5)</b> Significant adjacent suitable habitat. Habitat patch >20 Ha.	<b>5</b>
<b>Total</b>				<b>15</b>

#### Rationale

A study conducted in Central Queensland in 2009 found that the species is primarily restricted to gilgai habitat and does not move in or out of adjacent habitats during seasonal variation of conditions (Veary et al., 2011). Therefore, the abundance, variety and connectivity of gilgai habitat within an assessment unit is a vital aspect of habitat quality required for mobility. Sites where the species have been recorded in abundance are also in habitat patches that are typically greater than 10 hectares in area and are within or connected, to larger areas of remnant vegetation (DAWE, 2020).

### 4. Absence of threats

Indicator	Description			Score
<b>Potential for habitat loss or fragmentation</b>	<b>High (1)</b> Habitat within the assessment unit is located in an area that is likely to be degraded for infrastructure of agriculture.	<b>Moderate (3)</b> Habitat within the assessment unit is located in an area that will be potentially degraded.	<b>High (5)</b> Habitat within the assessment unit not likely to be degraded.	<b>5</b>
<b>Presence and abundance of livestock or feral pigs</b>	<b>High (1)</b> Livestock or pigs abundant with obvious ground compaction and over grazing in gilgai habitat.	<b>Moderate (3)</b> Livestock or pigs present in moderate to low numbers with some indications of ground compaction	<b>High (5)</b> Livestock or pigs not present	<b>5</b>

		and grazing in gilgai habitat.		
<b>Presence and abundance of Cane Toads</b>	<b>High (1)</b> Cane toads present throughout habitat. Toad tadpoles present in standing water.	<b>Moderate (3)</b> Occasional mature cane toads observed.	<b>High (5)</b> No Cane Toads observed.	<b>5</b>
<b>Total</b>				<b>15</b>

### *Rationale*

The Approved Conservation Advice for the species (TSSC, 2016) lists the main threat identified to the Ornamental Snake is a continued legacy of past broadscale land clearing and habitat degradation. As the species appears to reside at shallow depths within the soil profile, any process which disturbs the land form of gilgai habitats such as clearing, ploughing or the development of access tracks has the potential to significantly impact the species (Veary et al., 2011). The species is highly susceptible to the impacts of cattle grazing during periods when gilgai support water as cattle access can significantly alter the structure and integrity of gilgai form and function (Veary et al., 2011). The destruction of wetland habitats by feral pigs is also likely a threat (TSSC, 2016). The species has been observed to persist in areas where Cane Toads are present, however the species is susceptible to the Cane Toad toxin and death is highly likely if a Cane Toad is bitten or consumed (Veary et al., 2011)

The risk habitat loss, fragmentation and degradation will be determined by assessing the state and federal status of the vegetation which defines an assessment unit. Threatened regional ecosystems (state) and threatened ecological communities (Commonwealth) have a greater level of legislative protection and hence the likelihood of that patch being cleared is reduced. There are numerous factors that can contribute to the degree of risk that an assessment unit might be cleared, such as;

- the vegetation within the assessment unit is on freehold land and is listed as Category X (non-remnant vegetation) or Category B (remnant vegetation),
- the assessment unit is located under an existing PMAV,
- the assessment unit is located on a mining lease or within an infrastructure corridor.,
- the assessment unit is protected under an approved offset management plan and tenure arrangement.

This indicator will be determined through desktop analysis of relevant local, State and Commonwealth databases.

The presence and abundance of cattle, feral pigs and Cane Toads will be estimated by indicators such as direct observation, scats and tracks during field surveys.

*References*

- DAWE. (2020). *Denisonia maculata SPRAT Profile*. Department of Agriculture, Water and the Environment, Australian Government, Canberra. [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=1193](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1193).
- Marston, S (2010). *Personal Communication*. Brendale, Queensland: Ecological Survey & Management.
- Veary, A. T, Veary, E. L., Burgess, J and Fell, D. (2011). Assessment of Habitat Characteristics as Predictors of Habitat Suitability for the Threatened Ornamental Snake. Unpublished report and on-going research on behalf of the Australian Coal Association Research Program, Research Project C15044.

## Appendix B

# Suitably Qualified Ecologist CVs

### Training/Qualifications:

Erosion and Sediment Control IECA recognised training course, 2017

Lead Auditor- Integrated Management Systems: Quality, Environmental Management and Health and Safety, 2016

Post-doctoral Research Fellow, Miami University, Ohio, USA, 2004-2008 – Behavioural Ecology, Habitat Utilisation and Behavioural Genetics of Prairie Voles.

Doctor of Philosophy, (Ecology) Queensland University of Technology, 2009 – Population Biology, Habitat Utilisation and Population Genetics of the Giant White-tailed Rat

Bachelor of Science (1st Class Hons) (Environmental Science and Ecology), Griffith University, QLD, 2000 – Population Biology and Space Use of the Giant Barred Frog and Great Barred Frog.

Dr Craig Streatfeild is a Principal Environmental Scientist with over 20 years' experience in providing leadership and technical expertise in environmental impact assessments, environmental legislation, permitting and approvals, preparation of environmental management plans and environmental management, monitoring, compliance, fauna and flora assessments and mitigating impacts to fauna. Craig has been trained in quality, environmental management and health and safety systems auditing, erosion and sediment control and conflict resolution.

Although vertebrate population ecology (primarily for amphibians and small mammals/rodents), habitat utilisation and habitat fragmentation is Craig's initial area of expertise where he has extensive research experience with endangered species, particularly frogs and small mammal species, Craig has in recent years focused on delivering infrastructure, resource and development projects from early planning inception to final construction delivery including environmental impact assessments statements (EIA and EIS), post EIA/EIS tier 2 approvals, environmental offsets, environmental management plans and environmental compliance and ongoing compliance monitoring. Craig is also heavily involved in government liaison including negotiating approvals conditions, approval exemptions as well as project management, project development and delivery, coordination and management of multidisciplinary environmental impact assessments and monitoring programs and post EIA/EIS project approval processes.

Craig has extensive experience with environmental and biodiversity offsets and environmental approvals and permitting and has a strong understanding of the permitting requirements associated with a range of industries through his role as Environmental and Approvals Manager for the Rookwood Weir Project (Sunwater), Environmental Team Lead for the Road Relocations Design Phase of the Traveston Dam Project, Environmental Team Lead for the Goonyella to Abbott Point Rail Project, Environmental Approvals Advisor for various components of the QCLNG Project Stages, Project Manager for over 30 EIAs including strategic approvals pathway advice. These projects also required liaising with numerous stakeholders (such as design teams, client representatives and local, state and commonwealth government agencies) and preparing and maintaining approvals and compliance management registers.

Craig has also undertaken numerous environmental assessments primarily ecological and fauna related but also for soils, surface water and sediment and groundwater.

## RECENT PROJECT EXPERIENCE

**Fitzroy to Gladstone Pipeline (FGP).** The FGP is being delivered by the Gladstone Area Water Board (GAWB) and includes the design and construction of a 116 km long pipeline. Craig's involvement is providing approval and environmental support as part of the project team. Key tasks include reviewing and providing technical input into third party development applications, ecological assessment reports, preparing offsets documentation and liaising with a range of stakeholders including Federal and State Government agencies.

**Rookwood Weir Environmental Approvals and Compliance.** Environmental and approvals manager for the project. Initial works including a detailed GAP analysis and approvals and compliance matrices that assessed all required approvals including exemptions. Works involved managing and coordinating the development of all tier 2 approvals as well as authoring and/or providing technical reviews for a range of key secondary approvals associated with the Water Act, Vegetation Management Act, Environmental Protection Act, Nature Conservation Act, Fisheries Act and Local Government Planning Schemes.

Craig also managed and coordinated the development of compliance documentation to address EIS approval conditions and liaised with State and Commonwealth government departments in relation to amending current EIS approval conditions including biodiversity offsets and preparing EIS change reports for the Coordinator General. Craig was also heavily involved in preparing a detailed and strategic overarching offsets strategy that incorporated terrestrial, water quality and aquatic offsets and preparation of Offset Delivery Plans.

**Private Landowner Species Management Plans and Offset Management Plan.** Prepared and managed the species management plan (Cth), species management program (State) and offset management plan (Cth) to address an expansion of the current high-value agricultural practices as required by Commonwealth approval requirements for a range of EVNT species.

**Stanmore Coal Offset Management Plans and Offset strategies.** Prepared and managed species management plans (Cth), species management programs (State) and offset management plans (Cth) to address both State and Commonwealth approval conditions for a range of projects and EVNT species.

**Tier 2 approvals for private developments.** Prepared and managed the approval process for a range of tier 2 approvals for several private developments in and around Hervey Bay.

**Confidential Industrial Land Investigation for a Queensland State Government Department.** Reviewed and provided input into the required approvals associated with the project.

**Confidential Impact Assessment Investigation for a Privately-Owned Quarry.** Undertook detailed assessment for the presence of the Endangered Giant Barred Frog and habitat assessments for the species as part of presumed illegal disturbances.

**Confidential Infrastructure Corridor for Investigation for a Queensland State Government Department.** Technical review of the advice documentation, including likely approvals for a multi-user linear infrastructure corridor for the co-location of water, power and rail.

**Abbot Point Strategic Port Land Use Planning and Statutory Approvals.** Technical review of the post EIS approvals required including operational works applications and the requisite assessments required to support approval documentation.

**Metro Mining Bauxite Hills Bauxite EIS.** Projected managed and co-authored the EIS for submission to Queensland's EHP and the Commonwealth's DoEE for a bauxite mining operation in north Queensland. Works involved assessing and addressing impacts to a range of environmental factors as well as determining the scope of the post EIS approvals that were likely to be required. The project also

involved submission of an EPBC referral to the DoEE for both marine and terrestrial MNES and the development of an overarching environmental offsets advice statement.

**Metro Mining Skardon River Bauxite Project.** Authored and reviewed management plans as required by the project's approvals conditions including the overarching environmental management plan and an offsets delivery plan advice statement.

**Shandong Energy Hillalong Coal Mine EIS.** EIS and management plans lead author and project manager for the project that involved an open cut and underground mine, haul road and train load out facility. Responsibilities also included Government liaison with both State and Commonwealth Departments and identification of post EIS tier 2 approvals and likely management plans.

**Metro Mining Bauxite Hill Bauxite Mine Site Specific Environmentally Relevant Activity Impact Assessment.** Project Managed and co-authored the environmental assessment and management plans which involved submission to EHP of a Site-Specific EA application for a bauxite mining operation in north Queensland. EHP subsequently decided that an EIS was required for this project.

**Bandanna Energy's EIA Projects.** Lead author, EIS coordinator and project manager for the Springsure Creek Coal Mine project that involved several Site-Specific EAs, an EIS under the *Environmental Protection Act 1994* and a Commonwealth EIS. Works also involved assessment of likely post EIS approvals and management plans associated with a water offtake pipeline.

**Adani T0 Abbot Point Port Expansion.** This project involved a Commonwealth EIS for the development of a new port berth at the existing Abbot Point in north Queensland. Craig was the lead technical reviewer of several technical reports and associate chapters including marine ecology, terrestrial ecology and coastal processes.

**MetroCoal Bundi EIS Project.** Lead author, EIS coordinator and project manager for the Bundi Underground Coal Mine project. Part of Craig's involvement also included submission of an EPBC referral to the then SEWPaC and advice on the likely post EIS approvals and management plan required.

**QCLNG Project.** Approvals and environmental team lead for the consultant engaged by the principal contractor involved in delivering the Narrows component of the gas export pipeline. The role involved coordination of permits and approvals downstream of the EIS and EA, coordination of environmental issues including relating to the preparation of environmental management plans, preparation of environmental approvals and liaison with assessment officers within various state government agencies.

**CoalConnect Northern Missing Link Rail Project.** This project involved connecting the current Goonyella and Newlands rail lines and upgrading the existing Newlands to Abbot Point section. Craig's involvement initially included ecological environmental assessments and which later progressed the Environmental Team Leader for the design phase of the project This entailed coordinating all environmental related issues including undertaking environmental assessments, technically reviewing environmental assessment reports under QRs EPPM process (PEPAs, EPSs, EMPs, DRs), preparation of environmental approvals and liaison with QR's environmental and approvals managers and assessment officers within various state government agencies.

**Road infrastructure for the Traveston Crossing Dam, Queensland.** This multifaceted project involved the upgrade, realignment and construction of numerous roads that would be inundated during Stage 1 of the dam. Craig was lead author for two several REFs and management plans as well as numerous approvals/permits under Queensland State Legislation.

## **EMPLOYMENT HISTORY**

AUGUST 2018 TO PRESENT – SECONDMENT TO SUNWATER – Environment and Approvals Manager for the Rookwood Weir.

AUGUST 2017 TO AUGUST 2018 – SECONDMENT TO GAWB – Environment and Approvals Manager for the Rookwood Weir.

JUNE 2017 TO CURRENT – BASE CONSULTING GROUP PTY LTD, BRISBANE – Principal Environmental Scientist.

MAY 2011 TO MAY 2017 – CDM SMITH AUSTRALIA PTY LTD, BRISBANE – Associate Environmental Scientist in the Environment and Approvals Team.

MAY 2007 TO MAY 2011 – KELLOGG BROWN & ROOT PTY LTD, BRISBANE – Senior Environmental Scientist in the Environment, Planning and Water Resources Group.

2004 TO 2007 – MIAMI UNIVERSITY, OXFORD, OHIO, USA – Postdoctoral Reserch Fellow.

### Training/Qualifications:

Bachelor of Science , University of Queensland 1997

BAM accredited (NSW) Assessor Number BAAS19022

Apply/Senior First Aid and CPR

RIIVFH (201B) Operation of light Vehicle

Standard 11 Generic Coal Induction

AHC BIO201 Insect and clean machinery for plant, animal and soil material.

### Specialisation

Ecological surveys (Terrestrial and aquatic environments).

EVNT flora and fauna survey and monitoring for linear, residential and port infrastructure projects.

### Years in industry

20

Andrew is a senior ecologist with over 20 years of practical experience in the areas of flora and fauna surveys throughout New South Wales, Queensland, and the Northern Territory. Andrew's main area of expertise is the identification and classification of flora and fauna and the management of threatened species and communities as listed under the *Environment Protection and Biodiversity Conservation Act 1999*, *Nature Conservation Act 1992* and *Vegetation Management Act 1999*.

Andrew has significant experience in some of New South Wales, and Queensland's largest infrastructure projects including coordinating geotechnical surveys for rail, power and gas projects, on-ground flora assessments and development of weed and vegetation management and rehabilitation strategies.

### Relevant Projects

- FFJV Inland Rail (Northstar to Border) vegetation assessment for Borrow pit areas. Surveys required identifying vegetation types in proposed borrow pit areas and assessing using the NSW BAM assessment and reporting methodology.
- FFJV Inland Rail Geotechnical clearances and Protected Plant surveys. Surveys required identifying potential EVNT flora species that may occur within the proposed alignment and assessing geotechnical test locations for the presence/absence of identified flora species
- Flora and fauna surveys at three (3) proposed mine sites within the Emerald region. Surveys included identification of EPBC listed threatened ecological communities, identification of state and federal EVNT flora and fauna species and assistance in establishment of fauna trapping and flora monitoring programs.
- Establishment and monitoring of EVNT translocation program for *Marsdenia coronata* within the Springfield development area. This project involved the development of translocation methodology in conjunction with nursery staff, identification and marking of in-situ plants of *Marsdenia coronata* prior to translocation, development of salvage requirements in conjunction with nursery staff and the pre- and post-translocation health monitoring of transplanted individuals within the recipient site at Mardenia Lookout Springfield.
- Ecological Assessment Report and Protected Plant survey for future road widening in Gutchy creek area within the Gympie region for DTMR. Surveys identified the presence of *Samadera bidwillii* within the proposed works footprint resulting in submissions to relevant state and federal departments.

## **Project Experience**

### **July 2019 to present**

#### **Base Consulting Group**

##### **Senior Ecologist**

Vegetation clearances for geotechnical surveys for Adani rail feasibility investigations.

Determination of vegetation values for state offsets within Bowen region.

EVNT Flora and fauna surveys and waterway assessments for 1200km linear infrastructure project within northern Queensland.

Ecological assessment reports and Biodiversity and Offset management plans for Stanmore Coal Pty Ltd

Bird and bat management plans, vegetation assessment and ecological assessment reports for proposed windfarm in northern Queensland.

### **October 2018 to July 2019**

#### **Aurecon Australasia Pty Ltd, Brisbane, Australia**

##### **Senior Ecologist**

FFJV Inland Rail Geotechnical clearances and Protected Plant surveys. Surveys required identifying potential EVNT flora species that may occur within the proposed alignment and assessing geotechnical test locations for the presence/absence of identified flora species

FFJV Inland Rail (Northstar to Border) vegetation assessment for Borrow pit areas. Surveys required identifying vegetation types in proposed borrow pit areas and assessing using the NSW BAM assessment and reporting.

Firebreak ecology field survey and reporting at Abbott Point Coal terminal Bowen. Survey involved the identification of vegetation within the proposed firebreak and determining clearing requirements for its construction.

Protected Plant Surveys, Ecological Assessment Reports and Rehabilitation Plans for NBN towers throughout South-east Queensland.

Ecological Assessment Report and Protected Plant survey for future road widening in Gympie region for DTMR.

Ecological Assessment Report for SunCoast Power Project as part of a Ministerial Infrastructure Designation Amendment.

### **July 2010 to October 2018**

#### **Saunders Havill Group**

##### **Senior Ecologist**

Vegetation clearances for geotechnical surveys for Adani rail feasibility investigations.

Vegetation clearances for geotechnical surveys for Alpha coal mine.

Field assessment for EPBC referrals and Offset reports.

Nature Conservation Act protected plant surveys throughout Queensland.

Monitoring of EVNT translocation programs for *Masdenia coronata* and *Melaleuca irbyana* within the Springfield and Ipswich Regional Council areas.

Ecological equivalence assessments for biodiversity offsets.

Flora and fauna surveys along 270km of natural gas pipeline including mapping of EVNT species, weed distribution and verification of Regional Ecosystem mapping.

Flora and fauna surveys at three (3) proposed mine sites within the Emerald region. Surveys included identification of EPBC listed threatened ecological communities, identification of EVNT flora species and assistance in establishment of fauna trapping and monitoring.

Collection of flora field data utilising the Queensland Herbarium, "Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland".

Field survey and report preparation of Property Maps of Assessable Vegetation (PMAV's) for a number of development sites throughout Queensland.

Field survey and preparation of EVNT flora translocation plans including site survey, GPS mapping of populations and reporting and monitoring.

Preparation of extensive weed management plans for development and quarry sites in southern and central Queensland. Weed management plans included weed identification, comprehensive mapping of weed polygons, weed control strategies and reporting and monitoring.

Preparation of Quarry Rehabilitation Plans for sand and hard rock quarries in central and southern Queensland. Rehabilitation plans included site survey, soil amelioration methodologies, species requirements and spacing and monitoring and reporting.

Basic and comprehensive ecological assessment reports for development and ULDA site. Ecological assessments included identification of flora species, mapping of remnant and regrowth vegetation, wetland survey, weed identification and site ecological constraints analysis.

Preparation of code responses for vegetation clearing permits and koala SPRP reports including determination of offset requirements.

National, State and Local environmental searches including 'environmentally sensitive areas' mapping, regional ecosystem mapping, referable wetlands mapping, geological and soils searches, EPBC Protected Matters and Wildnet searches.

## **July 2007 to July 2010**

### **Australian Farm Forestry Pty Ltd**

#### **General Manager**

Coordination and management of over 35 staff including field and nursery staff.

The overseeing of the production of over 500,000 plants in the Australian Farm Forestry nursery facilities in 2009. Plants were utilised for revegetation/rehabilitation projects and forestry and carbon off-set plantations.

Preparation of Environmental Rehabilitation Plans, Environmental Management Plans, EVR Management Plans, Quality Management Policy and Procedures and OH&S Policy and Procedures.

Monitoring of cash flow, wages, time in motion studies and budgets for all nursery, revegetation, rehabilitation and forestry projects.

Ensuring all environmental works including rehabilitation and revegetation works comply with all local, state and federal legislation.

### **Training/Qualifications:**

Master of Environmental Science,  
University of New England, 2016

Bachelor of Applied Science  
(Natural Systems & Wildlife  
Management), University of  
Queensland, 1995

Certificate II Conservation and Land  
Management (Natural Areas  
Restoration), NSW TAFE, 2011

Regional Ecosystem training.

Bio-condition Assessment training.

Mining Standard 11 Surface  
Induction.

Industry Safety Induction (ISI) Gas  
Fields.

Apply/Senior First Aid and CPR  
RIIVEH (201B) Operation of light  
Vehicle

AHCMOM213 - Operate & Maintain  
Chainsaws & AHCPCM203 - Fell  
Small Trees

### **Specialisation**

Flora and fauna survey and  
monitoring for linear, residential and  
mine infrastructure projects.

### **Years in industry**

10

Jamie Ernst is a terrestrial ecologist with 10 years experience in the environmental field. He has significant experience with ecological surveys with a special focus upon flora surveys and endangered flora species. He has undertaken numerous ecology surveys for defence, mining, coal seam gas and infrastructure projects across Queensland and northern NSW. Working across multiple bioregions throughout Queensland Jamie has developed a strong focus in the ecology of Australian vegetation with an excellent working knowledge of the flora of Queensland. In addition, Jamie has been involved in all aspects of fauna management highlighting cross-disciplinary experience. During his early career, Jamie obtained considerable experience and expertise with the implementation of large scale restoration and rehabilitation projects within South East Queensland.

Jamie has experience in:

- Native and exotic plant species identification
- Vegetation assessments including Bio-condition assessment
- Protected plant surveys
- Weed surveys and mapping with ArcGIS, QGIS and fulcrum. Collecting and analysis of field data
- Fauna surveys including pitfall trapping, cage and Elliot traps, spotlighting, call playback and bird surveys
- Fauna habitat assessments
- Integrated management, including quality control, operating procedures and Workplace Health and Safety
- Report writing, proposal writing, daily field observation recording, photo monitoring and GPS data logging
- Ecological restoration approaches including natural regeneration, assisted regeneration and revegetation
- Using scientific methodology to develop and support site restoration approaches
- Site preparation, planting and maintenance of small and large-scale revegetation projects
- Manual and chemical control of a large range of weed species on range of vegetation types
- Ibis Management: including roost counts, landfill counts, landfill & roost dispersal and monitoring
- Remote area driving and recovery skills
- Leadership and time management.

# Project Experience

## October 2020 to present

### Base Consulting Group

#### Senior Ecologist

Site assessments throughout Queensland including BioCondition surveys, tree plots, Regional Ecosystem verification and mapping, quaternary, secondary and tertiary transects, fauna and flora species lists, protected plant searches, habitat value assessments, active searches for threatened flora and fauna, Property Maps of Assessable Vegetation (PMAV's), wetland and watercourse assessments, marine plant mapping and weed mapping.

Ground-truthing ecological values including threatened flora and fauna species, vegetation mapping within the Copperstring 2.0 alignment and spur lines between Townsville and Mt Isa. Provided ecology inputs to the revised Copperstring MNES report and supplementary EIS.

Ground truthing ecological values, species habitat assessments and BioCondition assessment of impact areas within the Powerlink Kidston-Genex alignment from Mount Fox to Kidston.

Pre-clearance surveys and reporting; weed and pest surveys; BioCondition Assessment; water quality, sediment and dust monitoring; and the development of the baseline monitoring condition report for Bowen Rail Company's Abbot Point rail maintenance and provisioning yard.

## March 2019 to October 2020

### AECOM Australia

#### Ecologist

Site assessments throughout Queensland including Bio-condition surveys, tree plots, Regional Ecosystem verification and mapping, quaternary, secondary and tertiary transects, fauna and flora species lists, protected plant searches, habitat value assessments, active searches for threatened flora and fauna, wetland and watercourse assessments, marine plant mapping and weed mapping.

Ground-truth vegetation communities, identify and record flora and fauna species, assess Matters of National Environmental significance and EPBC listed species habitat values, verify Ecologically Sensitive Areas, Threatened Ecological Communities, watercourses, wetlands within BHP Saraji East.

Marine plant mapping, tree plots, flora and fauna assessments, protected plant surveys for the Department of Transport and Main Roads in multiple locations throughout Queensland.

Ground-truthing ecological values including threatened flora and fauna species, vegetation mapping, Groundwater Dependant Ecosystems, Category B Environmentally Sensitive Areas and Threatened Ecological Communities at Ensham mine, Emerald.

Development / establishment of assessment sites and ongoing monitoring of terrestrial vegetation within QGC tenements – Wandoan / Taroom. Included the monitoring and ground-truthing ecological values, threatened flora species, vegetation mapping, Groundwater Dependant Ecosystems, and Threatened Ecological Communities.

Ground-truthing ecological values including threatened flora and fauna species, vegetation mapping for potential offset sites to determine the habitat quality of sites under the Queensland Environmental Offsets framework in Central Queensland for Arrow Energy.

Ground-truthing ecological values including threatened flora and fauna species, vegetation mapping of potential offset sites to determine the habitat quality under the Queensland Environmental Offsets framework in South East Queensland for EDQ.

Ground-truthing ecological values including threatened flora and fauna species, vegetation mapping, protected plant surveys for treatment plant infrastructure, Magnetic Island, Townsville.

Rehabilitation monitoring, BioCondition plot development and rehabilitation reporting Glencore – Clermont Mine, Clermont.

## **August 2017 to March 2019**

### **Ecosure**

#### **Ecologist**

Cane toad tadpole and adult control programs, Brisbane City Council. Construct and further develop cane toad tadpole trap designs. Develop and construct adult cane toad trap designs. Implement trapping programs, analysis and reporting of results.

Field survey and report preparation of Property Maps of Assessable Vegetation (PMAV's) for development applications within SE Queensland.

Completion of protected plant surveys within SE Qld for the proposed authorisation of timber harvesting operations within a state forest.

Completion of protected plant surveys to identify protected plants in glide path clearance areas at Gold Coast Airport.

Completion of protected plant surveys, detailed flora and fauna surveys to identify protected flora and fauna within a solar farm footprint, Toowoomba.

Ergon / Powerlink powerline easement inspections in central and north Queensland for the identification of exotic plants species, collection of field data and other legislative environmental requirements.

Bio-condition assessment of restoration areas within the Numinbah Valley Restoration project, Gold Coast hinterland.

Tree assessments within Northern NSW, including flora and vegetation survey - collection, analysis and reporting of results.

Australian white Ibis Dispersal, Southern Qld. Dispersal and roost counts at landfill sites, roost counts at nesting sites, egg and nest removal.

## **January 2012 to August 2017.**

### **Ecosure**

#### **Bush regeneration supervisor**

Vegetation and weed mapping for Department of Defence, Greenbank Training Area involving the collection of field data and the identification of native and exotic species.

Development and implementation of scientific trials to control exotic grasses in salt marshes on behalf of Brisbane City Council. Trial focused on suitable weed control approaches, timing, herbicide rates, monitoring and analysis of results, and development of a final report. On completion of trial, recommendations of report were implemented in ongoing restoration works for the recovery of the site. Presented findings at Restore, Regenerate, Revegetate conference; Armidale, February 2017.

Develop restoration action plans for site restoration and revegetation activities within Lockyer Valley and Stanley River. Coordinate restoration activity to improve stability and ecological value through vegetation management. Survey to identify native flora species present on Seqwater sites.

Coordinating the control of a large diversity of weeds across extensive areas in preparation for fire management and to support restoration goals at multiple defence sites, including Gallipoli Barracks, Borneo Barracks, Greenbank Training Area and Wide Bay Training Area. In addition, flora surveys were completed to identify native and weed species.

Coordinating the control of a large range of weed species across Brisbane City Council natural areas. A range of weed control techniques were required to balance a variety of weeds and habits in a range of situations. Flora surveys were conducted to establish native and exotic species presence onsite.

Collect field data, identification of native and exotic species and mapping of vegetation communities as part of the Mt Coot tha weed mapping project.

## Appendix C

# Denham Park Ornamental Snake Survey Technical Memo

# Denham Park Ornamental Snake Survey Technical Note

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Attn: Department of Climate Change, Energy, the Environment and Water (DCCEEW)

Client: Stanmore IP South

20/02/2023

Dear Carlos, Alice and Jeremy (cc Richard Oldham @ Stanmore)

## **RE: Interim findings of targeted ornamental snake surveys within Denham Park**

Base Consulting Group (BASE) was commissioned by Stanmore IP South (Stanmore) to conduct a targeted survey of the ornamental snake on the Denham Park property. This survey was undertaken to confirm the presence of the ornamental snake within the proposed Offset Area as outlined in the current Offset Area Management Plan (OAMP) for the Denham Park property that has been submitted to DCCEEW for review and approval. The OAMP details Stanmore's process to address the offset requirements related to the effects of Isaac Downs mine operations on the ornamental snake. The targeted survey was outlined in the OAMP as occurring within the first year following approval of the OAMP. Although approval is pending, the proposed survey was still undertaken due to seasonal restrictions in ornamental snake activity periods.

### **Methodology**

The targeted fauna survey was undertaken over four days/nights between February 1st and 4th, 2023. Surveys were undertaken by a team of two suitably ecologists led by Paul Fox, an expert in fauna ecological surveys with over 20 years of experience and supported by Isaac Witten who has previous experience in ornamental snake surveys and habitat quality surveys at Denham Park. The purpose of the survey was to confirm the presence of the ornamental snake and its prey species within the designated Offset Area outlined in the OAMP (refer to Figure 1).

Four nights of non-intrusive nocturnal surveys were undertaken using spotlights, totalling 40 person hours spread over the four consecutive nights. Spotlighting involved meandering transects through areas that were considered suitable for the ornamental snake within the Offset Area and adjacent to the Offset Area. The spotlighting technique involved walking through suitable gilgai and Brigalow habitats and scanning the ground for the presence of the species and its prey.

Microhabitats including leaf litter, logs, woody debris, rocks and cracks were searched during diurnal surveys in areas where these features were abundant. These searches targeted both the Ornamental snake and amphibian prey species. Approximately 10 person hours of active searches were undertaken during the survey period.

The timing of the survey was deemed suitable for a wet season survey, as the area had received significant rainfall in the preceding weeks. The proposed Offset Area was noted to have a plentiful supply of inundated gilgai depressions throughout, producing ideal habitat for the ornamental snake and its prey.

## **Survey Limitations**

Rainfall prior to the survey event provided reasonably good conditions for determining the presence of the ornamental snake and its prey species; however, there was a significant amount of Buffel Grass growth competing with the native flora present within the Project area. During the survey event, significant rainfall occurred on 4 February, which hampered access to and spotlighting within, the offset site.

## **Results**

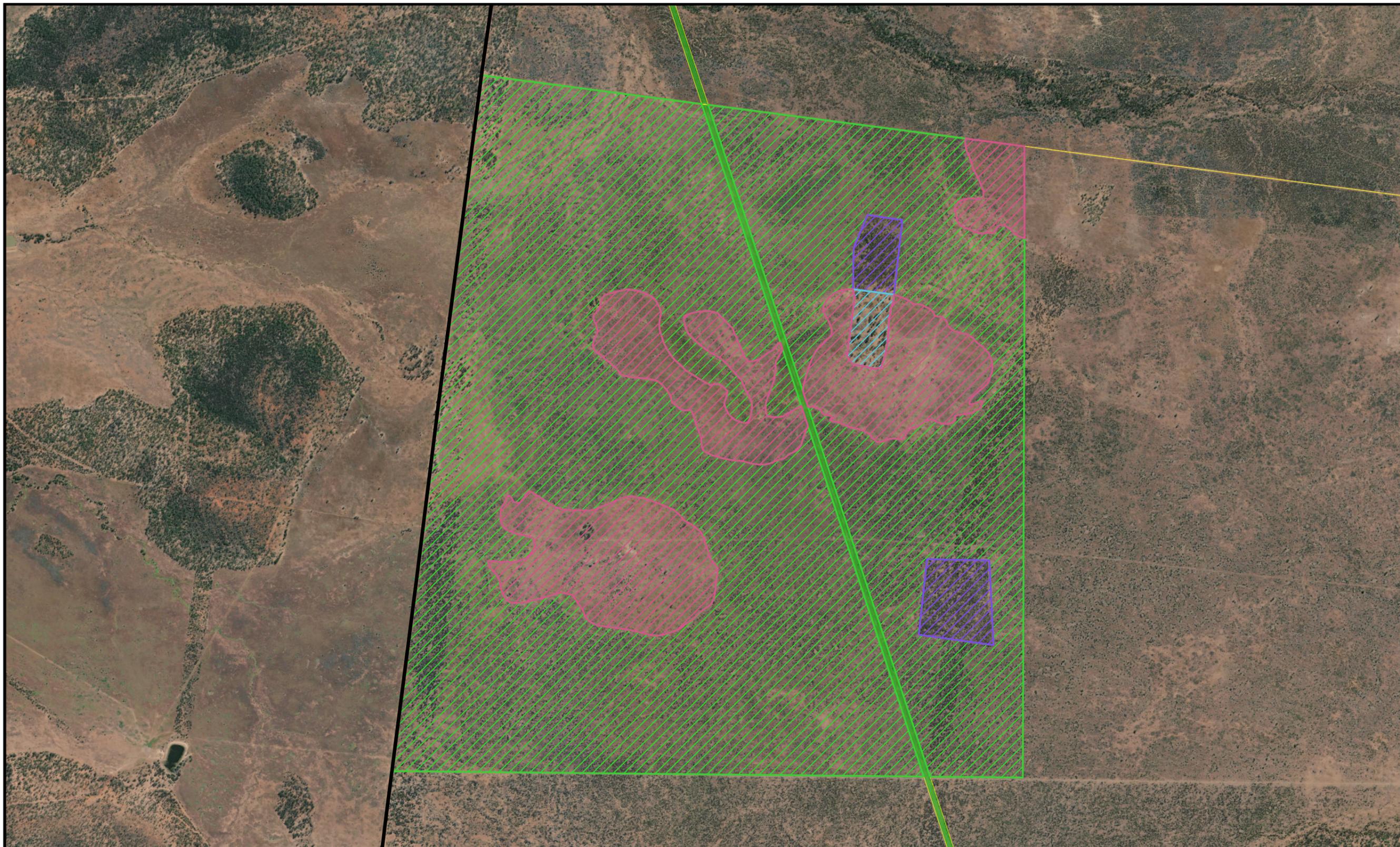
### ***Ornamental Snake***

The ornamental snake is well known within the adjacent landscape surrounding the Offset Area, and there are multiple historic records within the Offset Area as outlined in the OAMP. There are also suitable habitat types within and in proximity to the Denham Park Offset Area that support the full lifecycle of the ornamental snake. A total of five ornamental snakes were observed on the first night of spotlighting in the south-east section of the Offset Area. Four individuals were observed in areas of advanced regrowth brigalow associated with RE 11.4.9 (Figure 2) and one individual was found in an area of low regrowth brigalow mapped as a non-remnant (Figure 2). All of the ornamental snakes were in close proximity to inundated gilgai depressions, which was expected given the timing of the survey and their propensity to favour these areas during the wet season.

The second night focused on the north-east section of the Offset Area and north of the patch of brigalow where the species was recorded on the previous night. Tall and dense buffel grass (*Cenchrus ciliaris*) hampered the survey by reducing visibility around areas of key habitat (Plate 1). Areas with higher ground visibility surrounding gilgais in the advanced regrowth brigalow patch were also searched. No ornamental snakes were observed and although gilgai depressions were present in these areas, none were inundated at the time of survey.

Due to the presence of tall and dense buffel grass, and all but the lowest lying gilgais retaining water, spotlighting effort on the third night focused on unsurveyed areas of advanced regrowth from the first night's survey. Three ornamental snakes were observed within the area of advanced regrowth brigalow in close proximity to inundated areas. An additional individual was observed in low regrowth brigalow and was found eating a small frog (Figure 2).

Complete access to the Offset Area was restricted on the fourth and final night due to wet weather. However, to gain an understanding of the presence of the species in the wider Denham Park property, spotlighting was undertaken within the same paddock but to the east of the Offset Area and in the vicinity of where EMM found one individual. This area had similar characteristics to the Offset Area, with low regrowth brigalow and gilgai depressions throughout; however, no ornamental snakes were observed.



**Figure 1: Offset Area**

0 400 800 m

Scale @ A3: 1:15000  
 Date: 14/02/2023  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- Denham Park
- DCDB
- Easement
- Proposed Offset Area (AU)**
- Assessment Unit 1: (Grassland RE 11.9.1)
- Assessment Unit 2: (Low Regrowth Brigalow RE 11.4.9)
- Assessment Unit 3: (Regrowth Eucalypt Woodland RE 11.9.1)
- Assessment Unit 4: (Regrowth Brigalow RE 11.4.9)



*Plate 1 Limitation on survey, dense tall buffel grass surrounding gilgai.*

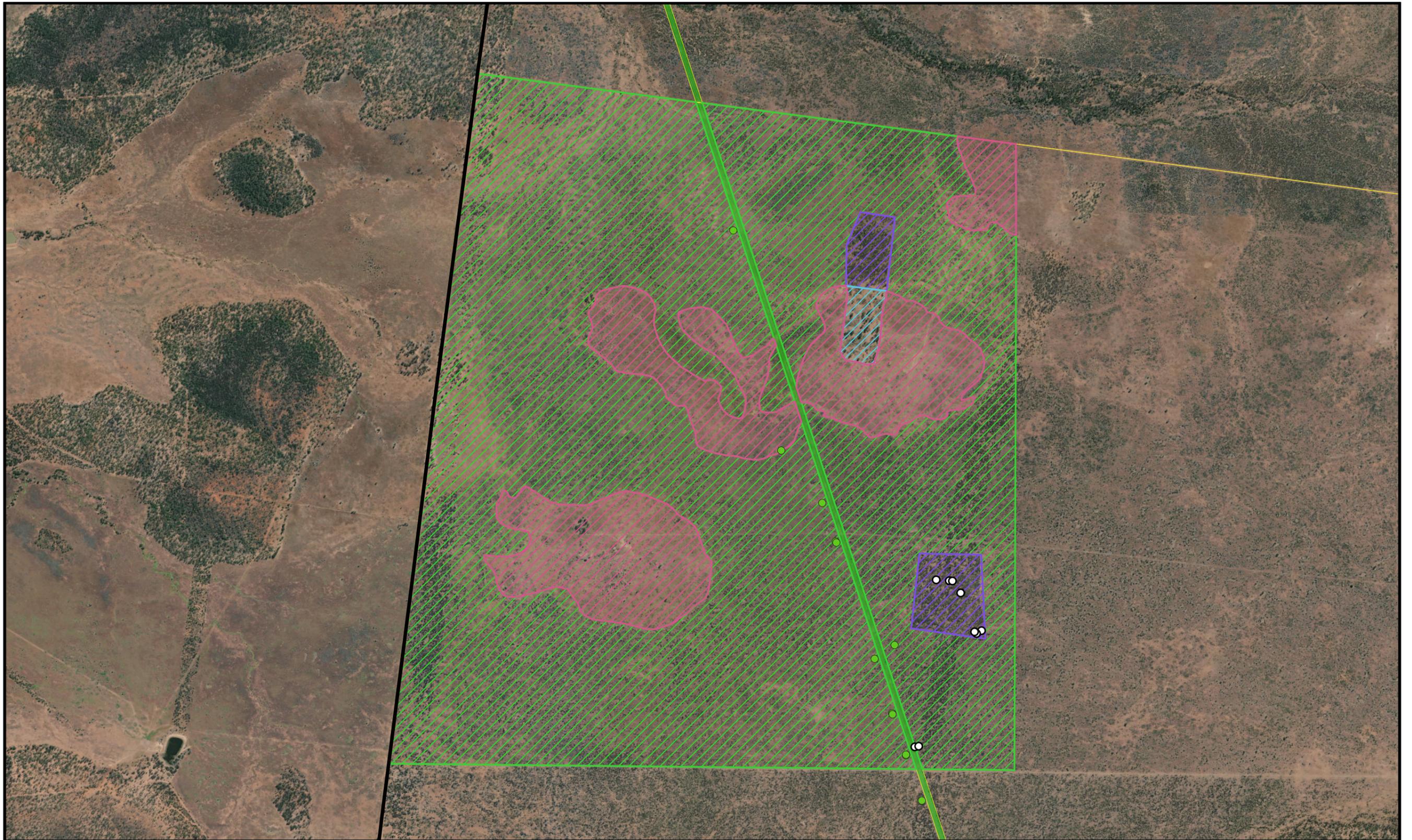


*Plate 2 Ornamental snake eating frog species.*



***Prey Species***

Prey species (frogs) were also documented during spotlighting, and were observed in all locations visited, including RE 11.9.1. Higher abundances were recorded in areas of flooded gilgai depressions in the southern half of the offset site. Five frog species were recorded including four burrowing frogs and one tree frog. Those species recorded are included in Table 1.



**Figure 2: Ornamental Snake Sightings**

0 400 800 m

Scale @ A3: 1:15000  
 Date: 14/02/2023  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- Denham Park
- DCDB
- Easement
- Proposed Offset Area (AU)**
- Assessment Unit 1: (Grassland RE 11.9.1)
- Assessment Unit 2: (Low Regrowth Brigalow RE 11.4.9)
- Assessment Unit 3: (Regrowth Eucalypt Woodland RE 11.9.1)
- Assessment Unit 4: (Regrowth Brigalow RE 11.4.9)
- Ornamental Snake Sighting 2023
- Historic record 2004



Table 1 Prey species recorded during surveys

Species	Representative photo
<i>Litoria caerulea</i> (Australian green tree frog)	 <p>Denham Park Ornamental snake survey 01-02-2023 13:27 -21.66915, 147.67662 Moranbah QLD</p>
<i>Cyclorana novaehollandiae</i> (New Holland frog)	 <p>Denham Park Ornamental snake survey 01-02-2023 20:50 -21.66620, 147.67526 Moranbah QLD</p>
<i>Cyclorana alboguttata</i> (Striped burrowing frog)	

Species	Representative photo
<i>Platyplectrum ornatum</i> (Ornate burrowing frog)	 <p>           Benham Park            Ornamental Snake Survey            04 Dec 2022 20:29            21 33722 127 90131            Worabish QLD         </p>
<i>Cyclorana brevipes</i> (Short-footed frog)	Heard calling – no photo available

## Conclusion

A total of nine individuals were observed over the survey period and confirms the presence of the species within the Offset Area. All ornamental snake individuals were observed within the lower lying and inundated gilgai habitats in the south-eastern section of the Offsets Area. However, the presence of tall and dense buffel grass inhibited observation of the ground layer and hence, may have precluded observing additional individuals.

Five species of known ornamental snake were also observed throughout the Offset Area, including areas of RE 11.9.1. Due to the presence of preferred prey species, it is likely ornamental snakes would also inhabit these areas, particularly throughout their lifecycle.

Regards



Dr Craig Streatfeild

# Ecological Assessment Report

# Denham Park Ecological Assessment Report

Offset Investigations for Stanmore IP South Pty Ltd



**BASE/**

Client: Stanmore IP South

Reference: J0053.3

### Document Control

Title:	Denham Park Ecological Assessment Report
Address:	Denham Park
Job Number:	J0053.3 Ornamental Snake Offsets
Client:	Stanmore

### Document Issue

Issue	Date	Prepared By	Approved By
Rev A – Draft for client review	26/09/2022	Isaac Witten/Andrew Craig	Dr Craig Streatfeild
Rev B – Response to client's comments	12/10/2022	Isaac Witten/Dr Craig Streatfeild	Dr Craig Streatfeild
Rev O – Final	17/10/2022	Isaac Witten	Dr Craig Streatfeild

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## 1.0 Introduction

Base Consulting Group (BASE) was commissioned by Stanmore IP South Pty Ltd (Stanmore) to prepare this Ecological Assessment Report (EAR) for ecological assessments undertaken on the Denham Park Property. This EAR is a supporting document to an Offset Area Management Plan (OAMP). The OAMP outlines Stanmore's intent on addressing offset obligations for impacts to listed Matters of National Environmental Significance (MNES) from operations at the Isaac Downs Mine (IDM). The IDM is operated by Stanmore, a wholly owned subsidiary of Stanmore Resources Ltd (Stanmore Resources).

### 1.1 Project Background

The IDM project is operating a metallurgical open cut coal mine located approximately 10 km east of Moranbah in Central Queensland. Mining operations are carried out under an existing State Government approved environmental authority (EA) and occurs across several approved mining leases (ML), namely ML 700046, ML 700047 and ML 700048 for the IDM. The environmental authority for the IDM project became effective on 25 August 2021 (EA0002817) and involves a range of activities including:

- Open cut metallurgical coal mine.
- In-pit and out of pit spoil dumps.
- Flood protection levee.
- Mine infrastructure area (MIA).
- Water management infrastructure including mine water dam, sediment dams and clean water diversion.
- Access road from the Peak Downs Highway.
- Linear infrastructure corridors to connect the Project to the existing Isaac Plains Mine on ML 70342 with a ROM coal haul road, power supply and water pipelines (linear infrastructure).
- Use of existing Isaac Plains Mine CHPP, tailings management systems, and train load out facility.

The IDM require offsets for significant residual impacts to MNES including the Ornamental Snake (*Denisonia maculata*), the Koala (*Phascolarctos cinereus*), Greater Glider (*Petauroides volans*), and Squatter Pigeon (southern) (*Geophaps scripta scripta*). It is the intent of Stanmore to legally secure available offsets for the Ornamental Snake within the Denham Park property (refer Figure 1).

Stanmore has separately legally secured offsets for impacts to the Koala, Greater Glider and Squatter Pigeon through Commonwealth approved offset area management plans (BASE, 2021)

### 1.2 Scope and Purpose of Report

The scope of this EAR was to undertake baseline ecological surveys within the Denham Park Property to assess the on-ground (field verified) vegetation communities and the ability of the vegetation communities to provide offsets for the Ornamental Snake (*Denisonia maculata*). Baseline habitat quality of the field-verified vegetation communities within a larger Investigation Area (herein referred to as the 'Investigation Area') and within a refined Proposed Offset Area was also determined. Baseline habitat quality of the field-verified vegetation communities and habitat values specific to the Ornamental Snake was determined within the Proposed Offset Area.

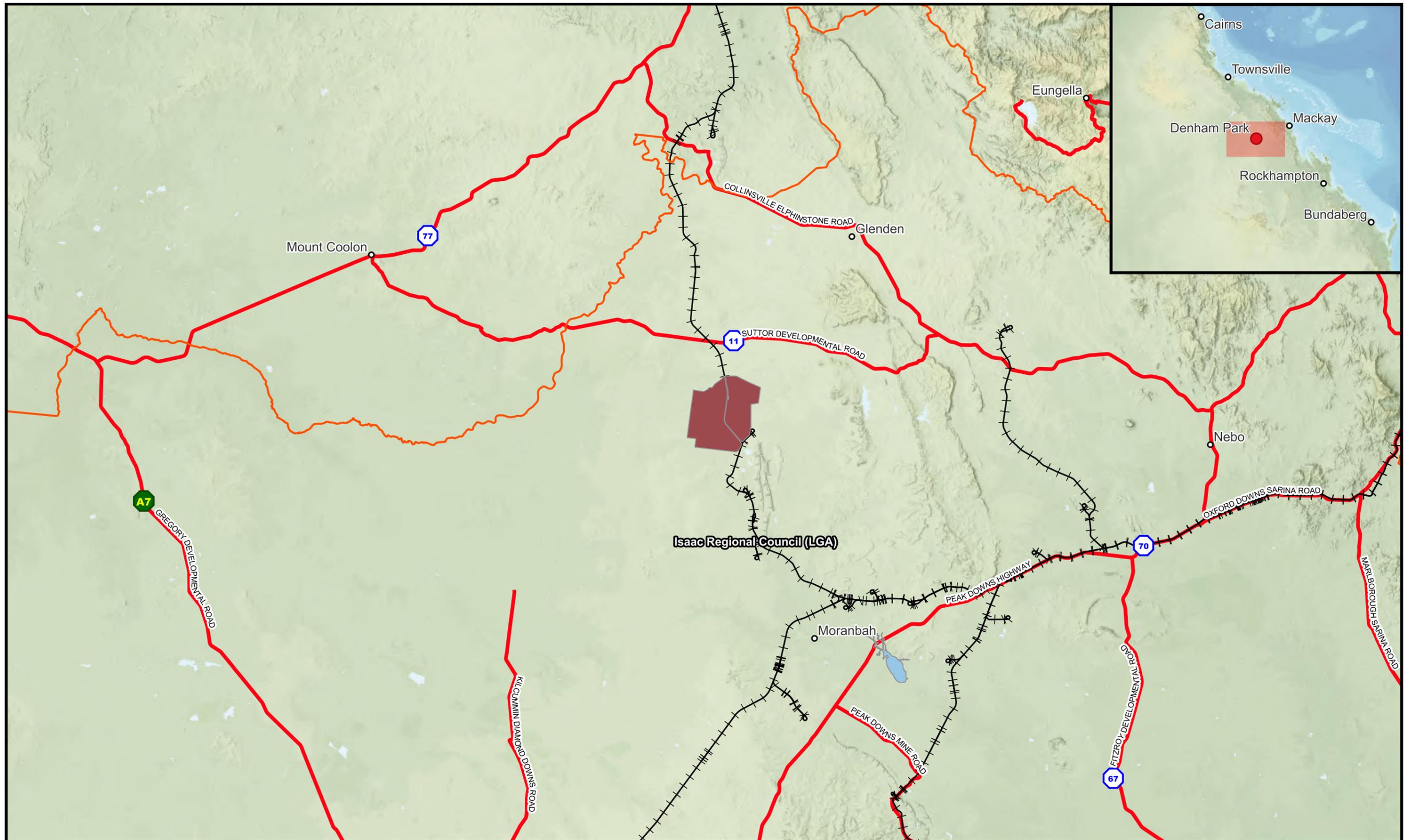
The purpose of the report is to identify the ecological values of vegetation communities within the Investigation Area and Proposed Offset Area. The results of the habitat quality assessments are outlined and are used to support the OAMP.

### **1.3 Investigation Area**

Two lots on the same plan were initially surveyed for this EAR. The properties were identified as Denham Park (Lot 11 SP262530) and Lapunya (Lot 23 SP262530). The Lapunya homestead is currently unoccupied and both Lots are hereby referred to as “Denham Park”. Both Lots are owned by a subsidiary of Stanmore Resources, Stanmore SMC Pty Ltd (SMC), and leased to a third party. Denham Park is located within the Brigalow Belt bioregion approximately 38 km north of Moranbah (Figure 1). Denham Park encompasses 11,826 ha of which approximately 2,381 ha is currently mapped as remnant vegetation and 76 ha is currently mapped as High Value Regrowth (HVR). Denham Park is located approximately 50 km to the northeast of the IDM and lies within the Isaac Regional Local Government Area (Figure 1).

The two Lots were assessed for their potential to provide offsets for the Ornamental Snake, for practical management actions to be undertaken and the potential for the areas to be legally secured if deemed suitable for offsets. Following initial reconnaissance surveys, desktop assessment and consultation with the leaseholder, it was determined that a paddock (Belah Paddock) in Lot 23 SP262530, was most suited as a potential offset site for the Ornamental Snake and warranted further investigation (this area is referred to as the Investigation Area) (Figure 2). The balance of Denham Park was excluded from further field assessments.

Following additional ecological assessments and further consultation with the leaseholder and Stanmore Resources, the Investigation Area within Denham Park was refined to a preferred Proposed Offset Area (herein referred to as the ‘Proposed Offset Area’).



**Figure 1: Site Context**

0 10 20 km

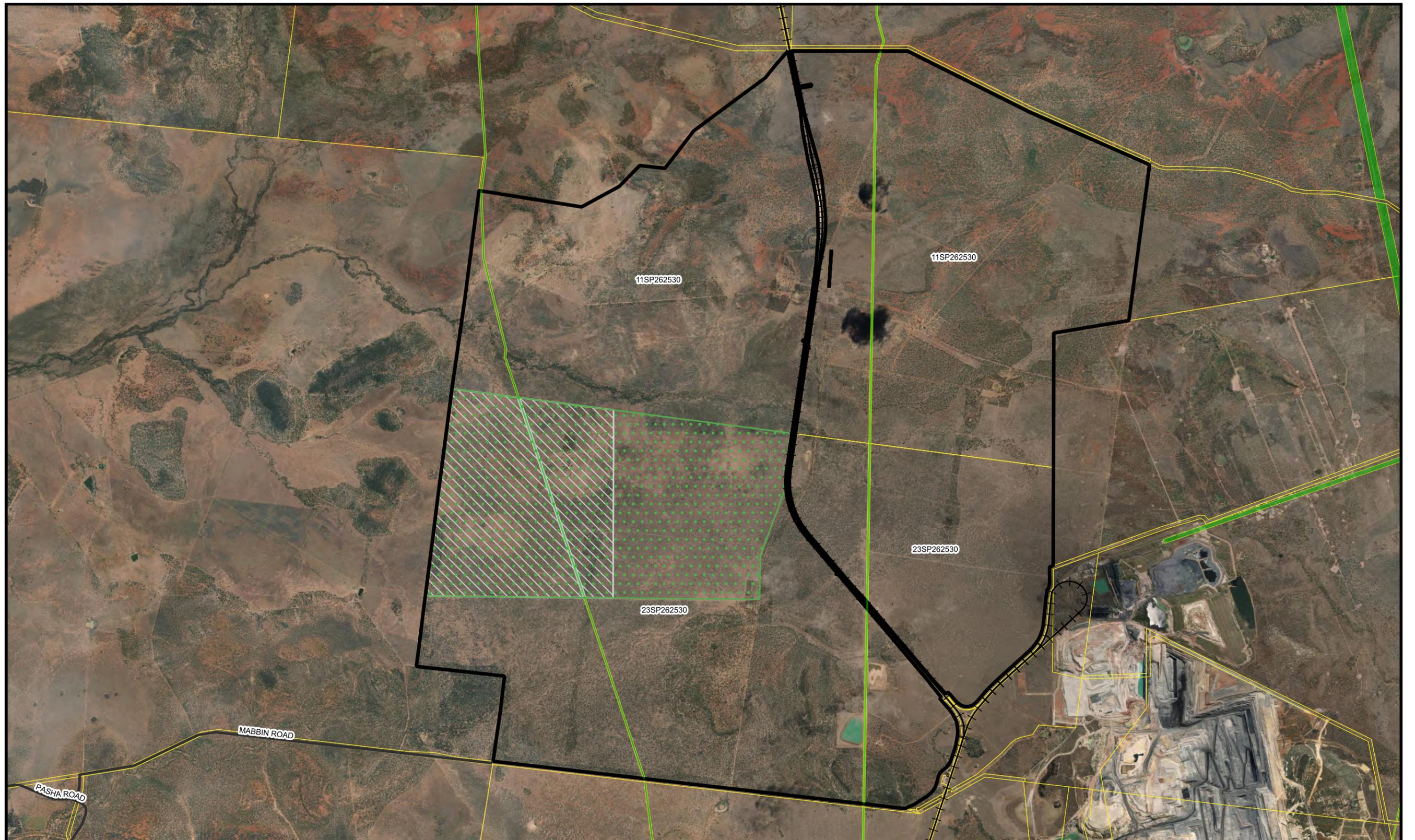
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 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGIN, IGP, swisstopo, and the GIS User Community, DATSIP

- Denham Park
- Isaac Downs Mine (Impact Area)
- Isaac Regional Council (LGA)
- Cities and Towns
- State Controlled Road
- Rail

**BASE/**



**Figure 2: Project Area**

0 1000 2000 m

Scale @ A3: 1:50000  
 Date: 11/10/2022  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- Denham Park
- Investigation Area
- Proposed Offset Area
- DCDB
- Easement
- Road
- Rail

**BASE/**

## 2.0 Regulatory Requirements and Policy Framework

### 2.1 *Environment Protection and Biodiversity Conservation Act*

The EPBC Act is the Commonwealth Government’s principal piece of environmental legislation and is administered by the DCCEEW (formerly Department of Agriculture and Water (DAWE)). The EPBC Act is designed to protect MNES, which include threatened species of flora and fauna, threatened ecological communities (TECs), migratory species as well as other protected matters. The Act includes EPBC categories of threat for threatened flora and fauna, identifies key threatening processes to their survival and provides for the preparation of recovery plans for threatened flora and fauna.

#### 2.1.1 Conditions of Approval

The EPBC approval decision (EPBC 2019/8413) for the Project was received on 26 May 2021 and varied on 6 August 2021. Conditions 4 to 7, 10 and 12 of the EPBC Act approval are relevant to the requirement for an offset for the Ornamental Snake. Of particular relevance to this EAR is Condition 7c that mentions the Offset Area Management Plan (OAMP) must include relevant baseline data and other supporting evidence, including results from field validation surveys and quantifiable ecological data, that documents the presence or likely presence of the Ornamental Snake and the quality of the habitat.

To assess the likely presence of the Ornamental Snake within the offset area, a range of ecologically relevant criteria was developed in consultation with DAWE and used. These criteria were initially prepared for an alternate offset site where the species had not previously been found but have relevance to this offset site in assessing suitable microhabitat features for the species.

These criteria, and where they have been addressed in this EAR are outlined in Table 1.

**Table 1 Criteria to Assess the Presence or Likely Presence of Ornamental Snake**

Criteria for likely presence	Relevant section in this document
Desktop	
Known records in proximity to the potential offset site based on Queensland’s WildNet and ALA records	Section 4.1.1.5 and Figure 5
Change in land use between the date of historic records on site and present to establish land management changes	Section 4.1.3 and Appendix C
Connectivity of site to other areas of suitable habitat	Section 4.1.1.5 and Figure 5, Figure 6 and Figure 7
Additional unpublished records from Qld departments, Queensland Museum, gas industry reports etc which may not be public	Section 4.1.1.5 and Figure 5
Climatic conditions leading up to and during surveys eg. temperatures, rainfall	Section 4.2.1
Field assessments	

Criteria for likely presence	Relevant section in this document
<b>Microhabitat features</b>	
Presence of coarse woody debris (CWD) (absent/present, approximate size and length)	Section 4.2.3 and Appendix D
Estimate of CWD abundance (metres per hectare)	Appendix D
Presence of rocks piles (absent/presence, approximate size, material, if known)	No rock piles present
Leaf litter presence, density, and depth	Appendix D
Herbs, forbs and shrub presence and density	Appendix D
Presence and abundance of weed species	Section 4.2.4 and Appendix D
Tree and shrub canopy cover estimate	Appendix D
Quality of habitat attributes measured for each Regional Ecosystem type using BioCondition Benchmarks	Section 4.2.3 and Appendix D
<b>Gilgais/cracking clays</b>	
Presence and type of gilgais	Section 4.2.2 and 4.2.3 and Appendix D
Absence/presence of vegetation and vegetation described noting effects of vegetation and root systems binding cracking clays	Section 4.2.2 and 4.2.3 and Appendix D
Cracking clay soils	Section 4.2.2 and 4.2.3 and Appendix D
Cracking clay soils content described (eg. clay/silt/sand)	Section 4.2.2
Presence/absence of disturbance	Section 4.1.3, 4.2.4, 4.2.5 and 4.2.6
Current inundation of cracking clay soils at time of survey and estimate the total area supporting cracking clay soils	Section 4.2.6

## 2.2 EPBC Act 1999 Environmental Offsets Policy

This policy outlines the Commonwealth Governments approach to the use of environmental offsets under the EPBC Act. The EPBC Act Environmental Offsets Policy (October 2012), has five key aims that involve:

- Ensuring the use of offsets are efficient, effective, timely, transparent and scientifically robust.
- Providing all stakeholders with greater certainty on how offsets are determined and provided.
- Delivering improved environmental outcomes.
- Outlining the appropriate nature and scale of offsets.
- Providing guidance on acceptable offsets and their delivery.

The Policy also provides eight key principles that are applied in determining the suitability of offsets as follows:

- Deliver an overall conservation outcome that improves or maintains the viability of the MNES in question.
- Be primarily built around direct offsets but may also include other compensatory measures.
- Be in proportion to the level of statutory protection that applies to the MNES.
- Be of a size and scale proportionate to the residual impacts on the protected matter.
- Account for and manage the risks of the offset not succeeding.
- Be additional to what is already required under law or regulation.
- Be efficient, effective, timely, transparent, scientifically robust and reasonable.
- Have transparent governance arrangement including management actions, monitoring and auditing.

Considering the above policy principles and offset requirements, ecological assessments have been undertaken on Denham Park to assess the sites potential as an offset area.

### **2.3 Vegetation Management Act 1999**

The Vegetation Management Act 1999 (Qld) (VM Act) regulates the clearing of native vegetation in Queensland and is administered by the Department of Resources (DoR). The VM Act also protects and regulates areas designated for offsets or compliance (Category A). The VM Act categorises the status of native vegetation as remnant (Category B), high value regrowth (HVR) (Category C), reef regrowth watercourse vegetation (Category R) and non-remnant (Category X). Remnant, HVR or reef regrowth vegetation can be further classified into regional ecosystems (REs) based on bioregion, landform and dominant canopy species.

In addition, within the VM Act Regulations all RE are assigned to a Vegetation Management Class (VM Class). This is based on the current extent remaining compared to its pre-clearing extent, as gazetted under the VM Act and listed in the Regional Ecosystem Description Database (REDD) maintained by the Queensland Herbarium, Department of Environment and Science (DES).

Regional ecosystems are designated a Biodiversity Status (BD Status) through the Regional Ecosystem Description Database (REDD) based on an assessment of vegetation condition and are used for a range of planning and management applications. Table 2 summarises the criteria used to assess the VM Act class and BD status of REs.

Table 2 Criteria Assessing VM Act Class and BD Status

Regional Ecosystems	BD Status Criteria	VM Class Criteria
Endangered	Less than 10% of its pre-clearing extent remains unaffected by severe degradation and/or biodiversity loss; or	Less than 10% of its pre-clearing extent remaining, or
	10–30% of its pre-clearing extent remains unaffected by severe degradation and/or biodiversity loss and the remnant vegetation is less than 10,000ha; or	10% to 30% of its pre-clearing extent remaining and the remnant vegetation remaining is less than 10,000 ha.
	It is a rare regional ecosystem subject to a threatening process.	
Of Concern	10% to 30% of its pre-clearing extent remaining, or	10% to 30% of its pre-clearing extent remaining; or
	More than 30% of its pre-clearing extent remaining and the remnant vegetation remaining is less than 10,000 ha; and	More than 30% of its pre-clearing extent remaining and the remnant vegetation remaining is less than 10,000 ha.
	10–30% of its pre-clearing extent remains unaffected by moderate degradation and/or biodiversity loss.	
No Concern at Present	More than 30% of its pre-clearing extent remaining and the remnant vegetation remaining is more than 10,000 ha; and	N/A
	the degradation criteria listed above for 'endangered' or 'of concern' regional ecosystems are not met.	N/A
Least Concern	N/A	More than 30% of its pre-clearing extent remaining and the remnant vegetation remaining is more than 10,000 ha.

## 2.4 Biosecurity Act 2014

The *Biosecurity Act 2014* (Qld) (Biosecurity Act) commenced on 1 July 2016 and ensures a consistent, risk-based approach to biosecurity in Queensland. The Act provides biosecurity measures to safeguard Queensland's economy, agricultural and tourism industries and environment from:

- Pests (e.g. wild dogs and weeds).
- Diseases (e.g. foot-and-mouth disease).
- Contaminants (e.g. lead on grazing land).

Under the Biosecurity Act, invasive plants and animals are categorised as either a 'prohibited matter' or a 'restricted matter' and replaced many separate pieces of legislation that were previously used to manage biosecurity. Decisions made under the Biosecurity Act will depend on the likelihood and consequences of the risk. The *Biosecurity Regulation 2016* sets out how the Biosecurity Act is implemented and applied. Introduced flora identified during field surveys were assessed against the list of restricted invasive plants which allowed the opportunity to identify potential weed impacts to flora values across the Investigation Area.

## 2.5 Project Impacts and Offset Requirements

Potential direct and indirect impacts within and adjacent the IDM Project have been described in the various approval documents (BASE, 2021; ECOSM, 2020). These impacts include the direct loss of Ornamental Snake habitat as a result of vegetation clearing within the Project footprints.

Offsets are required for the four MNES to account for the significant residual impacts as a result of the Project including the Ornamental Snake (*Denisonia maculata*), Koala (*Phascolarctos cinereus*), Greater Glider (*Petauroides volans*), and Squatter Pigeon (southern) (*Geophaps scripta scripta*). Stanmore has previously legally secured offsets for significant residual impacts to the Koala, Greater Glider and Squatter Pigeon through Commonwealth approved offset area management plans (BASE, 2020; BASE, 2021). As such, only the Ornamental Snake is the the focus of this EAR.

In accordance with the EPBC Act Environmental Offsets Policy, it is necessary to assess the quality of the proposed offset area to accurately calculate the offset obligations.

## 3.0 Methodology

A combined desktop and field-based program was undertaken to determine the habitat quality of the offset Investigation Area.

### 3.1 Desktop Assessment

#### 3.1.1 Literature Review

The following literature was reviewed as part of the desktop assessment for the Investigation Area:

- Isaac Downs Terrestrial Ecology Impact Assessment Report (ECOSM, 2020).
- Matters of National Environmental Significance (MNES) Assessment Report – QPM Energy Project (Draft in Progress) (EMM, 2022).
- Guide to determining terrestrial habitat quality: A toolkit for assessing land-based offsets under the Queensland Environmental Offsets Policy, Version 1.3 (DES, 2020).
- *Environment Protection and Biodiversity Conservation Act 1999* Environmental Offsets Policy (DAWE, 2012).
- BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.2 (Eyre, et al., 2015).
- Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland (Nalder, et al., 2020).
- Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (DES, 2018).
- Species Profile and Threats Database – *Denisonia maculata* (DAWE, 2022).

#### 3.1.2 Desktop Review

Desktop assessment was conducted to assess the suitability of the Investigation Area as an offset site, to assist in determining target areas for the field surveys and to provide data for the determination of the quality of habitat for MNES within the offset Investigation Area.

The following resources were reviewed as part of the desktop assessment for the Investigation Area to:

- Regional Ecosystem Description Database (REDD), Version 12 (Queensland Herbarium, 2021).
- Vegetation Management Regional Ecosystem spatial layer, Version 12 (DES, 2021).
- BioCondition Benchmarks Database Version 3.1 (Queensland Herbarium, 2021).
- Atlas of Living Australia website at <http://www.ala.org.au>. Accessed June 2022.
- Commonwealth Protected Matters Search Tool (PMST) – accessed on search area was 20 km radius of Denham Park.
- Review of historic aerial imagery (Google Earth Pro).

## 3.2 Field Assessment

Two survey events were undertaken by suitably qualified ecologists in June 2022 and August 2022 following detailed desktop analysis.

The initial reconnaissance survey was undertaken between the 12<sup>th</sup> and 14<sup>th</sup> of June 2022. The objective of this survey was to determine the potential suitability of Denham Park to provide offsets for impacts to the Ornamental Snake and to assess the accuracy of current Department of Resources (DoR) vegetation community mapping. The initial survey incorporated a high-level habitat and vegetation assessment of the entire Denham Park Property. Data from this survey determined the Belah Paddock provided the best potential to accommodate the required offsets for the Ornamental Snake. The Investigation Area was subject to further surveys to quantify the quality of habitat in the August survey event.

Following the initial high-level survey of the Denham Park property, a subsequent and more detailed assessment was undertaken in the Investigation Area. This survey included on-ground vegetation community classifications and habitat quality assessments.

The methodologies used to describe and assess the on-ground vegetation communities and determine the baseline habitat quality and likely presence of the Ornamental Snake are outlined below.

### 3.2.1 Vegetation Community Classification

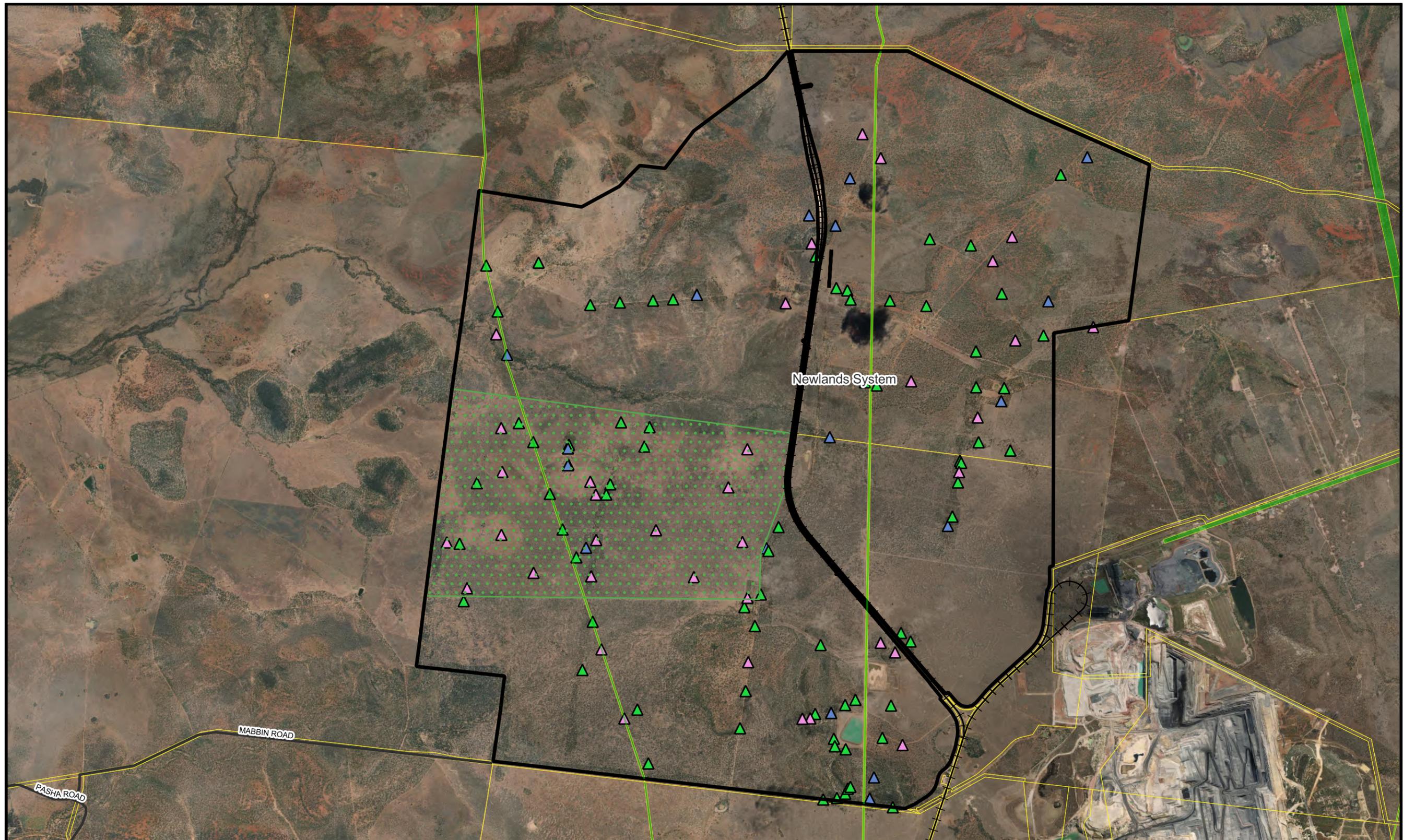
The extent, classification, and condition of ground-truthed vegetation communities within the Investigation Area was validated in accordance with the Methodology for surveying and mapping regional ecosystem and vegetation communities in Queensland (Neldner, et al., 2020). Investigation included undertaking quaternary level assessments across the Investigation Area.

Quaternary-level sites were utilised to verify vegetation units and confirm dominant characteristic flora species. Structural analysis included recording the height class and life form of the dominant species within the mid and canopy strata as per (Neldner, et al., 2020). Evidence of previous disturbance, fire history, incidence of exotic species and general notes on soil type and ecological integrity were compiled for each quaternary survey site. Numerous time-encoded digital photographs were taken at each site as a reference.

RE classification was determined based on the vegetation, soil and landform characteristics identified in the field, geological mapping for the region and the REDD. Condition status for woody vegetation was evaluated utilising the definitions of remnant vegetation under the VM Act. For the purposes of this assessment, vegetation was mapped into three categories:

- Remnant: woody vegetation that has not been cleared or vegetation that has been cleared but where the dominant canopy has greater than 70 % of the height and greater than 50 % of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.
- HVR: areas previously cleared or disturbed (e.g., by wildfire) over 15 years ago and containing woody vegetation floristically and structurally consistent with the RE but typically less than 70 % of the height and less than 50 % density of the RE.
- Regrowth and non-remnant: areas previously cleared or otherwise significantly disturbed.

A total of 17 tertiary level, 35 quaternary level and 74 RE mapping assessment sites were undertaken within Denham Park (refer Figure 3)



**Figure 3: Flora Survey Sites**

0 1000 2000 m

Scale @ A3: 1:50000  
 Date: 09/09/2022  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- |                    |                      |
|--------------------|----------------------|
| Denham Park        | <b>Flora Surveys</b> |
| Investigation Area | Tertiary             |
| DCDB               | Quaternary           |
| Easement           | RE mapping point     |
| Road               |                      |
| Rail               |                      |

**BASE/**

### 3.2.2 Habitat Quality Assessment

Habitat quality was assessed using a combination of indicators that measure the overall viability of the site and its capacity to support fauna species. The Department of Resources (DoR) vegetation management RE mapping was initially used to determine the likely number and location of habitat quality assessment plots (HQAP). These plots were refined following field verification of the mapped vegetation communities.

Following the classification of vegetation, portions of the available Investigation Area were delineated into habitat quality assessment units (AU) and condition quantified via HQAP (site condition assessments). HQAP were undertaken in accordance with the Queensland's Department of the Environment and Science (DES) Guide to determining terrestrial habitat quality: A toolkit for assessing land-based offsets under the Queensland Environmental Offsets Policy, Version 1.3 (DES, 2020) (the 'Guide'). A habitat quality assessment unit (AU) refers to vegetated areas with the same RE and vegetation status (remnant or regrowth) which can be grouped together to give a total area for a single RE.

Photographs were taken along the HQAP transect centreline at the ends of each plot (e.g. at 0 m and 100 m), and in the order: north (0°), east (90°), south (180°) and west (270°) at the centre of the plot (e.g. at 50 m point). These photos are provided in Appendix A.

Total habitat quality is assessed through a range of habitat indicators to measure the ecological viability and habitat values of a site and its capacity to support fauna and are separated into three main categories: site condition, species stocking rate and site context. The first two categories use data collected in the field whereas site context is primarily a geospatial exercise.

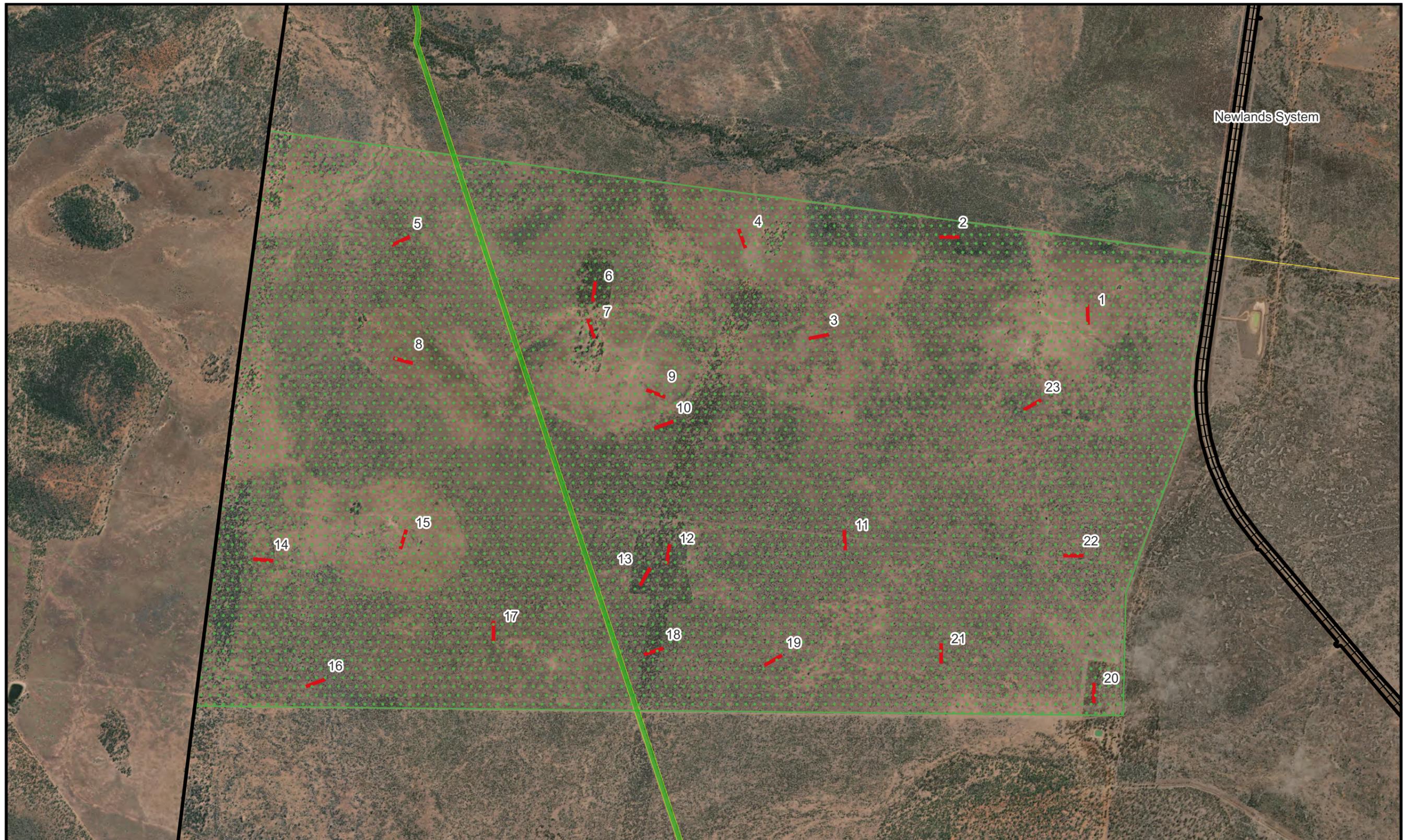
In a wooded ecosystem HQAP involved the collection of twelve (12) site-based attributes as outlined in Table 3 within a 100 m x 50 m nested sampling plot (Eyre et al., 2015). The final two attributes are derived from the scoring system used to determine habitat quality on the impact site.

In general, if the BioCondition benchmark for the assessment unit gives a zero for an attribute, then the attribute is removed from the final score. In total 23 HQAPs were completed as shown on Figure 4. Methodology for data collection of these attributes is further detailed in section 3.3.2.3.

**Table 3 Site Condition Attributes**

Attribute	Assessment Unit Type
Site Condition	Wooded Ecosystems
Large trees	100 x 50m plot
Tree canopy height	100 x 50m plot
Recruitment of canopy species	100 x 50m plot
Tree canopy cover (%)	100 m transect
Shrub layer cover (%)	100 m transect
Coarse woody debris	50 x 20 m plot
Native plant species richness for four life forms	100 x 50 m (trees)

Attribute	Assessment Unit Type
Site Condition	Wooded Ecosystems
	50 x 10 m (shrubs, grasses and forbs)
Non-native plant cover	50 x 10 m plot
Native perennial grass cover (%)	1 x 1 m quadrat
Organic litter cover	1 x 1 m quadrat
Quality and availability of habitat for food and foraging*	100 x 50 m plot
Quality and availability of habitat for shelter*	100 x 50 m plot
<p>*These species specific habitat attributes are derived from the scoring system used on the impact site (ECOSM, 2020) and are explained further in section 3.3.2.3.</p>	



Newlands System

**Figure 4: Habitat Quality Assessment Plots**

0 500 1000 m

Scale @ A3: 1:18000  
 Date: 09/09/2022  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGIN, IGP, swisstopo, and the GIS User Community, DATSIP

- Denham Park
- Investigation Area
- DCDB
- Easement
- Road
- Rail
- Habitat Quality Assessment Plots



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### 3.2.3 Ornamental Snake Microhabitat Assessment

Ornamental Snake microhabitat assessments were undertaken each of the HQAP sites across the Proposed Offset Area. At each site data were recorded for a variety of habitat values including:

- Habitat features (e.g. edge of wetland, drainage feature, woody debris).
- The overall quality of the habitat feature (low, moderate, good).
- Disturbance's present (e.g. feral pigs, grazing).
- Presence / absence, size, and depth of gilgais in the immediate area.
- Vegetation community in or surrounding gilgais.
- Presence / absence, size, and depth of cracking clays.
- Soil description.
- Inundation presence / absence.
- Leaf litter cover %.
- Rock piles presence / absence.

## 3.3 Data Analysis

### 3.3.1 GIS analysis

Spatial data collected during the field surveys were imported into GIS software (QGIS) to map vegetation communities and habitat boundaries as well as calculate areas of the respective vegetation communities and Ornamental Snake habitat. Target values identified during the field survey were attributed to the appropriate vegetation communities and habitat types.

#### 3.3.1.1 Review of Historical Land Use

A review of historical imagery was undertaken to determine the historical land use of the investigation area. High quality historical imagery was gathered from QImagery (<https://qimagery.information.qld.gov.au/>). This imagery was however, limited to the year 2000. Google Earth Pro was used to gather images from 1989 to 2020 in periodic increments with focus on times of historic recordings of the species and the present. Images are provided in Appendix B.

### 3.3.2 Habitat Quality Assessment Plot Scoring

Habitat quality assessments were conducted in each HQAP to determine habitat quality within the field verified REs/assessment units as per the requirements of the Guide. The Guide uses a range of habitat indicators to measure the ecological viability and habitat values of a site and its capacity to support a prescribed environmental matter. These are separated into three main categories: site condition, species stocking rate and site context. Site condition and species stocking rate uses data collected from field surveys whereas site context is a generally a geospatial application.

#### 3.3.2.1 Site Condition

Site condition within the Investigation Area was assessed from 23 HQAPs from surveys undertaken in August 2022. Site condition attributes were collected in accordance with the BioCondition Assessment

Manual (Eyre, et al., 2015) and compared against corresponding benchmark data (data from a representative vegetation community i.e. RE in an undisturbed state) and scored accordingly. Benchmark data was sourced from BioCondition Benchmarks for Regional Ecosystem Condition Assessment (Queensland Herbarium, 2021). Site condition attributes are displayed in Table 4.

**Table 4 Site Condition Scoring Matrix**

<b>Attribute</b>	<b>Maximum score</b>
Recruitment of woody perennial species	5
Native plant species richness:	
Trees	5
Shrubs	5
Grasses	5
Forbs	5
Tree Canopy Height	5
Tree Canopy Cover	5
Shrub canopy cover	5
Native perennial grass cover	5
Organic litter cover	5
Large trees	15
Coarse woody debris	5
Weed cover	10
Quality and availability of habitat for food and foraging*	55
Quality and availability of habitat for shelter*	15
Total Maximum Score	150
*These species specific habitat attributes are derived from the scoring system used on the impact site (ECOSM, 2020) and are explained further in section 3.3.2.3.	

The following steps were undertaken to determine the site condition score for the AU associated with each HQAP:

- Site condition attribute scores for each HQAP are summed per survey site; and

- An average site condition score for the AU is derived by summing the score and dividing by the number of HQAP in each AU; and
- Site Context The average site condition scores are divided by the total maximum score and then multiplied by 10 to give an AU site condition score.

### 3.3.2.2 Site Context Scoring

Ground-truthed mapping was used to undertake site context assessments to provide a quantitative assessment of the landscape values in the Investigation Area. The first three site context attributes were analysed in accordance with the Guide (DES, 2020). This involves calculating size of patch, connectivity and context following the methodology described in Eyre et al. (2015), while categorising ecological corridors as described in the guideline. The final two attributes use a combination of field data and GIS analysis (ECOSM, 2020). Table 5 displays the site context attributes utilised for this assessment.

Table 5 Site Context Scoring Matrix

Attribute	Maximum score
Size of patch	10
Context	5
Connectivity	5
Threats to species*	15
Species mobility capacity*	15
Total Maximum Score	50
*These species specific habitat attributes are derived from the scoring system used on the impact site (ECOSM, 2020) and are explained further in section 3.3.2.3.	

### 3.3.2.3 Species Habitat Attributes

Species habitat attributes are used to indicate an areas ability to support a specific species for all or part of its life cycle. Ecological Survey and Management (ECOSM, 2020), developed a scoring system for the species habitat attributes in the impact area which is based on the SPRAT profile, published research and field-based knowledge of the targeted species. For consistency the same species habitat attributes were adopted for the Proposed Offset Area. A detailed account of the scoring matrix is available in Appendix B.

### 3.3.2.4 Species Stocking Rate

Species stocking rate as outlined in the EPBC offsets calculator guide, replaces species habitat index as a measure of the presence of a species at the impact and offset site. As per the methods outlined in the biodiversity offset strategy for Isaac Downs (ECOSM, 2020), species stocking rate is to be assessed on a scale of 0 - 4 as categorised below:

- 0: No evidence the species is present at the site.

- 1: Evidence of species presence at the site during surveys conducted for the purpose of the EPBC environmental assessment.
- 2: There is a statistically significant increase in species density relative to the species density determined for a score of 1 or species density is equal to or greater than the species density at a reference site (not required to be an important population).
- 3: Equivalent to the species density at a reference site associated with an important population.
- 4: Equivalent to the maximum species density measured at a DAWE agreed number of reference sites associated with important populations.

### 3.3.2.5 Area Weighted Habitat Quality Scoring

The Proposed Offset Area is split into four AUs which are not of equal size. Therefore, in order to calculate a habitat quality score that accurately represents the site on a 'per hectare' scale, the scores must be area weighted. This was done following the methodology set out on page 41 of the Guide (DES, 2020).

## 3.4 Specimen Identification

Where plant species could not be identified in the field, fruiting and / or flowering specimens were taken to assist with identification. For those species not field identified during the surveys, samples were pressed, and dried, and positive identifications of plant specimens were subsequently made under laboratory conditions or submitted to the Queensland Herbarium for identification.

## 3.5 Nomenclature

The names and conservation statuses of Queensland mammals, birds, reptiles, and amphibians are based on DES WildNet database. Taxonomic nomenclature used for the description of floral species is according to Census of the Queensland Flora 2021. Exotic flora and fauna species are signified in text by an asterisk (\*).

## 3.6 Likelihood of Occurrence

The likelihood of the Ornamental Snake occurring in the Investigation Area and proposed Offset Area was determined using the criteria presented in Table 6. The assessment was based on historical records, the species' known ranges and habitat preferences, which were assessed against the characteristics of the Investigation Area observed during field surveys.

Table 6 Likelihood of Occurrence Scoring Matrix

Likelihood to occur	Definition
Present	The species was recorded during field surveys or has previously been recorded
High	The species was not recorded during field surveys, although it is known to occur in the immediate area, and habitat of suitable quality exists within the Investigation Area

Likelihood to occur	Definition
Moderate	The species was not recorded during field surveys, although it is known to occur in the wider region. Habitat was identified for the species in the Investigation Area during field surveys; however, it is marginal, fragmented and/or small in size, or degraded
Low	The species was not recorded during field surveys. The species is unlikely to occur in the wider region due to lack of, or extremely poor quality of habitat in the Investigation Area.

### 3.7 Limitations

Data acquisition during flora surveys generally has inherent limitations associated with variability of vegetation communities across a site, and changes to the detectability and presence of species with time. A high level of confidence in comprehensiveness is implicit in this study as survey sites were strategically located to capture representative samples of all communities. Further, the seasonal conditions during which this survey was undertaken were conducive to a relatively high degree of detectable floral diversity. However, given the above, it is recognised that field studies with a temporal limitation cannot always account for 100% of potential floral diversity present within a site.

## 4.0 Results

### 4.1 Desktop Survey Results

#### 4.1.1 Ornamental Snake Profile

##### 4.1.1.1 Description

The Ornamental Snake is a stout brown, grey-brown or grey-black snake with a darkly flecked or overall darker head with the lips distinctly barred in white/cream. The belly is white or cream with dark spots/flecks on the outer edges (Cogger, 2000). The iris is usually golden, and the tail often grades to a lighter orange-brown at the tip. The Ornamental Snake is nocturnal, moving only at night. It is probably active year-round but can remain inactive in shelters for periods of months during dry conditions (DSEWPC, 2004). Peak activity is likely to be late spring to early summer (DSEWPC, 2004).

##### 4.1.1.2 Distribution

The Ornamental Snake is primarily confined to the Brigalow Belt North and parts of the Brigalow Belt South within the drainage system of the Fitzroy and Dawson Rivers, Queensland (Cogger, 2000; DSEWPC, 2004).

##### 4.1.1.3 General Habitat Preference

Ornamental Snakes are found in close association with frogs which form much of its prey and is known to favour woodlands and open forests associated with moist areas, particularly gilgais with clay soils but is also known from lake margins, wetlands and waterways. This species is most likely to be found in Brigalow (*Acacia harpophylla*), Gidgee (*Acacia cambagei*), Blackwood (*Acacia argyrodendron*) or Coolabah (*Eucalyptus coolabah*) – dominated vegetation communities or pure grassland associated with gilgais (DAWE, 2022).

Ornamental Snakes tend to shelter in logs, under coarse woody debris and in ground litter and seem to prefer a diversity of gilgai size and depth, with some fringing groundcover vegetation and timber debris, where soils are of a high clay content with deep-cracking characteristics. Habitat patches greater than 10 ha and connected to larger areas of remnant vegetation are preferred (DAWE, 2022). EcoSM, (2020) described Ornamental Snake habitat as gilgai mounds and depressions with cracking-clay soils and moist areas, particularly within, or close to, habitat that is known to be favoured by its prey (frogs) with microhabitat features (i.e. logs, woody debris and leaf litter), and Brigalow threatened ecological community.

##### 4.1.1.4 Foraging and Refuge Habitat

Soil cracks on the high ground of gilgai development provide shelter for Ornamental Snakes during dry periods, and an abundance of frogs in gilgai areas provide food resources during wet periods (Brigalow Belt Reptiles Workshop, 2010). Ornamental snakes prefer areas with ground cover such as logs and coarse woody debris, and ground litter, which it uses for shelter (DAWE, 2022).

##### 4.1.1.5 Connectivity and Historic Records

A review of the DES WildNet and Atlas of Living Australia (ALA) historic records, show multiple records of the Ornamental Snake occurring within the Investigation Area and the wider Denham Park property (Figure 5). The records running linearly north to south along the western edge of Denham Park were recorded during construction of a gas pipeline in 2004, whilst the other records towards the eastern side

of the property when recorded in 2006. Recent surveys (2022) undertaken by EMM for a third-party gas project, recorded the species within the Denham Park property (Figure 5) (EMM, 2022). Spotlighting surveys during the EMM, 2022 surveys following heavy rainfall identified nine Ornamental Snakes on the first survey night and a further thirty on the second night of surveys. All individuals were in gilgais on the eastern side of the property. Surveys on the western section of the property (Investigation Area), were not possible due to flooding at the time of the surveys (EMM, 2022). However, EMM noted that the Ornamental Snake would likely occur in the western area.

There are additional historic records of the Ornamental Snake to the north and south of the Denham Park property, which indicates the Proposed Offset Area could be a corridor for the Ornamental Snake between these two areas. Denham Park, the Investigation Area and the Proposed Offset Area are situated within the current known distribution of the species as mapped by DCCEE and the Proposed Offset Area is classed as “species or species habitat is likely to occur” (Figure 6).

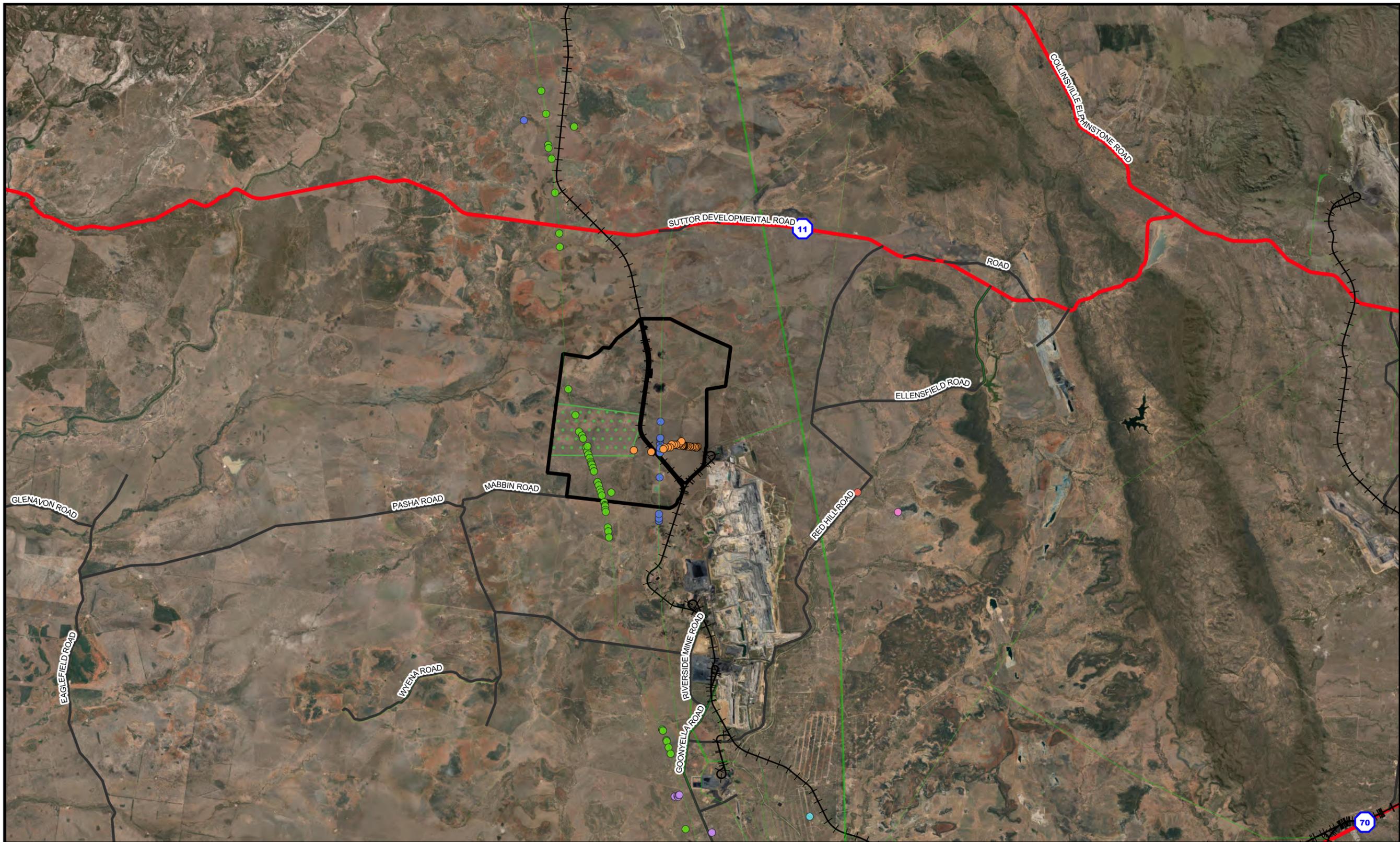
Habitat suitability models (HSM) for MSES species are available from DES and the Ornamental Snake is among the species in which has a HSM. HSM’s depict areas within the landscape that are important habitat areas for a species rather than just broad species distributions. To do this, habitat is classified into four habitat value categories: preferred habitat known (PHK); preferred habitat possible (PHP); general habitat known (GHK); or general habitat possible (DES, 2020). As seen in Figure 7, the vast majority of the Proposed Offset Site is classed as PHK, which is defined as “known where the taxon is present (based on high accuracy records/expert advice) and there are indications of reproduction, or where a significant number of individuals are present, or important resources (such as nest sites, roost caves, major food sources) are present, or where important movement corridors for breeding and/or non-breeding (including migratory) individuals have been identified” (DES, 2020).

#### 4.1.2 State Mapped Regional Ecosystem

State RE mapping was reviewed to determine the extent of vegetation communities within the Investigation Area. In total, three vegetation communities occur including two REs mapped within the Investigation Area - refer to Table 7. Figure 8 shows the current State mapped REs within the Investigation Area and the Proposed Offset Area.

**Table 7 State Mapped RE Within the Investigation Area**

Regional Ecosystem	Description
11.3.4	<i>Eucalyptus tereticornis</i> and/or <i>Eucalyptus</i> spp. woodland on alluvial plains
11.4.9	<i>Acacia harpophylla</i> shrubby woodland with <i>Terminalia oblongata</i> on Cainozoic clay plains.
Non-remnant	-



**Figure 5: Historic Records**

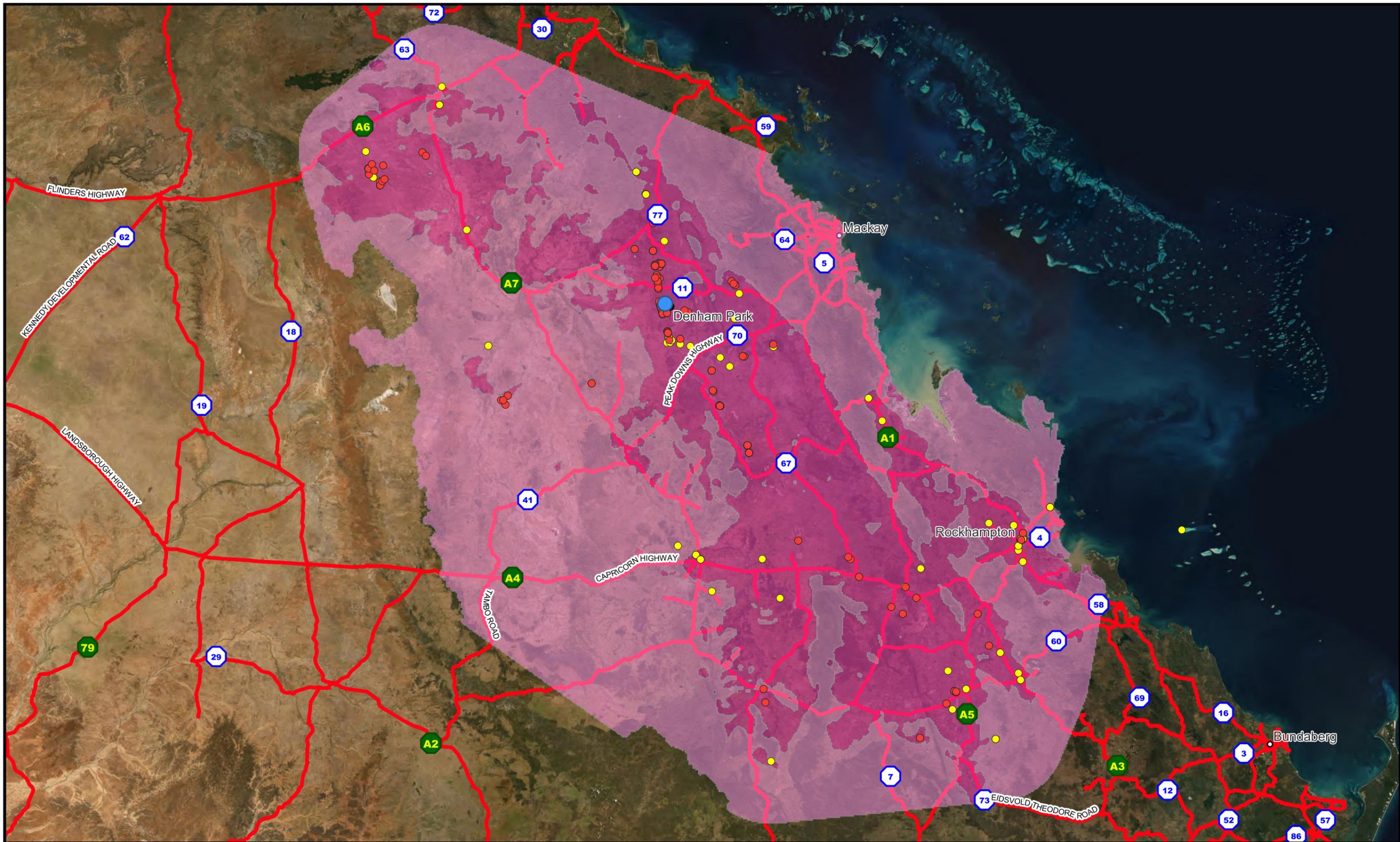
0 5 10 km

Scale @ A3: 1:200000  
 Date: 11/10/2022  
 Job: J0053.3  
 Drawn: Isaac Witten

DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- Denham Park
  - Investigation Area
  - Easement
  - State Controlled Road
  - Road
  - Rail
- 
- Ornamental Snake Records**
  - 2003
  - 2004
  - 2006
  - 2012
  - 2014
  - 2015
  - Ornamental Snake (EMM) (2022)





**Figure 6: Ornamental Snake Distribution (DCCEEW)**

0 50 100 km

Scale @ A3: 1:2250000  
 Date: 12/09/2022  
 Job: J0053.3  
 Drawn: Isaac Witten



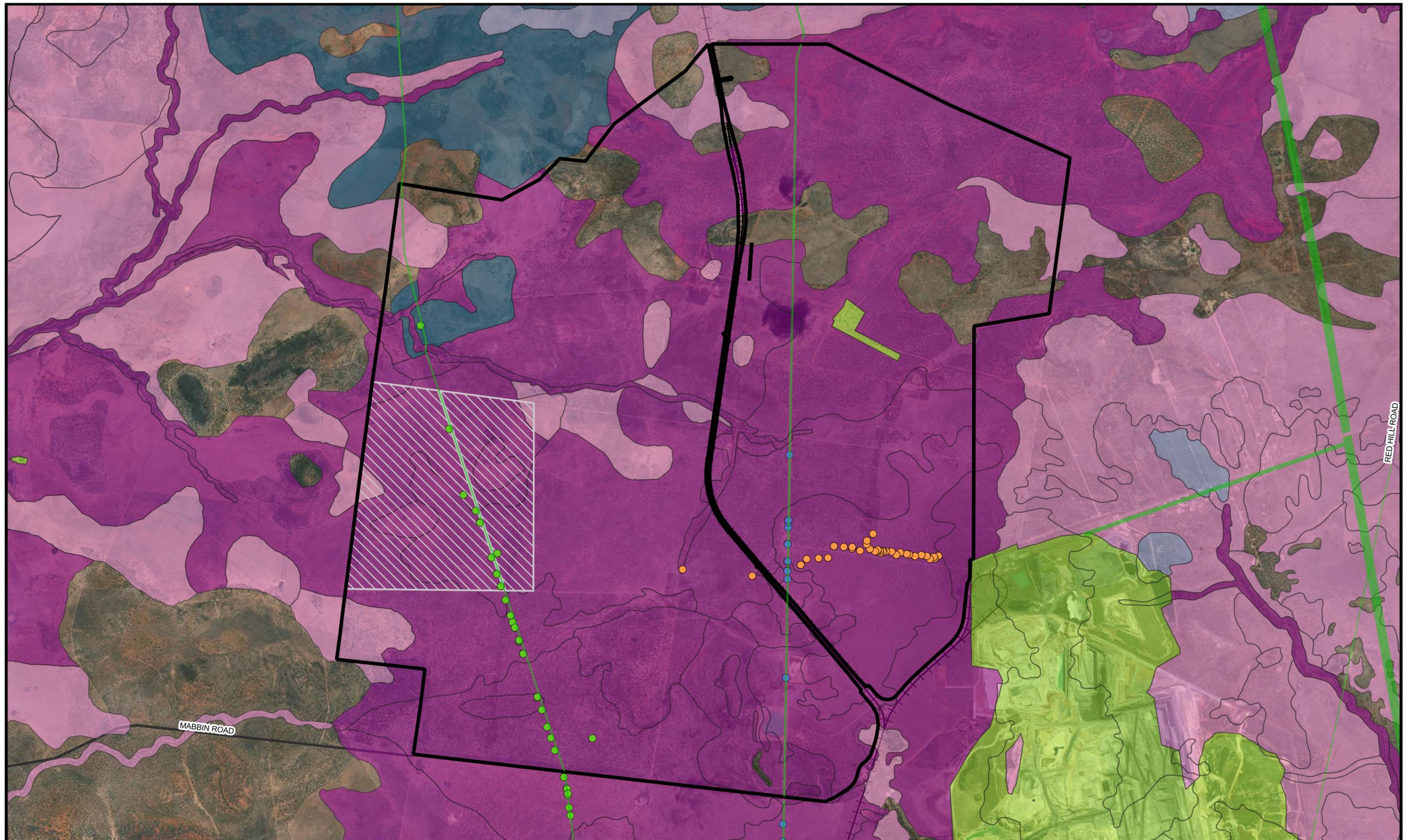
DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- Denham Park
- Cities/Towns
- State Controlled Road
- Ornamental Snake (ALA)
- Ornamental Snake (WildNet)
- Ornamental Snake (EMM)

- DCCEEW Species of National Environmental Significance Distributions: Ornamental Snake**
- Species or species habitat likely to occur
  - Species or species habitat may occur



BASE Dropbox\BASE Project Folder\Job Folder\J0053.3 Stanmore (Ornamental Snake Offsets)\Reports\1. Figures  
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**Figure 7: Habitat Suitability Modelling (DES)**

0 1 2 km

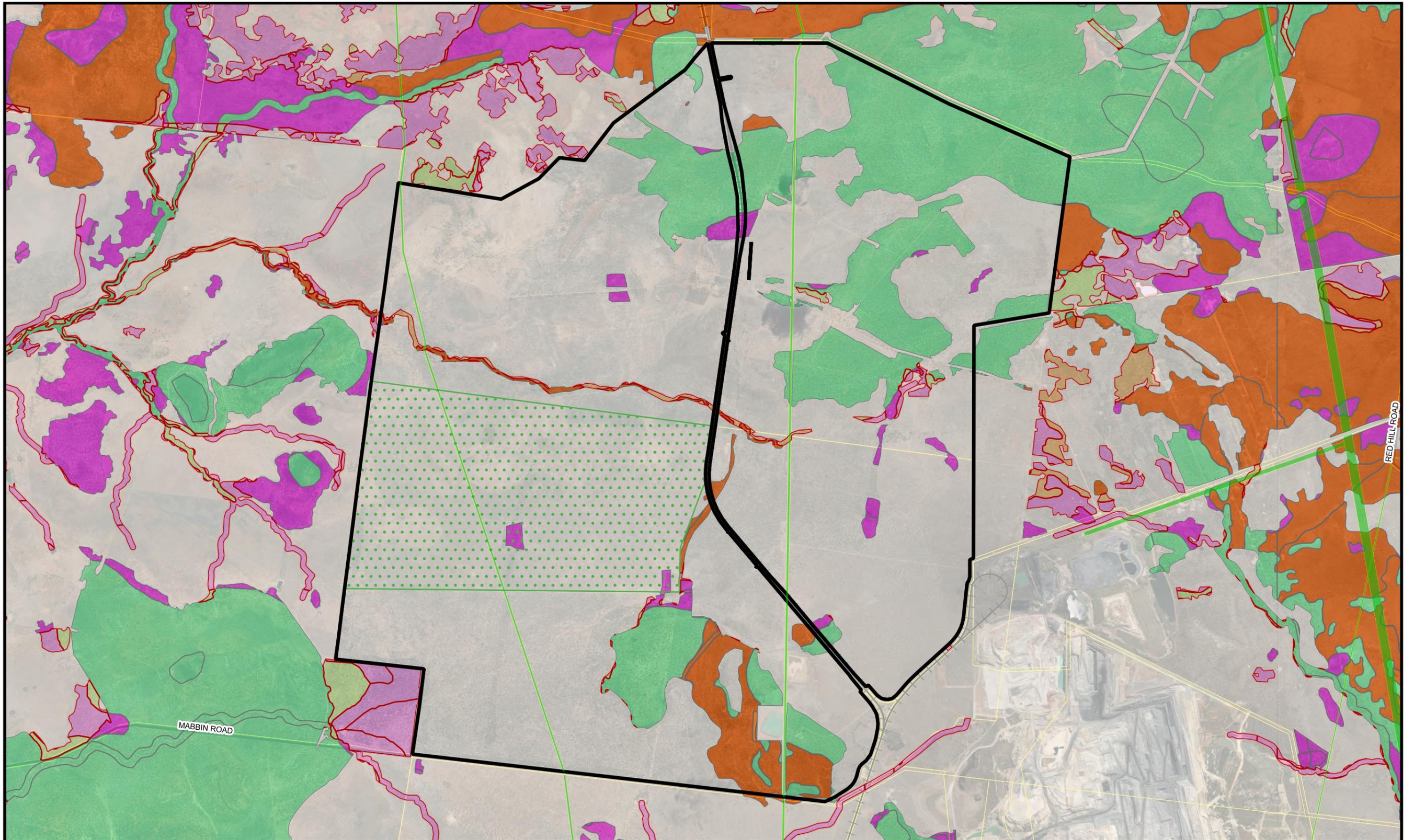
Scale @ A3: 1:50000  
 Date: 11/10/2022  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGP, IGP, swisstopo, and the GIS User Community, DATSIP

- |                      |                            |                               |
|----------------------|----------------------------|-------------------------------|
| Denham Park          | Preferred Habitat Known    | Ornamental Snake Records      |
| Proposed Offset Area | Preferred Habitat Possible | 2006                          |
| Easement             | General Habitat Known      | Ornamental Snake (EMM) (2022) |
| Road                 | General Habitat Possible   |                               |
| Rail                 | No longer habitat          |                               |

**BASE/**



**Figure 8: Regional Ecosystems (DES)**

0 1000 2000 m

Scale @ A3: 1:50000  
 Date: 12/09/2022  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- |                       |  |
|-----------------------|--|
| Denham Park           | Vegetation management regional ecosystem - all |
| Investigation Area    | Category A or B area containing endangered     |
| DCDB                  | Category A or B area containing of concern     |
| Easement              | Category A or B area that is least concern     |
| State Controlled Road | Category C or R area containing endangered     |
| Road                  | Category C or R area containing of concern     |
| Rail                  | Category C or R area that is of least concern  |
|                       | Non-remnant                                    |



### 4.1.3 Historic Land Used Analysis

There are numerous historical records of Ornamental Snake within the Investigation Area; however, the majority of these were from 2004 and 2006 during the installation of a gas pipeline (Figure 5). Therefore, historical land use was analysed to determine if there has been a major change in land use since then. Historical imagery indicates the site has a history of being consistently modified and managed for agricultural use dating back to 1989 (Appendix C). No historical aerial imagery occurs from the exact period of historical Ornamental Snake records in 2004 within the Proposed Offset Area. However, imagery was available in 2001 and 2006 (i.e. either side of the historical Ornamental Snake records) and from 2006 which is when Ornamental Snakes were recorded in the broader Investigation Area. Analysis of these images and those from the present indicates minimal land use and land management changes have occurred within the Proposed Offset Area and Investigation Area within this timeframe. Although the recent surveys from EMM (2022) could not access the western side of the property (Investigation Area), the species was recorded immediately adjacent to the Investigation Area in similar habitat. Importantly, the species was historically recorded from the same locations as those during the 2022 surveys which indicates the land use and habitat is similar to that from 2004 and 2006.

## 4.2 Field Survey Results

Two field assessments to determine suitability of vegetation communities within Denham Park to provide offset for the significant residual impacts to the Ornamental Snake were undertaken by suitably qualified ecologists from BASE as follows:

- Survey event 1 (Initial scoping and high-level vegetation classification): three (3) days; 12 – 14 July 2022.
- Survey event 2 (habitat quality assessments): five days; 15 – 20 August 2022.

The initial survey in July determined the Investigation Area as the best location to provide offset for the impacted MNES within the broader Denham Park property. The initial surveys were used as a guide to determine the specific Assessment Units within the Investigation Area; however, the final Assessment Units were determined following the second survey event.

### 4.2.1 Survey Timing and Climatic Conditions

Weather conditions leading up to both survey events were relatively wet in comparison to the average monthly rainfall, refer to Table 8 (BOM, 2022).

Table 8 Monthly Rainfall for 2022 and Average for All Years

Month	January	February	March	April	May	June	July	August	September	October	November	December
Mean rainfall (All years)	92.5	84.9	83.0	26.7	35.7	18.1	38.5	13.3	9.7	22.6	49.5	65.1
Actual rainfall 2022	97.2	12.2	20.6	41.8	108	0.2	133	3.6	-	-	-	-

#### 4.2.2 Field Verified Vegetation Communities

The field surveys confirmed the presence of four distinct vegetation communities within the Investigation Area that were considered as potential habitat for the Ornamental Snake. These areas make up the four Assessment Units (AU) referred to when completing the HQAPs (Table 9). Following consultation with Stanmore Resources and the current land manager and taking into consideration the scale of offsets required as well as ongoing management actions, an area within the Investigation Area was chosen to accommodate a Proposed Offset Area (Figure 9).

**Table 9 Assessment Units**

AU#	AU definition	BioCondition Benchmark RE used	Total area (ha) within the Investigation Area	Total area (ha) within the Proposed Offset Area
1	Cleared paddock	11.9.1	282	157.6
2	Low regrowth brigalow	11.4.9	1566.4	832.4
3	Eucalypt open forest	11.9.1	7.4	7.4
4	Regrowth brigalow	11.4.9	30.8	22.8
Total				1020 (ha)

Each of the vegetation communities recorded contained the potential to provide habitat for the Ornamental Snake. A description of the vegetation communities, the habitat values each supports and the averaged habitat quality score for the AU are exhibited in Table 10.

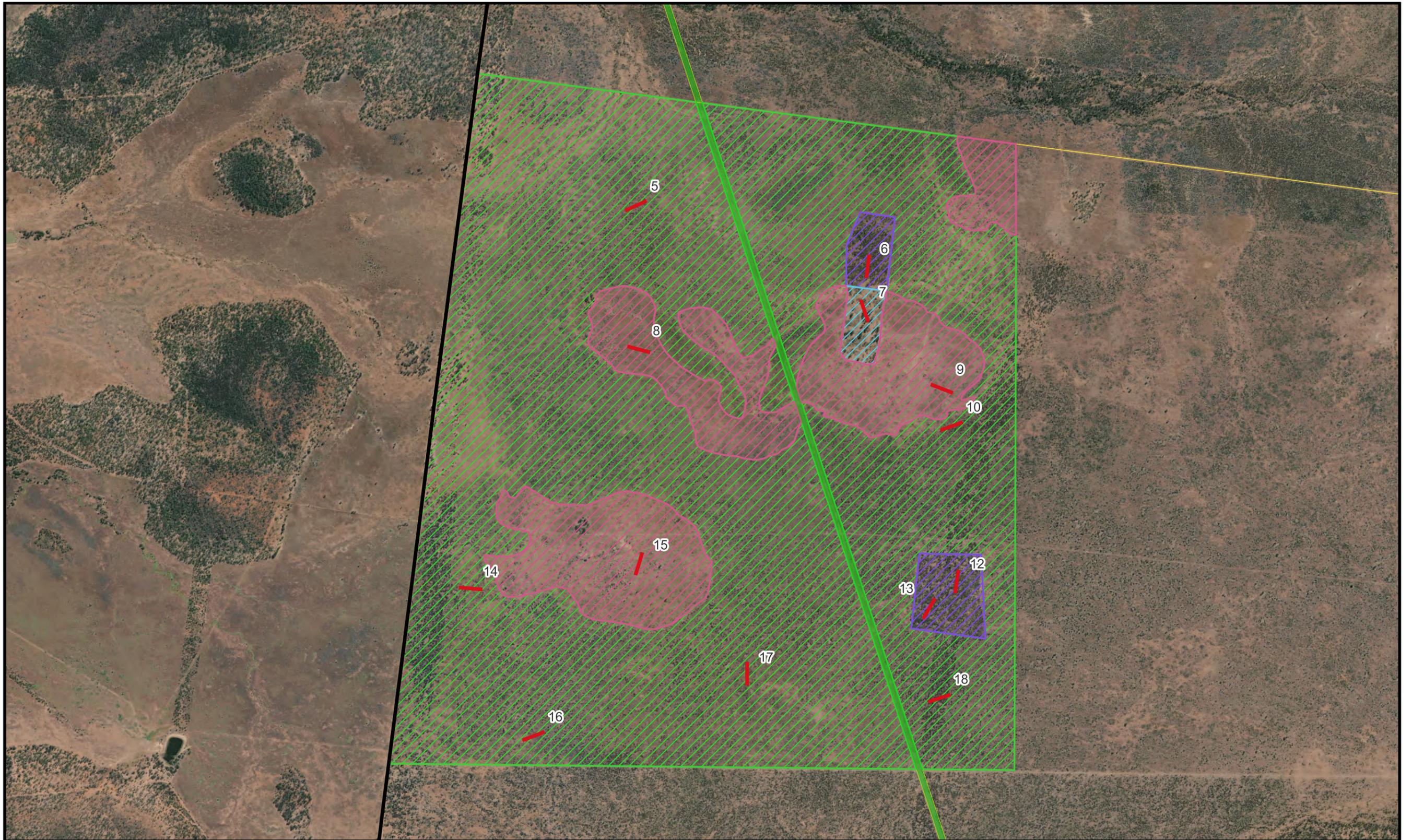
Table 10 Field Verified Vegetation Communities and Habitat Values

Assessment Unit	Description and habitat values	HQS in Proposed Offset Site	Field verified area (ha)	Image
<p>AU 1 – Cleared paddock with recruitment species synonymous with RE 11.9.1</p>	<p>Cleared paddock with sparse emergent <i>Eucalyptus cambageana</i>. Small patches of <i>Acacia harpophylla</i> are sparsely scattered across the Assessment Unit associated with gilgais. The shrub layer was very sparse and consisted of <i>Eucalyptus cambageana</i> and <i>Acacia harpophylla</i> saplings. Ground layer was split evenly between native and non-native grass species in patches throughout the area. <i>Bothriochloa decipiens</i> was the most abundant of the native grasses. Other native grass species included <i>Aristida calycina</i>, <i>Brachyachne convergens</i>, <i>Chloris truncata</i>, <i>Panicum decompositum</i>, <i>Astrelba pectinata</i> and <i>Sporobolus actinocladus</i>. The most abundant non-native species was <i>Cenchrus ciliaris</i>* which covered approximately %50 of AU1; other commonly occurring species include <i>Harrisia martinii</i>*, <i>Portulaca oleracea</i>* and <i>Urochloa mosambicensis</i>*. Native forbs were also present with species including <i>Abutilon spp</i>, <i>Sida spp</i>, <i>Hibiscus brachysiphonius</i>, <i>Portulaca australis</i> and <i>Enchylaena tomentosa</i>.</p> <p>The Assessment Unit tends to occur on hill crests or higher areas of undulating plains. Soils are clayey sand, with very limited clay content at times. Gilgais are sparse within this Assessment Unit, where they are present vegetation has not been cleared to allow shade for livestock. These areas provide foraging and shelter habitat for the Ornamental Snake.</p>	<p>2 (2.3 rounded to 2)</p>	<p>157.6</p>	

Assessment Unit	Description and habitat values	HQS in Proposed Offset Site	Field verified area (ha)	Image
<p>AU 2 – Low regrowth brigalow with recruitment species synonymous with RE 11.4.9</p>	<p>Cleared paddock with low (to 2m) regrowth with a cover of 10-20%. <i>Acacia harpophylla</i> dominates the regrowth with other commonly occurring species such as <i>Terminalia oblongata</i>, <i>Carissa ovata</i>, <i>Atalaya hemiglauca</i>, <i>Santalum acuminatum</i>, <i>Capparis anomala</i>, <i>Capparis lasiantha</i>, <i>Citrus glauca</i> and <i>Eremophila spp.</i> The ground layer is dense and often dominated by exotic grasses such as <i>Cenchrus ciliaris</i>* and <i>Urochloa mosambicensis</i>*. In areas dominated by native species the most abundant native grass is <i>Bothriochloa decipiens</i>. Other native ground layer species include <i>Aristida spp.</i>, <i>Sporobolus spp.</i>, <i>Enneapogon spp.</i>, <i>Dichanthium sericeum</i>, <i>Chloris truncata</i>, <i>Parsonsia lanceolata</i>, <i>Portulaca australis</i>, <i>Sida cunninghamii</i>, <i>Clematicissus opaca</i>.</p> <p>Gilgai's are common throughout this Assessment Unit and typical species surrounding gilgais include <i>Oryza australiensis</i>, <i>Eragrostis tenellula</i>, <i>Brachyachne convergens</i>, <i>Cyperus exaltatus</i>, and <i>Marsilea drummondii</i>.</p> <p>This Assessment Unit typically occurs on clay plains, with cracking clay soils and regular gilgais of varying sizes and depths. Provides foraging and shelter habitat for the Ornamental Snake. Shelter habitat in the cracking clay soils and foraging habitat around the gilgais where prey species occur.</p>	<p>4 (3.7 rounded to 4)</p>	<p>832.4</p>	

Assessment Unit	Description and habitat values	HQS in Proposed Offset Site	Field verified area (ha)	Image
<p>AU 3 – Eucalypt open forest with species synonymous with RE 11.9.1</p>	<p><i>Eucalyptus cambageana</i> open forest. A lower tree canopy is present and comprises of <i>Eucalyptus cambageana</i> and <i>Acacia harpophylla</i>. There is a sparse shrub layer present and consists of <i>Alectryon diversifolius</i>, <i>Capparis lasiantha</i>, <i>Acacia harpophylla</i>, and <i>Flindersia dissosperma</i>. Ground layer is mid-dense and dominated by <i>Cenchrus ciliaris</i>*. Native ground layer species are less common comprising of various forbs and grasses including <i>Salsola australis</i>, <i>Enchylaena tomentosa</i>, <i>Bothriochloa decipiens</i>, <i>Chloris truncate</i> and <i>Sporobolus caroli</i>.</p> <p>The Assessment Unit typically occurs on hillcrests with sandy soils. Provides shelter habitat for the Ornamental Snake through, large woody debris and leaf litter. There is an abundance of gilgais surrounding the assessment unit on the lower slopes.</p>	<p>3 (2.7 rounded to 4)</p>	<p>7.4</p>	 <p>The image consists of two photographs. The top photograph shows a wide view of an open forest with several tall, slender trees and a dense ground layer of dry, yellowish-brown grasses. A large, weathered log lies in the foreground. The bottom photograph is a closer view of the same forest, highlighting the lower tree canopy and the sparse shrub layer. The ground is covered in dry grasses and leaf litter.</p>

Assessment Unit	Description and habitat values	HQS in Proposed Offset Site	Field verified area (ha)	Image
<p>AU 4 – High regrowth brigalow with species synonymous with RE 11.4.9</p>	<p>Low open forest to low woodland dominated by <i>Acacia harpophylla</i> with associated species such as <i>Terminalia oblongata</i>, <i>Casuarina cristata</i>, <i>Flindersia dissosperma</i>, <i>Atalaya hemiglauca</i>, <i>Lysiphyllum spp.</i> and <i>Santalum acuminatum</i>. A sparse shrub layer is present with mixed native species including <i>Acacia harpophylla</i>, <i>Carissa ovata</i>, and <i>Terminalia oblongata</i>. The ground layer is mid-dense and is typically dominated by non-native pastural grasses such as <i>Cenchrus ciliaris</i>* and <i>Urochloa mosambicensis</i>*. Native species occurring in the ground layer include various forbs and grasses such as <i>Bothriochloa decipiens</i>, <i>Aristida spp.</i>, <i>Sporobolus spp.</i>, <i>Enneapogon spp.</i>, <i>Achyranthes aspera</i>, <i>Chloris truncata</i>, <i>Parsonsia lanceolata</i>, <i>Portulaca australis</i>, <i>Sida cunninghamii</i>, <i>Alternanthera nana</i> and <i>Clematicissus opaca</i>.</p> <p>Gilgais are abundant throughout this Assessment Unit, typical species surrounding gilgais include <i>Oryza australiensis</i>, <i>Eragrostis tenellula</i>, <i>Brachyachne convergens</i>, <i>Cyperus exaltatus</i>, and <i>Marsilea drummondii</i>.</p> <p>This Assessment Unit typically occurs on clay plains, with cracking clay soils and regular gilgais of varying sizes and depths. Provides foraging and shelter habitat for the Ornamental Snake. Shelter habitat in the cracking clay soils, large woody debris and leaf litter and foraging habitat around the gilgais where prey species occur.</p>	<p>4 (4.2 rounded to 4)</p>	<p>22.8</p>	



**Figure 9: Proposed Offset Area (Assessment Units)**

0 400 800 m

Scale @ A3: 1:15000  
 Date: 12/09/2022  
 Job: J0053.3  
 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

- |                       |   |
|-----------------------|---|
| Denham Park           | <b>Proposed Offset Area (AU)</b>                          |
| Investigation Area    | Assessment Unit 1: (Grassland RE 11.9.1)                  |
| DCDB                  | Assessment Unit 2: (Low Regrowth Brigalow RE 11.4.9)      |
| Easement              | Assessment Unit 3: (Regrowth Eucalypt Woodland RE 11.9.1) |
| State Controlled Road | Assessment Unit 4: (Regrowth Brigalow RE 11.4.9)          |
| Road                  | HQAPs within Proposed Offset Area                         |
| Rail                  |   |



### 4.2.3 Habitat Quality Assessment Plot Results

Four AUs were confirmed throughout the Investigation Area and the Proposed Offset Area. During the August survey event, 23 HQAPs were established throughout the Investigation Area (Figure 4). The number of HQAPs was in accordance with the Guide and to provide insight into which area within the Investigation Area is most suited to deliver a conservation outcome for the Ornamental Snake. This area was chosen as the Proposed Offset Site and contains 13 HQAPs, placed within the four AUs (Table 11).

**Table 11 Number of HQAPs per Assessment Unit**

AU	Benchmark RE	Number of HQAP within Investigation Area	Number of HQAPS within Proposed Offset Area
1	11.9.1	6	3
2	11.4.9	13	6
3	11.9.1	1	1
4	11.4.9	4	3

The field data recorded at each of the HQAPs for each AU was used to determine a baseline site condition score. The data was then compared against the DES BioCondition benchmarks for the corresponding REs (Table 11) to give a site condition score. Site context was calculated post field surveys using a combination of GIS analysis and field data. Species stocking rate was given a score of 1 across the Proposed Offset Site due to the historical presence of the species and the presence during the 2022 EMM surveys. These scores were then converted into a score out of 10 using the methodology outlined in the Guide and as outlined in section 3.3.2.

The averaged habitat quality scores (HQS) for each AU within the Proposed Offset Area are displayed in Table 12. A full account of the HQS is provided in Appendix D. As the AU are not all equally sized, they must be area-weighted in order to gather a HQS for the entire Proposed Offset Area Table 12. The final area weighted habitat quality score for the Proposed Offset Area is 3.4, which rounds down to starting habitat quality score of 3.

**Table 12 Habitat Quality Scores Within the Proposed Offset Area**

Final habitat quality score (weighted)	AU1	AU2	AU3	AU4	Average/Final
Site Condition	0.74	1.67	1.02	2.07	
Site Context	0.53	1.02	0.67	1.11	
Species Stocking Rate	1	1	1	1	
HQS	2.3	3.7	2.7	4.2	
AU Area (ha)	157.6	832.4	7.4	22.8	
Total Proposed Offset Area (ha)	1020	1020	1020	1020	

Final habitat quality score (weighted)	AU1	AU2	AU3	AU4	Average/Final
Size weighting	0.15	0.82	0.01	0.02	
<b>Weighted Habitat Quality Score</b>	<b>0.35</b>	<b>3.02</b>	<b>0.02</b>	<b>0.09</b>	<b>3.47</b>

#### 4.2.4 Weed Species (Flora)

A total of 18 non-native species were recorded during the HQAPs within the Investigation Area of which, four (4), *Harrisia martini*, *Opuntia tomentosa*, *Senecio madagascariensis* and *Parthenium hysterophorus* are considered 'restricted matter' under the Queensland *Biosecurity Act 2014* of which all four (4), are also identified as a Weed of National Significance (WONS). A full list of weed species is included in Appendix E.

#### 4.2.5 Pest Species (Fauna)

A total of five (5) pest fauna species were detected from a combination of direct observations (i.e., physically observed) and indirect (i.e., tracks observed) methods. Three (3) of these are listed as 'restricted matter' under the *Biosecurity Act 2014*. Details of all pest species detected during surveys are shown in Table 13.

Table 13 Introduced Fauna Species Observed

Scientific Name	Common Name	Method of Detection	<i>Biosecurity Act 2014</i>
<i>Bos taurus</i>	Domestic cow	Observed	
<i>Canis lupus</i>	Dog	Scats and tracks	Category 3, 4, 6
<i>Felis catus</i>	Cat	Observed	Category 3, 4, 6
<i>Lepus europaeus</i>	European hare	Observed	
<i>Sus scrofa</i>	Feral pig	Observed, scats, diggings	Category 3, 4, 6
<i>Oryctolagus cuniculus</i>	Rabbit	Observed, scats	Category 3, 4, 5 and 6
<i>Rhinella marina</i>	Cane toads	Observed	

#### 4.2.6 Microhabitat Survey Results

A total of 13 microhabitat assessments were undertaken during the surveys of the Proposed Offset Area. Of the 13 sites, 11 recorded cracking clay soils with the remainder being sandy soils on high points. No frog species were recorded; however no targeted surveys were undertaken due to the timing of the surveys and the low likelihood of frog species being active. Inundation or pools of water was common and recorded at six (6) of the 13 sites and disturbances were recorded at all 13 sites. The main disturbance was cover of pastoral grass species.

### 4.3 Likelihood of Occurrence

A likelihood of occurrence assessment was undertaken using the likely presence criteria outlined in section 2.1.1 against the likelihood of occurrence criteria outlined in section 3.6. Desktop assessment of nearby historical records indicate the Ornamental Snake has previously been recorded within the Investigation Area and Proposed Offset Area. Land use of the area has been subject to minimal change since the recordings.

As the Ornamental Snake has been recorded within the Investigation Area and Proposed Offset Area, the species is present based on surveys from 2004 (Proposed Offset Area) and 2006 (Investigation Area). If these historical surveys were disregarded, suitable habitat for the Ornamental Snake is widespread across the Investigation Area and as such, the likelihood of the Ornamental Snake occurring within the Proposed Offset Site is high using the criteria set out in section 3.6. Further, the 2022 surveys undertaken by EMM found the Ornamental Snake on the eastern edge of the Investigation Area several hundred metres to the east of the proposed Offset Area, and in similar habitat to that found in the Proposed Offset Area.

## 5.0 Summary

Seasonality of the surveys undertaken prevented targeted surveys for the Ornamental Snake; however, a likelihood of occurrence assessment was completed and found the species was highly likely to occur within the Proposed Offset Area. This assessment was based on historical records from the Investigation Area and Proposed Offset Area, known distribution and habitat modelling, recent surveys from EMM (EMM, 2022) within the Denham Park property and field assessment of habitat features.

The Ornamental Snake has been recorded within the Investigation Area and Proposed Offset Area, the species is present based on surveys from Proposed Offset Area in 2004 and the Investigation Area in 2006. Although the targeted surveys could not be undertaken in August, surveys undertaken by EMM (2022) found the Ornamental Snake on the eastern edge of the Investigation Area several hundred metres to the east of the Proposed Offset Area, and in similar habitat to that found in the Proposed Offset Area. Further, aerial imagery analysis indicated the land use of the Investigation Area and Proposed Offset Area has been subject to minimal change since the 2004 and 2006 recordings within the Proposed Offset Area and Investigation Area, respectively.

Vegetation communities supported suitable, albeit degraded shelter and foraging habitat for the Ornamental Snake as an interconnected ecological system. Shelter habitat was comprised of large woody debris, leaf litter, and cracking clay soils in the lower lying land zone 4 areas, whilst foraging habitat comprised of gilgai depressions in a wide variety of depths and size. Habitat quality of the Proposed Offset Area was assessed from 13 habitat quality assessment plots and the current (starting) habitat quality was calculated as low quality with a score of three out of ten. This score is similar to the observed on the impact site for the species.

## 6.0 References

- BASE. (2021). *Isaac Downs - Offset Area Management Plan: EPBC 2019/8413*. Brisbane: Base Consulting Group.
- Cogger, H. (2000). *Reptiles and Amphibians of Australia - 6th Edition*. Sydney: Reed New Holland.
- DAWE. (2012). *Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy*. Canberra: Department of Agriculture, Water and the Environment.
- DAWE. (2022). *Species Profile and Threats Database - Denisonia maculata*. Retrieved from Department of Agriculture, Water and Environment website: [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=1193](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1193)
- DES. (2018). *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland Version 3*. Brisbane: Queensland Herbarium, Department of Environment and Science.
- DES. (2020). *Guide to determining terrestrial habitat quality: Methods for assessing habitat quality under the Queensland Environmental Offsets Policy Version 1.3*. Brisbane: Offsets Policy, Conservation Policy and Planning, Department of Environment and Science.
- DES. (2020). *Method for mapping Matters of State Environmental Significance: for the State Planning Policy 2017. Version 6.0*. Brisbane: Department of Environment and Science.
- DES. (2021). *Remnant vegetation cover - 2019 - Queensland*. Brisbane: Department of Environment and Science.
- DSEWPC. (2004). *Survey Guidelines for Australia's threatened reptiles*. Canberra: Australian Government.
- ECOSM. (2020). *Biodiversity offsets strategy - Isaac Downs Project*. Prepared for Stanmore IP South PTY LTD.
- ECOSM. (2020). *Terrestrial Ecology Impact Assessment Report: Isaac Downs Project*. Brendale: Ecological Survey and Management.
- EMM. (2022). *Matters of National Environmental Significance (MNES) Assessment Report: QPM Energy Project (Draft in progress)*. Brisbane: EMM.
- Eyre, T., Kelly, A., Neldner, V., Wilson, B., Ferguson, D., Laidlaw, M., & Franks, A. (2015). *A Condition Assessment Framework for Terrestrial Biodiversity in Queensland Version 2.2*. Brisbane: Department of Environment and Science, Queensland Government.
- Nalder, V. J., Wilson, B. A., Dillewaard, H. A., Ryan, T. S., Butler, D. W., McDonald, W. J., . . . Appelman, C. N. (2020). *Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland*. Brisbane: Queensland Herbarium, Queensland Department of Environment and Science.
- Neldner, V., Wilson, B. A., Dillewaard, H. A., Ryan, T. S., Butler, D. W., McDonald, W. J., . . . Appelman, C. N. (2020). *Methodology for Survey and Mapping of Vegetation Communities and Regional Ecosystems in Queensland Version 5.1*. State of Queensland.
- Queensland Herbarium. (2021, June 11). *Department of Environment and Science*. Retrieved from BioCondition Benchmark Database. Version 3.1: <https://www.qld.gov.au/environment/plants-animals/biodiversity/benchmarks>
- Queensland Herbarium. (2021). *Regional Ecosystem Description Database (REDD). Version 12*. Brisbane: Department of Environment and Science.

## Appendix A

# Habitat Quality Transect Photo Plan

Photo Plan - Habitat Quality Assessment Plot 1



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 2



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 3



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 4



North



East



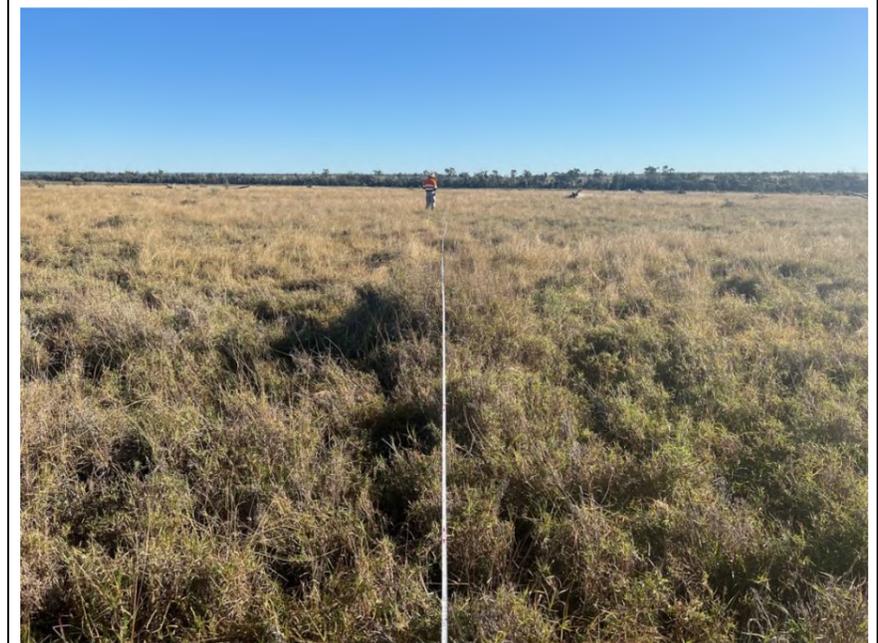
South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 5



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 6



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 7



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 8



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 9



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 10



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 11



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 12



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 13



North



East



South



West



Start

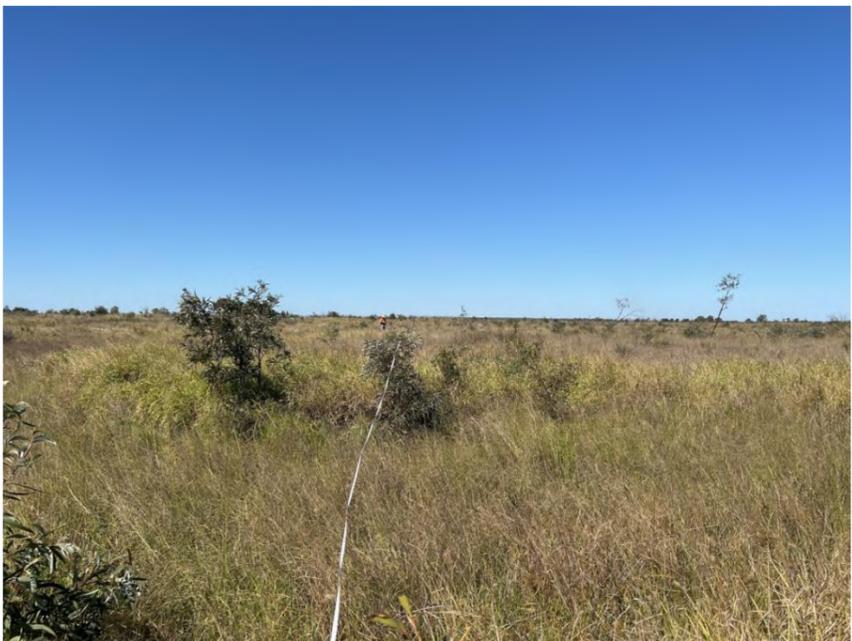


End

Photo Plan - Habitat Quality Assessment Plot 14



North



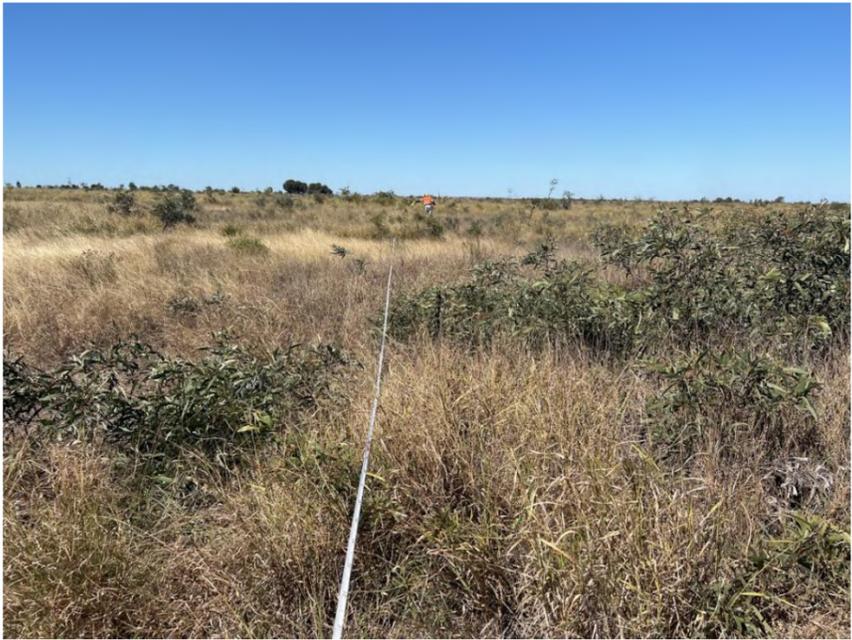
East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 15



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 16



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 17



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 18



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 19



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 20



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 21



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 22



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 23



North



East



South



West



Start



End

Photo Plan - Habitat Quality Assessment Plot 24

North	East	South
West	Start	End

## Appendix B

# Species Habitat Indices/Rationale

## Ornamental Snake (*Denisonia maculata*)

### 1. Quality and availability of foraging habitat

Indicator	Description			Score
Presence, abundance and variety of gilgai	<b>5</b>	<b>20</b>	<b>40</b>	<b>40</b>
	Sparse, isolated gilgai with minimal surrounding deep cracking soil or no gilgai present	Multiple gilgai present within assessment unit with some variety of depth and size. Deep cracking soil present.	Abundant connected gilgai with a variety of size and depth.	
Vegetation structure	<b>1</b>	<b>7</b>	<b>15</b>	<b>15</b>
	Cleared paddocks dominated by exotic grass species.	Regrowth vegetation with some areas of leaf litter and woody debris.	Remnant or advanced regrowth with abundant areas of deep leaf litter, coarse woody debris and native tussock grasses.	
<b>Total</b>				<b>55</b>

#### Rationale

The species appears to be a habitat specialist with few records occurring outside of gilgai and cracking clay habitats. This species is most commonly found in vegetation communities that occur on Cainozoic clay plains, with REs 11.4.3, 11.4.6, 11.4.8 and 11.4.9 representing the most common Regional Ecosystems in which this species has been recorded (DAWE, 2020). This species has also been recorded on REs 11.3.3 and 11.5.16 (DAWE, 2020), as well as RE 11.9.5 and non-remnant vegetation where gilgai are prevalent (Marston *pers comms*). The capacity of soils within gilgai systems to form deep cracks and retain ponded areas following rainfall, appears to be the main criteria for the distribution and preferential selection of gilgai habitats by the species (Veary et al., 2011).

The diet of this species consists predominately of frogs and particularly frogs of the *Cyclorana* genus (TSSC, 2016). The prey species of Ornamental Snake are associated with gilgai, cracking clay soils and ephemeral water bodies. As an example, a high abundance of snakes at a site near Nebo was observed to coincide with an abundance of young frogs emerging from an ephemeral pool (DAWE, 2020).

The quality of gilgai habitat will be assessed during field surveys and will be determined by assessing the presence, abundance and variety of gilgai habitat within an assessment unit. Gilgai presence will require consultation of current and historic aerial photographic imagery and walking areas of the assessment unit with apparent gilgai formations. This indicator will be measured qualitatively based on the combination of size, depth, bank angle and vegetation structure of gilgai within the assessment unit.

Assessment units that show no indication of gilgai and cracking soils and are not on land zone 4 (with an exemption for gilgai formations on land zone 9) will not be considered suitable habitat for the species.

## 2. Quality and availability of habitat required for shelter and breeding

Indicator	Description			Score
<b>Presence, abundance and variety of gilgai habitat</b>	<b>Low (0)</b> Sparse, isolated gilgai with minimal surrounding deep cracking soil.	<b>Moderate (5)</b> Multiple gilgai present within assessment unit with some variety of depth and size. Deep cracking soil present.	<b>High (10)</b> Abundant connected gilgai with a variety of size and depth. Abundant areas of deep cracking soil.	<b>10</b>
<b>Presence of ground timber, deep leaf litter and tussock grass</b>	<b>Low (1)</b> Sparse tussock grass and coarse woody debris	<b>Moderate (3)</b> Moderate abundance of tussock grass and coarse woody debris across the patch	<b>High (5)</b> Abundant tussock grass and coarse woody debris particularly adjacent or close to gilgai	<b>5</b>
<b>Total</b>				<b>15</b>

### Rationale

The species is known to seek refuge during dry periods in deep cracking clay associated with gilgai habitat (DAWE, 2020). The species is not known to leave gilgai habitat for breeding purposes. The presence and abundance of gilgai habitat within an assessment unit is the most important characteristic of quality and availability of habitat required for shelter and breeding. While the habitat conducive to the species is likely to be governed by underlying soil, in periods of extreme rainfall the species has been observed utilising the dense cover of tussock grasses for diurnal shelter (Veary, 2011). The species is also thought to shelter in logs and under coarse woody debris and ground litter (DAWE, 2020).

Both of these indicators will be determined during field survey assessments through habitat quality plots and visual qualitative assessments.

### 3. Quality and availability of habitat required for mobility

Indicator	Description			Score
<b>Presence, abundance and variety of gilgai</b>	<b>Low (1)</b> Sparse, isolated gilgai with minimal deep cracking soil present	<b>Moderate (5)</b> Multiple gilgai present within assessment unit with some variety of depth and size. Deep cracking soil present.	<b>High (10)</b> Abundant connected gilgai with a variety of size and depth.	<b>10</b>
<b>Patch size</b>	<b>Low (1)</b> No adjacent suitable habitat. Habitat patch <10 Ha.	<b>Moderate (3)</b> Some adjacent suitable habitat. Habitat patch >10 Ha.	<b>High (5)</b> Significant adjacent suitable habitat. Habitat patch >20 Ha.	<b>5</b>
<b>Total</b>				<b>15</b>

#### Rationale

A study conducted in Central Queensland in 2009 found that the species is primarily restricted to gilgai habitat and does not move in or out of adjacent habitats during seasonal variation of conditions (Veary et al., 2011). Therefore, the abundance, variety and connectivity of gilgai habitat within an assessment unit is a vital aspect of habitat quality required for mobility. Sites where the species have been recorded in abundance are also in habitat patches that are typically greater than 10 hectares in area and are within or connected, to larger areas of remnant vegetation (DAWE, 2020).

### 4. Absence of threats

Indicator	Description			Score
<b>Potential for habitat loss or fragmentation</b>	<b>High (1)</b> Habitat within the assessment unit is located in an area that is likely to be degraded for infrastructure of agriculture.	<b>Moderate (3)</b> Habitat within the assessment unit is located in an area that will be potentially degraded.	<b>High (5)</b> Habitat within the assessment unit not likely to be degraded.	<b>5</b>
<b>Presence and abundance of livestock or feral pigs</b>	<b>High (1)</b> Livestock or pigs abundant with obvious ground compaction and over grazing in gilgai habitat.	<b>Moderate (3)</b> Livestock or pigs present in moderate to low numbers with some indications of ground compaction	<b>High (5)</b> Livestock or pigs not present	<b>5</b>

		and grazing in gilgai habitat.		
<b>Presence and abundance of Cane Toads</b>	<b>High (1)</b> Cane toads present throughout habitat. Toad tadpoles present in standing water.	<b>Moderate (3)</b> Occasional mature cane toads observed.	<b>High (5)</b> No Cane Toads observed.	<b>5</b>
<b>Total</b>				<b>15</b>

### Rationale

The Approved Conservation Advice for the species (TSSC, 2016) lists the main threat identified to the Ornamental Snake is a continued legacy of past broadscale land clearing and habitat degradation. As the species appears to reside at shallow depths within the soil profile, any process which disturbs the land form of gilgai habitats such as clearing, ploughing or the development of access tracks has the potential to significantly impact the species (Veary et al., 2011). The species is highly susceptible to the impacts of cattle grazing during periods when gilgai support water as cattle access can significantly alter the structure and integrity of gilgai form and function (Veary et al., 2011). The destruction of wetland habitats by feral pigs is also likely a threat (TSSC, 2016). The species has been observed to persist in areas where Cane Toads are present, however the species is susceptible to the Cane Toad toxin and death is highly likely if a Cane Toad is bitten or consumed (Veary et al., 2011)

The risk habitat loss, fragmentation and degradation will be determined by assessing the state and federal status of the vegetation which defines an assessment unit. Threatened regional ecosystems (state) and threatened ecological communities (Commonwealth) have a greater level of legislative protection and hence the likelihood of that patch being cleared is reduced. There are numerous factors that can contribute to the degree of risk that an assessment unit might be cleared, such as;

- the vegetation within the assessment unit is on freehold land and is listed as Category X (non-remnant vegetation) or Category B (remnant vegetation),
- the assessment unit is located under an existing PMAV,
- the assessment unit is located on a mining lease or within an infrastructure corridor.,
- the assessment unit is protected under an approved offset management plan and tenure arrangement.

This indicator will be determined through desktop analysis of relevant local, State and Commonwealth databases.

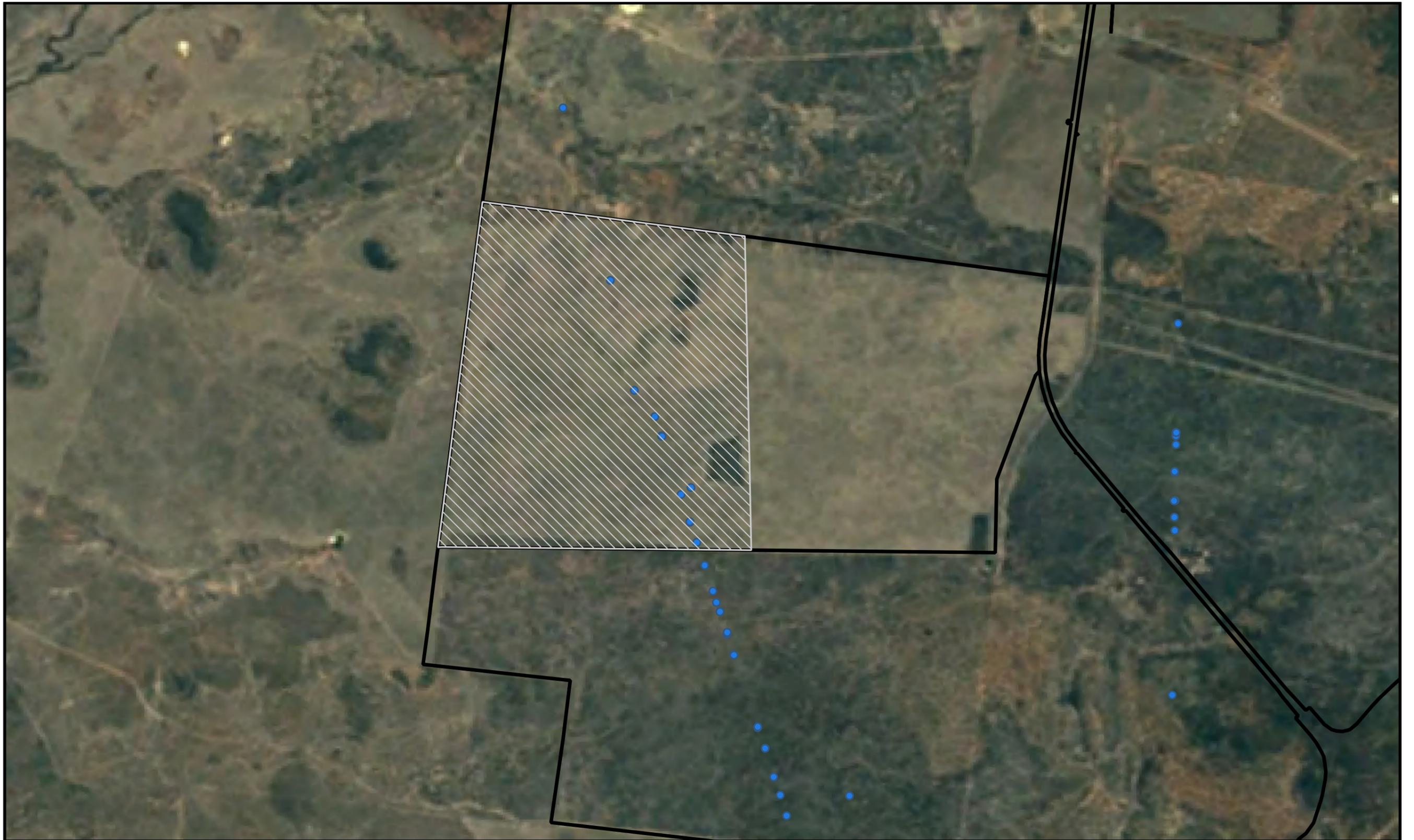
The presence and abundance of cattle, feral pigs and Cane Toads will be estimated by indicators such as direct observation, scats and tracks during field surveys.

*References*

- DAWE. (2020). *Denisonia maculata SPRAT Profile*. Department of Agriculture, Water and the Environment, Australian Government, Canberra. [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=1193](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1193).
- Marston, S (2010). *Personal Communication*. Brendale, Queensland: Ecological Survey & Management.
- Veary, A. T, Veary, E. L., Burgess, J and Fell, D. (2011). Assessment of Habitat Characteristics as Predictors of Habitat Suitability for the Threatened Ornamental Snake. Unpublished report and on-going research on behalf of the Australian Coal Association Research Program, Research Project C15044.

## Appendix C

# Historic Imagery



### Historic Land Use Analysis 1989

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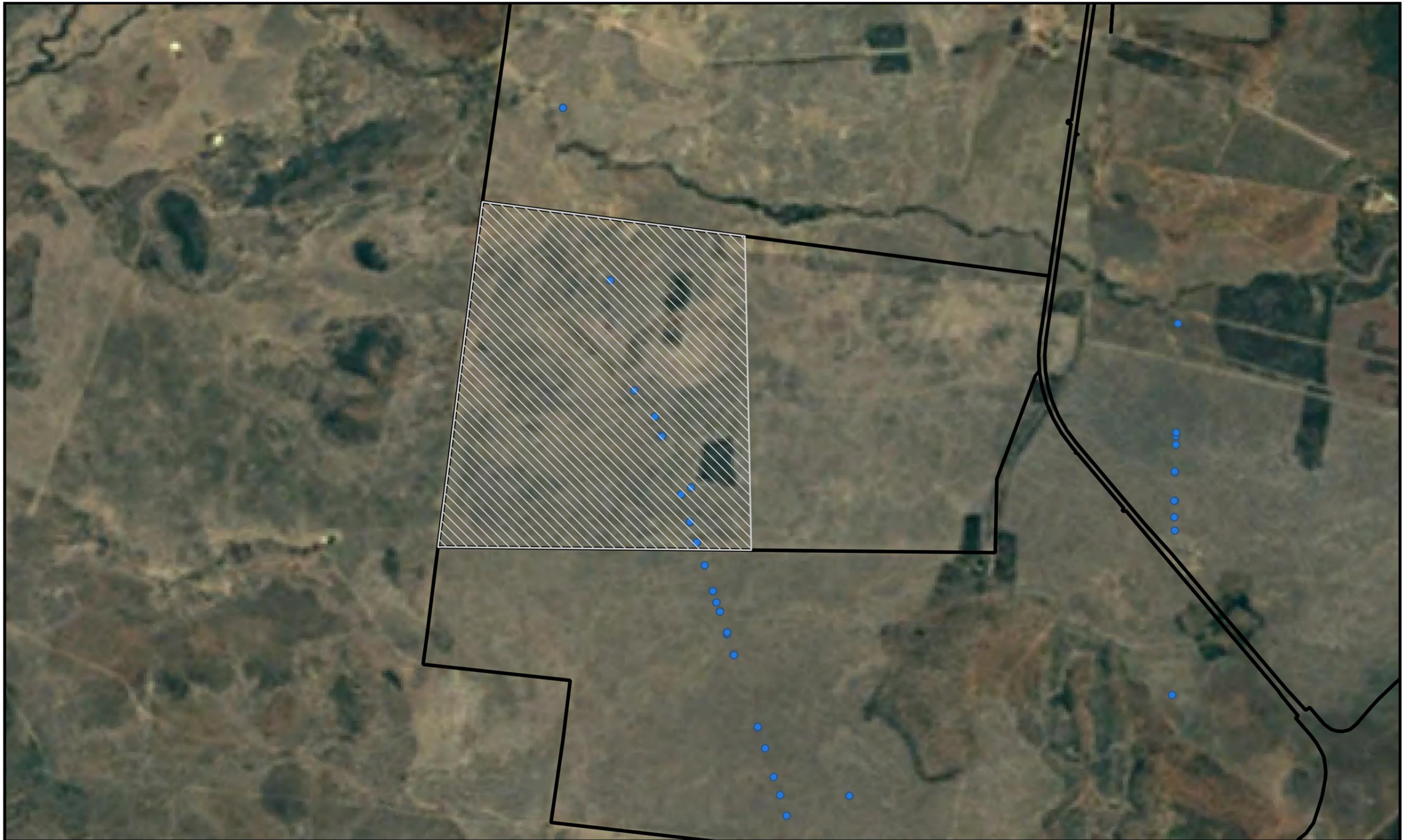
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DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

-  Denham Park
-  Proposed Offset Area
-  Ornamental snake records





### Historic Land Use Analysis 1990

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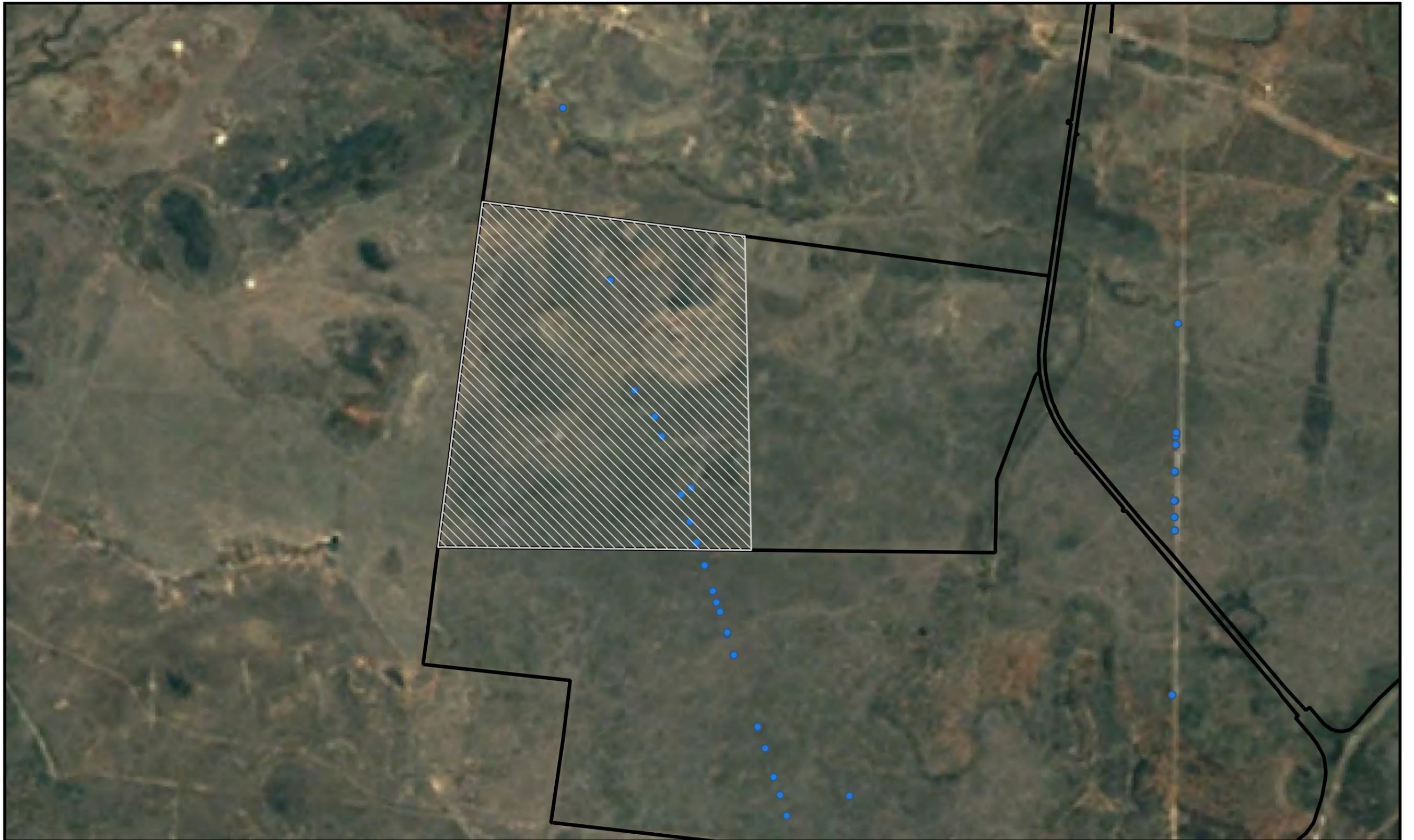
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-  Denham Park
-  Proposed Offset Area
-  Ornamental snake records





### Historic Land Use Analysis 1999

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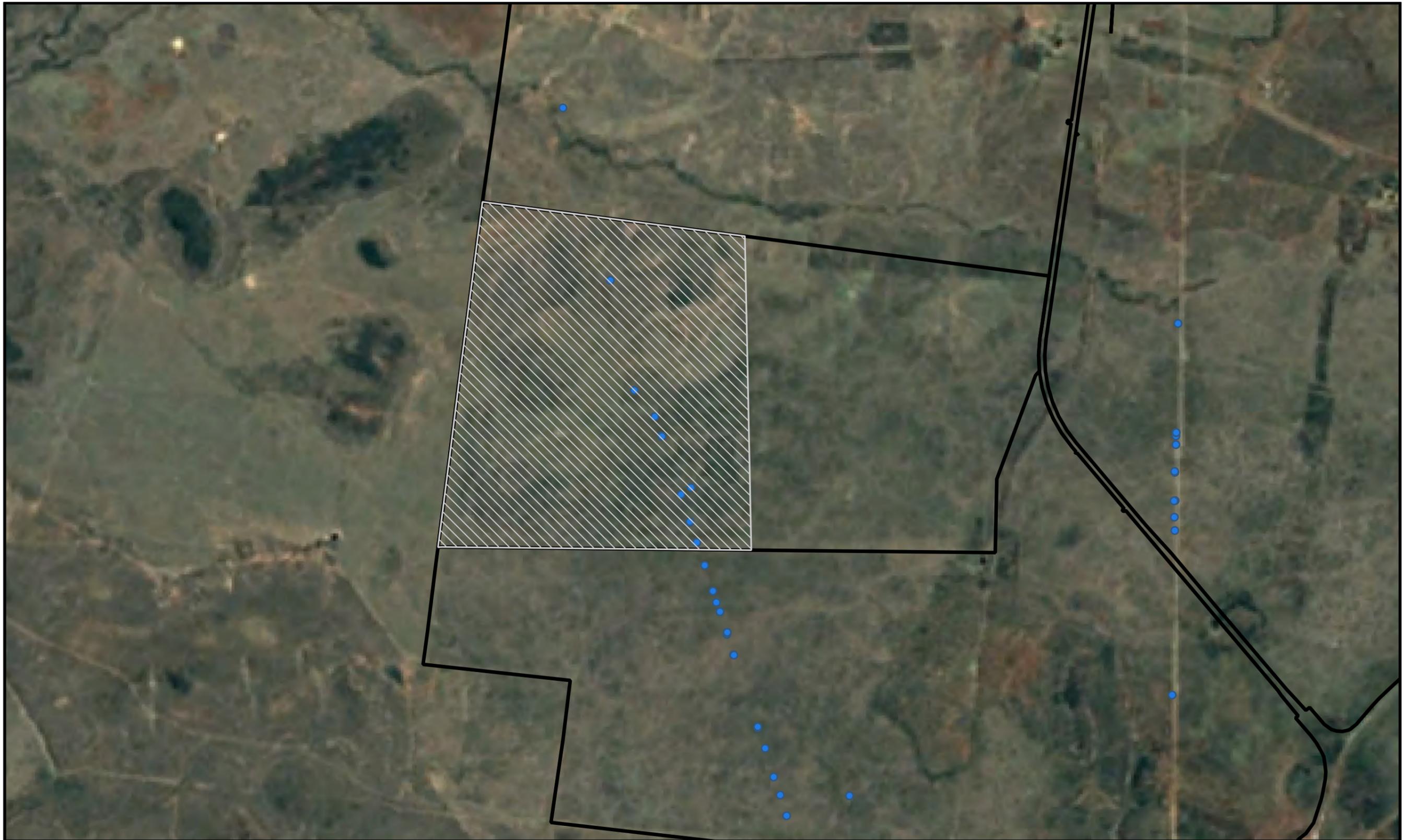
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 Drawn: Isaac Witten



-  Denham Park
-  Proposed Offset Area
-  Ornamental snake records

DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP





### Historic Land Use Analysis 2000

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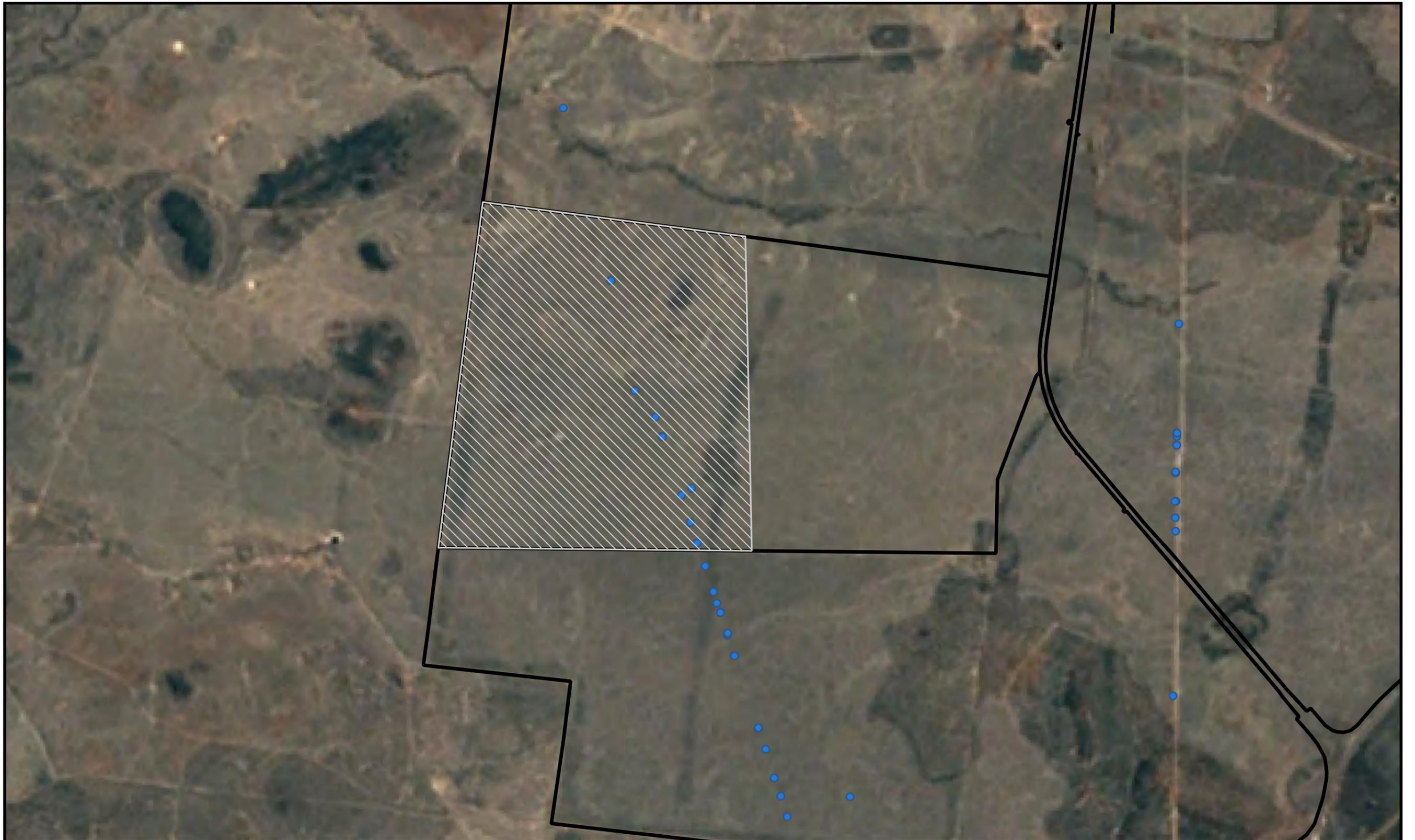
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 Drawn: Isaac Witten



-  Denham Park
-  Proposed Offset Area
-  Ornamental snake records

DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP





### Historic Land Use Analysis 2001

0 500 1000 1500 m

Scale @ A3: 1:30000  
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 Drawn: Isaac Witten



-  Denham Park
-  Proposed Offset Area
-  Ornamental snake records

DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIIP





### Historic Land Use Analysis 2006

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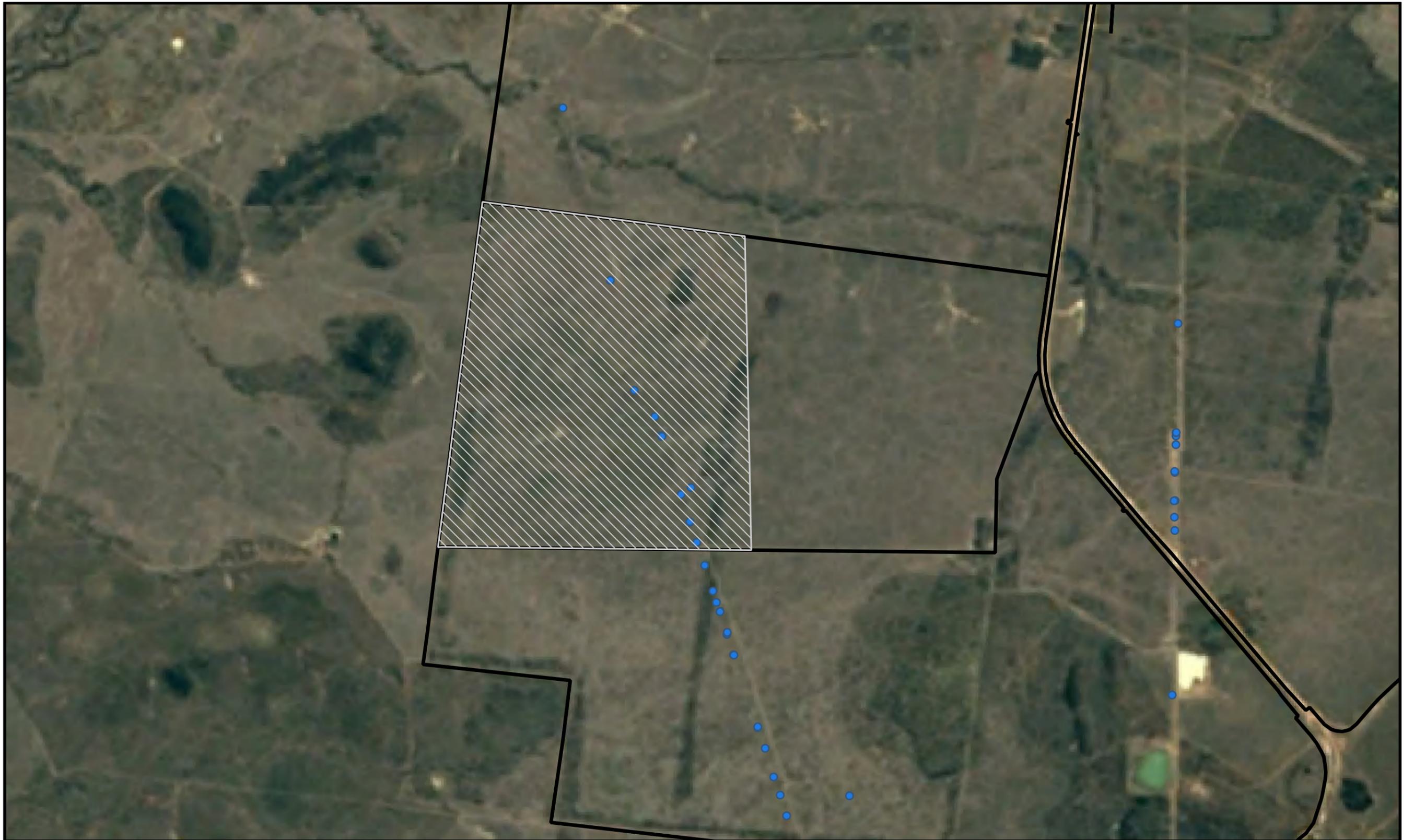
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-  Denham Park
-  Proposed Offset Area
-  Ornamental snake records





### Historic Land Use Analysis 2011

0 500 1000 1500 m

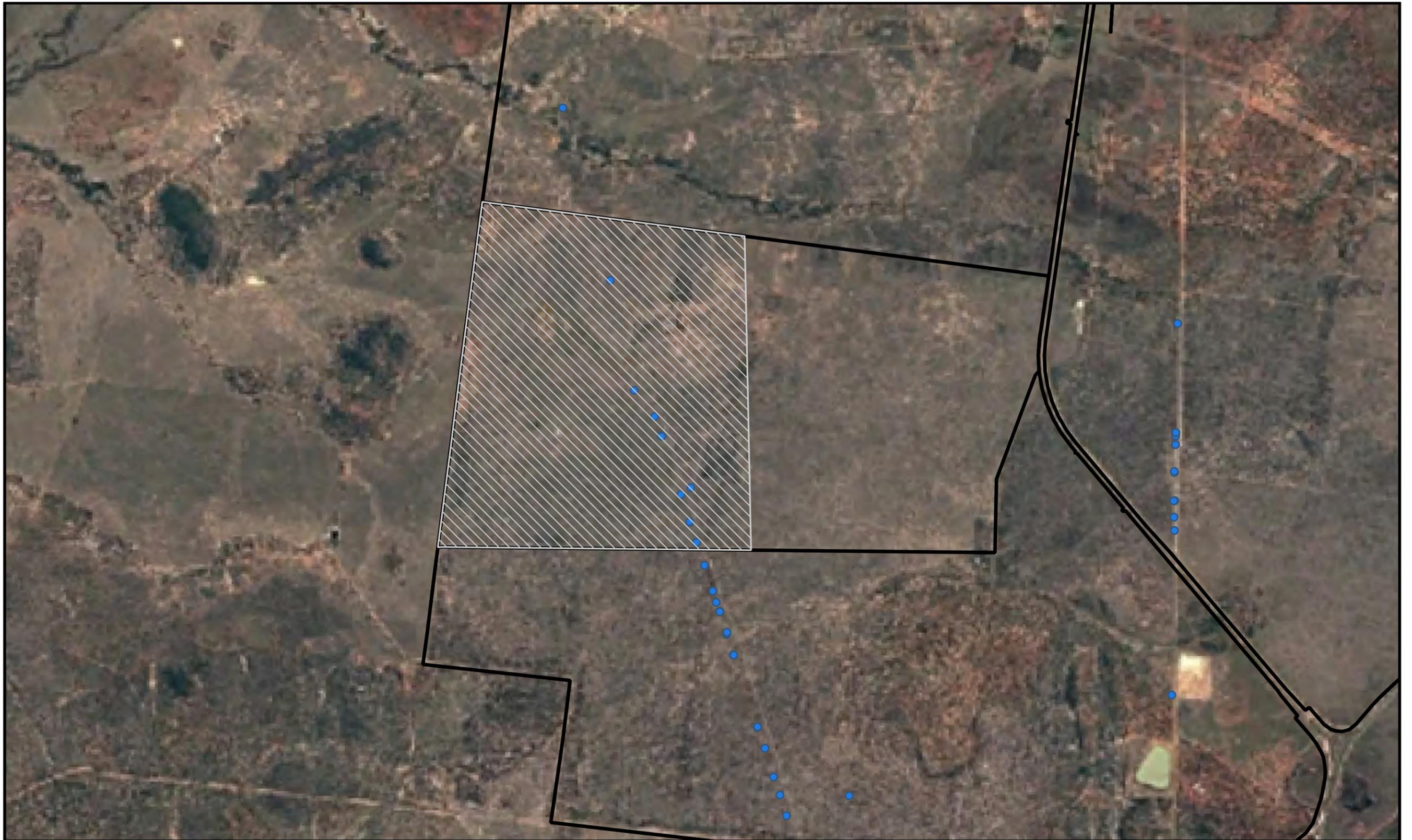
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-  Denham Park
-  Proposed Offset Area
-  Ornamental snake records

DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP





## Historic Land Use Analysis 2020

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 Drawn: Isaac Witten



DATA SOURCE: QSPATIAL 2022; The State of Queensland (Department of Resources) 2022; Esri, DigitalGlobe, GeoEye, i-cubed, USDA FSA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community, DATSIP

-  Denham Park
-  Proposed Offset Area
-  Ornamental snake records

**BASE/**

## Appendix D

# Habitat Quality Data

Assessment Unit - Regional Ecosystem	AU 1 - Non-remnant Grassland																											
Site Reference	Benchmark	HQAP1			HQAP3			HQAP4			HQAP8			HQAP9			HQAP15			Average %	Average							
11.9.1	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	benchmar	Score					
<b>Site Condition</b>																												
Recruitment of woody perennial species in EDL	100	100	100%	100	5	100	100%	100	5	100	100%	100	5	100	100%	100	5	100	100%	100	5	100	100%	100	5	100%	5.0	
Native plant species richness - trees	3	0	0%	0	0	1	33%	33	2.5	0	0%	0	0	0	0%	0	0	0	0%	0	0	2	67%	67	2.5	17%	0.8	
Native plant species richness - shrubs	6	3	50%	50	2.5	10	167%	167	5	5	83%	83	2.5	7	117%	117	5	4	67%	67	2.5	7	117%	117	5	100%	3.8	
Native plant species richness - grasses	7	1	14%	14	0	3	43%	43	2.5	2	29%	29	2.5	4	57%	57	2.5	3	43%	43	2.5	2	29%	29	2.5	36%	2.1	
Native plant species richness - forbes	10	7	70%	70	2.5	6	60%	60	2.5	0	0%	0	0	7	70%	70	2.5	9	90%	90	5	8	80%	80	2.5	62%	2.5	
Tree canopy height emergant	18	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0	0%	0	0	0	0
Tree canopy height	16	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	7	44%	15	0			
Tree canopy height subcanopy	10	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	2%	0.0	
Tree canopy cover emergant	5	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0			
Tree canopy cover	36	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	7.5	21%	7	0			
Tree canopy cover subcanopy	25	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	1%	0.0	
Shrub canopy cover	16	3	19%	19	3	5	31%	31	3	2.2	14%	14	3	3.2	20%	20	3	3.4	21%	21	3	3.8	24%	24	3	21%	3.0	
Native grass cover	22	7	32%	32	1	70	318%	318	5	36	164%	164	5	9.4	43%	43	1	9	41%	41	1	5.8	26%	26	1	104%	2.3	
Organic litter	31	7	23%	23	3	11.4	37%	37	3	16	52%	52	3	14.4	46%	46	3	10.2	33%	33	3	17.6	57%	57	3	41%	3.0	
Large trees (euc plus non-euc)	17	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0%	0.0	
Coarse woody debris	612	12	2%	2	0	74	12%	12	2	459	75%	75	5	334	55%	55	5	171	28%	28	2	120	20%	20	2	32%	2.7	
Non-native plant cover	0	70		0	0	30		3	3	50		0	0	47		3	3	43		3	3	65		0	50.83333	1.5		
Quality and availability of food and foraging habitat				6	6			6	6				6				6				6				6	6.0		
Quality and availability of shelter				1	1			1	1				1				1				1				1	1.0		
Site Condition Score				24				40.5					33												33.5	33.66667		
MAX Site Condition Score				140				140					140												140	140.0		
Site Condition Score - out of 3				0.51				0.87					0.71												0.72	0.72		
<b>Site Context</b>																												
Size of patch				0				0					0												0	0.0		
Connectivity				0				0					0												0	0.0		
Context				0				0					0												0	0.0		
Ecological Corridors																												
Threats to the species				2				2					2												2	2.0		
Species mobility capacity				8				8					6												6	2.0		
Site Context Score				10				10					8												8	8.7		
MAX Site Context Score				45				45					45												45	45.0		
Site Context Score - out of 3				0.67				0.67					0.53												0.53	0.6		

Assessment Unit - Regional Ecosystem	AU 2 - Non-remnant Regrowth Brigalow																								
Site Reference	Benchmark	HQAP2				HQAP 5				HQAP 6				HQAP 10				HQAP11				HQAP14			
	11.4.9	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score			
<b>Site Condition</b>																									
Recruitment of woody perennial species in EDL	100	100	100%	100	5	100	100%	100	5	100	100%	100	5	100	100%	100	5	100	100%	100	5	100	100%	100	5
Native plant species richness - trees	2	0	0%	0	0	0	0%	0	0	4	200%	200	5	0	0%	0	0	2	100%	100	5	0	0%	0	0
Native plant species richness - shrubs	5	9	180%	180	5	6	120%	120	5	9	180%	180	5	7	140%	140	5	6	120%	120	5	8	160%	160	5
Native plant species richness - grasses	5	4	80%	80	2.5	10	200%	200	5	2	40%	40	2.5	9	180%	180	5	2	40%	40	2.5	3	60%	60	2.5
Native plant species richness - forbes	10	10	100%	100	5	14	140%	140	5	6	60%	60	2.5	8	80%	80	2.5	11	110%	110	5	12	120%	120	5
Tree canopy height emergent	n/a																								
Tree canopy height	10	0	0%	0	0	0	0%	0	0	7	70%	35	3	0	0%	0	0	0	0%	0	0	0	0%	0	0
Tree canopy height subcanopy	6	0	0%	0	0	0	0%	0	0	4	67%	33	3	0	0%	0	0	0	0%	0	0	0	0%	0	0
Tree canopy cover emergent	n/a																								
Tree canopy cover	25	0	0%	0	0	0	0%	0	0	24.4	98%	49	3	0	0%	0	0	4.6	18%	9	0	0	0%	0	0
Tree canopy cover subcanopy	11	0	0%	0	0	0	0%	0	0	9.8	89%	9.8	3	0	0%	0	0	0	0%	0	0	0	0%	0	0
Shrub canopy cover	5	12.4	248%	248	3	20.1	402%	402	3	11.5	230%	230	3	14.7	294%	294	3	7.5	150%	150	5	10.7	214%	214	3
Native grass cover	16	5.8	36%	36	1	28.4	178%	178	5	0	0%	0	0	31.4	196%	196	5	51.6	323%	323	5	6.4	40%	40	1
Organic litter	45	39.8	88%	88	3	9.6	21%	21	3	19.8	44%	44	3	8.8	20%	20	3	4	9%	9	0	10	22%	22	3
Large trees (euc plus non-euc)	47	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0
Coarse woody debris	980	451	46%	46	2	5	1%	1	0	270	28%	28	2	26	3%	3	0	135	14%	14	2	66	7%	7	0
Non-native plant cover	0	65		0	0	25		3	0	65		0	0	10		5	0	50		0	0	75		0	0
Quality and availability of food and foraging habitat					12				47				27				12				47			47	
Quality and availability of shelter					1				11				8				1				13			11	
Site Condition Score				39.5				92				69				46.5				94.5			82.5		
MAX Site Condition Score				140				140				140				140				140			140		
Site Condition Score - out of 3				0.85				1.97				1.48				1.00				2.03			1.77		
<b>Site Context</b>																									
Size of patch				0				0					0				0				0			0	
Connectivity				0				0					0				0				0			0	
Context				0				0					0				0				0			0	
Ecological Corridors																									
Threats to the species				2				11					6				2				11			11	
Species mobility capacity				8				8					6				6				6			6	
Site Context Score				10				19				12				8				17			17		
MAX Site Context Score				45				45				45				45				45			45		
Site Context Score - out of 3				0.67				1.27				0.80				0.53				1.13			1.13		

Assessment Unit - Regional Ecosystem																				
Site Reference																				
	HQAP16				HQAP17				HQAP 18				HQAP 19				HQAP 21			
	Raw Data	% Benchmark	Score		Raw Data	% Benchmark	Score		Raw Data	% Benchmark	Score		Raw Data	% Benchmark	Score		Raw Data	% Benchmark	Score	
<b>Site Condition</b>																				
Recruitment of woody perennial species in EDL	100	100%	100	5	100	100%	100	5	100	100%	100	5	100	100%	100	5	100	100%	100	5
Native plant species richness - trees	0	0%	0	0	0	0%	0	0	0	0%	0	0	2	100%	100	5	0	0%	0	0
Native plant species richness - shrubs	10	200%	200	5	9	180%	180	5	7	140%	140	5	6	120%	120	5	12	240%	240	5
Native plant species richness - grasses	7	140%	140	5	1	20%	20	0	10	200%	200	5	5	100%	100	5	6	120%	120	5
Native plant species richness - forbes	7	70%	70	2.5	11	110%	110	5	15	150%	150	5	10	100%	100	5	12	120%	120	5
Tree canopy height emergant																				
Tree canopy height	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0
Tree canopy height subcanopy	0	0%			0	0%			0	0%			0	0%			0	0%		
Tree canopy cover emergant																				
Tree canopy cover	0	0%	0	0	0	0%	0	0	0	0%	0	0	8.4	34%	17	0	0	0%	0	0
Tree canopy cover subcanopy	0	0%			0	0%			0	0%			0	0%			0	0%		
Shrub canopy cover	9.9	198%	198	5	19.6	392%	392	3	19.6	392%	392	3	9.2	184%	184	5	16.8	336%	336	3
Native grass cover	34.8	218%	218	5	16.8	105%	105	5	20.2	126%	126	5	41.8	261%	261	5	27.6	173%	173	5
Organic litter	9.8	22%	22	3	8.4	19%	19	3	29.4	65%	65	3	16	36%	36	3	9	20%	20	3
Large trees (euc plus non-euc)	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0
Coarse woody debris	10	1%	1	0	151	15%	15	2	300	31%	31	2	277	28%	28	2	178	18%	18	2
Non-native plant cover	40			3	55			0	46			3	20			5	20			5
Quality and availability of food and foraging habitat				21				47				47				47				27
Quality and availability of shelter				6				13				13				13				6
Site Condition Score				60.5				88				96				105				71
MAX Site Condition Score				140				140				140				140				140
Site Condition Score - out of 3				1.30				1.89				2.06				2.25				1.52
<b>Site Context</b>																				
Size of patch				0				0				0				0				0
Connectivity				0				0				0				0				0
Context				0				0				0				0				0
Ecological Corridors																				
Threats to the species				6				11				11				11				6
Species mobility capacity				8				6				6				6				6
Site Context Score				14				17				17				17				12
MAX Site Context Score				45				45				45				45				45
Site Context Score - out of 3				0.93				1.13				1.13				1.13				0.80

Assessment Unit - Regional Ecosystem	AU 2 - Non-remnant Regrowth Brigalow										
Site Reference	Benchmark	HQAP22				HQAP23				Average %	Average
	11.4.9	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	benchmar	Score		
<b>Site Condition</b>											
Recruitment of woody perennial species in EDL	100	100	100%	100	5	100	100%	100	5	100%	5
Native plant species richness - trees	2	1	50%	50	2.5	1	50%	50	2.5	38%	1.538462
Native plant species richness - shrubs	5	9	180%	180	5	9	180%	180	5	165%	5
Native plant species richness - grasses	5	5	100%	100	5	5	100%	100	5	106%	3.846154
Native plant species richness - forbes	10	11	110%	110	5	11	110%	110	5	106%	4.423077
Tree canopy height emergent	n/a										
Tree canopy height	10	3.5	35%	18	0	3.5	35%	18	0	4%	0.230769
Tree canopy height subcanopy	6	0	0%			0	0%				
Tree canopy cover emergent	n/a										
Tree canopy cover	25	7.9	32%	16	0	7.9	32%	16	0	8%	0.230769
Tree canopy cover subcanopy	11	0	0%			0	0%				
Shrub canopy cover	5	6	120%	120	5	6	120%	120	5	252%	3.769231
Native grass cover	16	40	250%	250	5	40	250%	250	5	166%	4
Organic litter	45	11.8	26%	26	3	11.8	26%	26	3	32%	2.769231
Large trees (euc plus non-euc)	47	0	0%	0	0	0	0%	0	0	0%	0
Coarse woody debris	980	162	17%	17	2	162	17%	17	2	17%	1.384615
Non-native plant cover	0	15			5	15			5	38.53846	2.615385
Quality and availability of food and foraging habitat					47				6		33.38462
Quality and availability of shelter					11				1		8.307692
Site Condition Score					100.5				49.5		76.5
MAX Site Condition Score					140				140		140
Site Condition Score - out of 3					2.15				1.06		1.64
<b>Site Context</b>											
Size of patch					0				0		0
Connectivity					0				0		0
Context					0				0		0
Ecological Corridors											
Threats to the species					11				2		7.769231
Species mobility capacity					6				8		6.615385
Site Context Score					17				10		14.38462
MAX Site Context Score					45				45		45
Site Context Score - out of 3					1.13				0.67		0.96

Assessment Unit - Regional Ecosystem	AU 3 - Nonremnant Regrowth 11.9.1						
Site Reference	Benchmark 11.9.1	HQAP 7			Average %	Average	
		Raw Data	% Benchmark	Score	benchmar	Score	
<b>Site Condition</b>							
Recruitment of woody perennial species in EDL	100	100	100%	100	5	100%	5
Native plant species richness - trees	3	2	67%	67	2.5	67%	2.5
Native plant species richness - shrubs	6	6	100%	100	5	100%	5
Native plant species richness - grasses	7	3	43%	43	2.5	43%	2.5
Native plant species richness - forbes	10	3	30%	30	2.5	30%	2.5
Tree canopy height emergant	18					0%	
Tree canopy height	16	15	94%	55	3	94%	
Tree canopy height subcanopy	10	7	70%			70%	3
Tree canopy cover emergant	5					0%	
Tree canopy cover	36	55.8	155%	54	3	155%	
Tree canopy cover subcanopy	25	1.8	7%			7%	3
Shrub canopy cover	16	0.4	3%	3	0	3%	0
Native grass cover	22	0	0%	0	0	0%	0
Organic litter	31	31	100%	100	5	100%	5
Large trees (euc plus non-euc)	17	6	35%	35	5	35%	5
Coarse woody debris	612	754	123%	123	5	123%	5
Non-native plant cover	0	60			0		0
Quality and availability of food and foraging habitat					6		6
Quality and availability of shelter					3		3
Site Condition Score					47.5		47.5
MAX Site Condition Score					140		140
<b>Site Condition Score - out of 3</b>					<b>1.02</b>		<b>1.02</b>
<b>Site Context</b>							
Size of patch					0		0
Connectivity					0		0
Context					0		0
Threats to the species					2		2
Species mobility capacity					8		8
Site Context Score					10		10
MAX Site Context Score					45		45
<b>Site Context Score - out of 3</b>					<b>0.67</b>		<b>0.67</b>

Assessment Unit - Regional Ecosystem	AU 4 - Remnant 11.4.9																		
Site Reference	Benchmark	HQAP 6				HQAP 12				HQAP 13				HQAP 20				Average %	Average
	11.4.9	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	benchmar	Score	
<b>Site Condition</b>																			
Recruitment of woody perennial species in EDL	100	100	100%	100	5	100	100%	100	5	100	100%	100	5	100	100%	100	5	100%	5
Native plant species richness - trees	2	4	200%	200	5	5	250%	250	5	6	300%	300	5	6	300%	300	5	263%	5
Native plant species richness - shrubs	5	9	180%	180	5	6	120%	120	5	11	220%	220	5	3	60%	60	2.5	145%	4.375
Native plant species richness - grasses	5	2	40%	40	2.5	3	60%	60	2.5	4	80%	80	2.5	6	120%	120	5	75%	3.125
Native plant species richness - forbes	10	6	60%	60	2.5	9	90%	90	5	14	140%	140	5	9	90%	90	5	95%	4.375
Tree canopy height emergant	n/a																		3
Tree canopy height	10	7	70%	35	3	6.5	65%	33	3	7	70%	35	3	6.25	63%	31	3	33%	
Tree canopy height subcanopy	6	3	50%			3.25	54%			3.25	54%			3	50%				
Tree canopy cover emergant	n/a																		3
Tree canopy cover	25	24.4	98%	49	3	33.4	134%	67	3	23	92%	46	3	34.8	139%	70	3	58%	
Tree canopy cover subcanopy	11	9.8	89%			8.7	79%			29.4	267%			7.2	65%				
Shrub canopy cover	5	11.5	230%	230	3	2.7	54%	54	5	6.7	134%	134	5	3.1	62%	62	5	120%	4.5
Native grass cover	16	0	0%	0	0	8	50%	50	3	23.8	149%	149	5	8.2	51%	51	3	63%	2.75
Organic litter	45	19.8	44%	44	3	13.2	29%	29	3	27.8	62%	62	3	15.6	35%	35	3	42%	3
Large trees (euc plus non-euc)	47	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0%	0
Coarse woody debris	980	270	28%	28	2	451	46%	46	2	599	61%	61	5	288	29%	29	2	41%	2.75
Non-native plant cover	0	65			0	80			0	35			3	55			0		0.75
Quality and availability of food and foraging habitat					27				47				55				27		39
Quality and availability of shelter					8				13				15				8		11
Site Condition Score				69				101.5					119.5			76.5			91.625
MAX Site Condition Score				140				140					140			140			140
Site Condition Score - out of 3				1.48				2.18					2.56			1.64			1.96
<b>Site Context</b>																			
Size of patch				0				0					0				0		0
Connectivity				0				0					0				0		0
Context				0				0					0				2		0.5
Threats to the species				6				13					13				8		10
Species mobility capacity				6				6					6				6		6
Site Context Score				12				19					19			14			16
MAX Site Context Score				45				45					45			45			45
Site Context Score - out of 3				0.80				1.27					1.27			0.93			1.07

## Appendix E

# Weed Species List

Botanical Name	Common Name	Legislation
<i>Cenchrus ciliaris</i>	Buffel grass	-
<i>Chloris inflata</i>	Purple top chloris	-
<i>Eragrostis curvula</i>	African lovegrass	-
<i>Gomphrena celosioides</i>	Gomphrena weed	-
<i>Harrisia martinii</i>	Harrisia cactus	WONS and Restricted Matter category 3
<i>Malvastrum americanum</i>	Spiked malvastrum	-
<i>Malvastrum americanum</i> var. <i>americanum</i>	Spiked malvastrum	-
<i>Melinis repens</i>	Red natal grass	-
<i>Opuntia tomentosa</i>	Velvety tree pear	WONS and Restricted Matter category 3
<i>Parthenium hysterophorus</i>	Parthenium	WONS and Restricted Matter category 3
<i>Portulaca oleracea</i>	Pigweed	-
<i>Senecio madagascariensis</i>	Fireweed	WONS and Restricted Matter category 3
<i>Sida acuta</i>	Common wireweed	-
<i>Sida rhombifolia</i>	Common sida	-
<i>Sida spinosa</i>	Spiny sida	-
<i>Stylosanthes scabra</i>	Shrubby stylo	-
<i>Urochloa mosambicensis</i>	Sabi grass	-

## Appendix E

# Habitat Quality Data

Site Reference	AU 1 - Non-remnant 11.9.1														
	Benchmark 11.9.1	HQAP 4				HQAP 5				HQAP 10				Average % benchmar	Average Score
		Raw Data	% Benchmark	Score		Raw Data	% Benchmark	Score		Raw Data	% Benchmark	Score			
<b>Site Condition</b>															
Recruitment of woody perennial species in EDL	100	100	100%	100	5	100	100%	100	5	100	100%	100	5	100	5.0
Native plant species richness - trees	3	0	0%	0	0	0	0%	0	0	2	67%	67	2.5	22	0.8
Native plant species richness - shrubs	6	7	117%	117	5	4	67%	67	2.5	7	117%	117	5	100	4.2
Native plant species richness - grasses	7	4	57%	57	2.5	3	43%	43	2.5	2	29%	29	2.5	43	2.5
Native plant species richness - forbes	10	7	70%	70	2.5	9	90%	90	5	8	80%	80	2.5	80	3.3
Tree canopy height emergant	18	0	0%			0	0%			0	0%				
Tree canopy height	16	0	0%	0	0	0	0%	0	0	7	44%	15	0		
Tree canopy height subcanopy	10	0	0%			0	0%			0	0%			5	0.0
Tree canopy cover emergant	5	0	0%			0	0%			0	0%				
Tree canopy cover	36	0	0%	0	0	0	0%	0	0	7.5	21%	7	0		
Tree canopy cover subcanopy	25	0	0%			0	0%			0	0%			2	0.0
Shrub canopy cover	16	3.2	20%	20	3	3.4	21%	21	3	3.8	24%	24	3	22	3.0
Native grass cover	22	9.4	43%	43	1	9	41%	41	1	5.8	26%	26	1	37	1.0
Organic litter	31	14.4	46%	46	3	10.2	33%	33	3	17.6	57%	57	3	45	3.0
Large trees (euc plus non-euc)	17	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0.0
Coarse woody debris	612	334	55%	55	5	171	28%	28	2	120	20%	20	2	34	3.0
Non-native plant cover	0	47			3	43			3	65			0		2.0
Quality and availability of food and foraging habitat					6				6				6		6.0
Quality and availability of shelter					1				1				1		1.0
Site Condition Score					37				34				33.5		34.8
MAX Site Condition Score					140				140				140		140.0
Site Condition Score - out of 3					0.79				0.73				0.72		0.75
<b>Site Context</b>															
Size of patch					0				0				0		0.0
Connectivity					0				0				0		0.0
Context					0				0				0		0.0
Threats to the species					2				2				2		2.0
Species mobility capacity					6				6				6		6.0
Site Context Score					8				8				8		8.0
MAX Site Context Score					45				45				45		45.0
Site Context Score - out of 3					0.53				0.53				0.53		0.5

AU 2 - Non-remnant Regrowth Brigalow																									
Site Reference	Benchmark	HQAP 1			HQAP 6			HQAP9			HQAP11			HQAP 12			HQAP 13			Average %	Average				
	11.4.9	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	benchmar	Score																
<b>Site Condition</b>																									
Recruitment of woody perennial species in EDL	100	100	100%	100	5	100	100%	100	5	100	100%	100	5	100	100%	100	5	100	100%	100	5	100	100%	100	5
Native plant species richness - trees	2	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0
Native plant species richness - shrubs	5	6	120%	120	5	7	140%	140	5	8	160%	160	5	10	200%	200	5	9	180%	180	5	7	140%	140	5
Native plant species richness - grasses	5	10	200%	200	5	9	180%	180	5	3	60%	60	2.5	7	140%	140	5	1	20%	20	0	10	200%	200	5
Native plant species richness - forbes	10	14	140%	140	5	8	80%	80	2.5	12	120%	120	5	7	70%	70	2.5	11	110%	110	5	15	150%	150	5
Tree canopy height emergant	n/a																								
Tree canopy height	10	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0
Tree canopy height subcanopy	6	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0
Tree canopy cover emergant	n/a																								
Tree canopy cover	25	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0
Tree canopy cover subcanopy	11	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0
Shrub canopy cover	5	20.1	402%	402	3	14.7	294%	294	3	10.7	214%	214	3	9.9	198%	198	5	19.6	392%	392	3	19.6	392%	392	3
Native grass cover	16	28.4	178%	178	5	31.4	196%	196	5	6.4	40%	40	1	34.8	218%	218	5	16.8	105%	105	5	20.2	126%	126	5
Organic litter	45	9.6	21%	21	3	8.8	20%	20	3	10	22%	22	3	9.8	22%	22	3	8.4	19%	19	3	29.4	65%	65	3
Large trees (euc plus non-euc)	47	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0%	0	0
Coarse woody debris	980	5	1%	1	0	26	3%	3	0	66	7%	7	0	10	1%	1	0	151	15%	15	2	300	31%	31	2
Non-native plant cover	0	25			3	10			5	75			0	40			3	55			0	46			3
Quality and availability of food and foraging habitat					47			12					47			21					47			47	
Quality and availability of shelter					11			1					11			6					13			13	
Site Condition Score				92			46.5			82.5			60.5			88					96			77.6	
MAX Site Condition Score				140			140			140			140			140					140			140	
Site Condition Score - out of 3				1.97			1.00			1.77			1.30			1.89					2.06			1.66	
<b>Site Context</b>																									
Size of patch				0			0			0			0			0					0			0	
Connectivity				0			0			0			0			0					0			0	
Context				0			0			0			0			0					0			0	
Threats to the species				11			2			11			6			11					11			9	
Species mobility capacity				8			6			6			8			6					6			7	
Site Context Score				19			8			17			14			17					17			15.3	
MAX Site Context Score				45			45			45			45			45					45			45	
Site Context Score - out of 3				1.27			0.53			1.13			0.93			1.13					1.13			1.02	

	AU 3 - 11.9.1						
Site Reference	Benchmark	HQAP 3			Average %	Average	
	11.9.1	Raw Data	% Benchmark	Score	benchmar	Score	
<b>Site Condition</b>							
Recruitment of woody perennial species in EDL	100	100	100%	100	5	100%	5
Native plant species richness - trees	3	2	67%	67	2.5	67%	2.5
Native plant species richness - shrubs	6	6	100%	100	5	100%	5
Native plant species richness - grasses	7	3	43%	43	2.5	43%	2.5
Native plant species richness - forbes	10	3	30%	30	2.5	30%	2.5
Tree canopy height emergant	18					0%	3
Tree canopy height	16	15	94%	55	3	94%	
Tree canopy height subcanopy	10	7	70%			70%	
Tree canopy cover emergant	5					0%	3
Tree canopy cover	36	55.8	155%	54	3	155%	
Tree canopy cover subcanopy	25	1.8	7%			7%	
Shrub canopy cover	16	0.4	3%	3	0	3%	0
Native grass cover	22	0	0%	0	0	0%	0
Organic litter	31	31	100%	100	5	100%	5
Large trees (euc plus non-euc)	17	6	35%	35	5	35%	5
Coarse woody debris	612	754	123%	123	5	123%	5
Non-native plant cover	0	60			0		0
Quality and availability of food and foraging habitat					6		6
Quality and availability of shelter					3		3
Site Condition Score					47.5		47.5
MAX Site Condition Score					140		140
<b>Site Condition Score - out of 3</b>					<b>1.02</b>		<b>1.02</b>
<b>Site Context</b>							
Size of patch					0		0
Connectivity					0		0
Context					0		0
Threats to the species					2		2
Species mobility capacity					8		8
Site Context Score					10		10
MAX Site Context Score					45		45
<b>Site Context Score - out of 3</b>					<b>0.67</b>		<b>0.67</b>

AU 4 - High Regrowth 11.4.9															
Site Reference	Benchmark	HQAP 2				HQAP 7				HQAP 8				Average %	Average
	11.4.9	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	Raw Data	% Benchmark	Score	benchmar	Score
<b>Site Condition</b>															
Recruitment of woody perennial species in EDL	100	100	100%	100	5	100	100%	100	5	100	100%	100	5	100	5
Native plant species richness - trees	2	4	200%	200	5	5	250%	250	5	6	300%	300	5	250	5
Native plant species richness - shrubs	5	9	180%	180	5	6	120%	120	5	11	220%	220	5	173	5
Native plant species richness - grasses	5	2	40%	40	2.5	3	60%	60	2.5	4	80%	80	2.5	60	3
Native plant species richness - forbes	10	6	60%	60	2.5	9	90%	90	5	14	140%	140	5	97	4
Tree canopy height emergant	n/a														
Tree canopy height	10	7	70%	35	3	6.5	65%	33	3	7	70%	35	3	34	
Tree canopy height subcanopy	6	3	50%			3.25	54%			3.25	54%				3
Tree canopy cover emergant	n/a														
Tree canopy cover	25	24.4	98%	49	3	33.4	134%	67	3	23	92%	46	3	54	
Tree canopy cover subcanopy	11	9.8	89%			8.7	79%			29.4	267%				3
Shrub canopy cover	5	11.5	230%	230	3	2.7	54%	54	5	6.7	134%	134	5	139	4
Native grass cover	16	0	0%	0	0	8	50%	50	3	23.8	149%	149	5	66	3
Organic litter	45	19.8	44%	44	3	13.2	29%	29	3	27.8	62%	62	3	45	3
Large trees (euc plus non-euc)	47	0	0%	0	0	0	0%	0	0	0	0%	0	0	0	0
Coarse woody debris	980	270	28%	28	2	451	46%	46	2	599	61%	61	5	45	3
Non-native plant cover	0	65			0	80			0	35			3		1
Quality and availability of food and foraging habitat					27				47				55		43
Quality and availability of shelter					8				13				15		12
Site Condition Score					69				101.5				119.5		96.7
MAX Site Condition Score					140				140				140		140.00
Site Condition Score - out of 3					1.48				2.18				2.56		2.07
<b>Site Context</b>															
Size of patch					0				0				0		0.00
Connectivity					0				0				0		0.00
Context					0				0				0		0.00
Threats to the species					6				13				13		10.67
Species mobility capacity					6				6				6		6.00
Site Context Score					12				19				19		16.7
MAX Site Context Score					45				45				45		45.00
Site Context Score - out of 3					0.80				1.27				1.27		1.11

<b>Final habitat quality score (weighted)</b>	<b>AU1</b>	<b>AU2</b>	<b>AU3</b>	<b>AU4</b>	<b>Average/Final</b>
Site Condition score (out of 3)	0.75	1.66	1.02	2.07	1.37
Site Context Score (out of 3)	0.53	1.02	0.67	1.11	0.83
Species Stocking Rate Score (out of 4)	1	1	1	1	1.00
Habitat Quality score (out of 10)	2.3	3.7	2.7	4.2	3.21
Assessment Unit area (ha)	157.6	832.4	7.4	22.8	
Total offset area (ha)	1020.2	1020.2	1020.2	1020.2	
Size Weighting	0.15	0.82	0.01	0.02	
<b>Weighted Habitat Quality Score</b>	<b>0.35</b>	<b>3.01</b>	<b>0.02</b>	<b>0.09</b>	<b>3.47</b>

## Appendix F

# EPBC Offset Area Calculator



## Appendix G

# Regional Ecosystem Fire Management Guidelines

RE index	Bioregion	Regional Ecosystem	Description label	Fire guidelines
110409	BRB	11.4.9	Acacia harpophylla shrubby woodland with Terminalia oblongata on Cainozoic clay plains	STRATEGY: Maintain fire management of surrounding country 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. ISSUES: Casuarina cristata is fire sensitive, although germination can be good in bare areas. Brigalow is soft-seeded, so germination is not promoted by fire. Buffel grass invasion will increase risk from fire. High intensity fires will cause damage to overstorey. Grazing may be an option for reducing fuel loads where exotic grass such as buffel have invaded.
110901	BRB	11.9.1	Acacia harpophylla-Eucalyptus cambageana woodland to open forest on fine-grained sedimentary rocks	STRATEGY: Maintain fire management of surrounding country 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. ISSUES: Casuarina cristata is fire sensitive, although germination can be good in bare areas. Brigalow is soft-seeded, so germination is not promoted by fire. Buffel grass invasion will increase risk from fire. High intensity fires will cause damage to overstorey. Grazing may be an option for reducing fuel loads where exotic grass such as buffel have invaded.